NATIONAL MARINE FISHERIES SERVICE
BEAUFORT, NORTH CAROLINA 28516

U.S. FISH COMMISSION
BEAUFORT, N.C.

UNITED STATES COMMISSION OF FISH AND FISHERIES
SPENCER F. BAIRD, COMMISSIONER

THE FISHERIES

AND

FISHERY INDUSTRIES

OF THE

UNITED STATES

PREPARED THROUGH THE CO-OPERATION OF THE COMMISSIONER OF FISHERIES AND THE SUPERINTENDENT OF THE TENTH CENSUS

BY

GEORGE BROWN GOODE
ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION
AND A STAFF OF ASSOCIATES

SECTION V

HISTORY AND METHODS OF THE FISHERIES

IN TWO VOLUMES, WITH AN ATLAS OF TWO HUNDRED AND FIFTY-FIVE PLATES

VOLUME I

WASHINGTON
GOVERNMENT PRINTING OFFICE
1887

U. S. Fishery Laboratory
Beaufort, North Carolina

2780

SH
351
A2
no.5
v.1

ASSOCIATE AUTHORS.

JOEL A. ALLEN	Museum of Comparative Zoology, Cambridge.
TARLETON H. BEAN	U. S. National Museum, Washington.
JAMES TEMPLE BROWN	U. S. National Museum, Washington.
A. HOWARD CLARK	U. S. National Museum, Washington.
CAPTAIN JOSEPH W. COLLINS	Gloucester, Massachusetts.
R. EDWARD EARLL	U. S. Fish Commission, Washington.
HENRY W. ELLIOTT	*Cleveland, Ohio.*
ERNEST INGERSOLL	New Haven, Connecticut.
DAVID S. JORDAN	Indiana University, Bloomington, Indiana.
LUDWIG KUMLIEN	Milwaukee, Wisconsin.
MARSHALL MCDONALD	U. S. Fish Commission, Washington.
FREDERICK MATHER	N. Y. Fish Commission, Cold Spring, New York.
BARNET PHILLIPS	*Brooklyn, New York.*
RICHARD RATHBUN	U. S. National Museum, Washington.
JOHN A. RYDER	U. S. Fish Commission, Washington.
CHARLES W. SMILEY	U. S. Fish Commission, Washington.
SILAS STEARNS	*Pensacola, Florida.*
FREDERICK W. TRUE	U. S. National Museum, Washington.
WILLIAM A. WILCOX	Gloucester, Massachusetts.

Blank page retained for pagination

LETTER OF TRANSMITTAL.

WASHINGTON, D. C., *July* 1, 1884.

SIR: I have the honor to submit herewith a report on the HISTORY AND METHODS OF THE PRINCIPAL FISHERIES OF THE UNITED STATES.

This report constitutes Section V of the Special Report on the Food Fishes and Fishery Industries of the United States, prepared through the co-operation of the Commission of Fish and Fisheries and the Superintendent of the Tenth Census. Section I, the Natural History of Useful Aquatic Animals; Section II, Geographical Review of the Fisheries and Fishing Communities; Section III, Fishing Grounds; and Section IV, Fishermen, have already been completed.

This section is intended to be printed in two volumes, with an atlas of two hundred and fifty-five plates of illustrations. In the first volume are discussed the fisheries for food-fishes and in the second volume the fisheries for marine mammals and reptiles, mollusks and other invertebrates.

The following-named census agents and assistants of the United States Fish Commission have taken part in the preparation of the present section: Dr. Tarleton H. Bean, Mr. James Templeman Brown, Mr. A. Howard Clark, Capt. Joseph W. Collins, Mr. R. Edward Earll, Mr. Henry W. Elliott, Mr. Charles H. Gilbert, Prof. G. Brown Goode, Mr. Ernest Ingersoll, Prof. David S. Jordan, Mr. Ludwig Kumlien, Col. Marshall McDonald, Mr. Newton P. Scudder, Mr. Silas Stearns, Mr. James G. Swan, Mr. Frederick W. True, and Mr. W. A. Wilcox. I regret to state that Mr. James Templeman Brown died before the completion of his report upon the apparatus and methods of the whale fishery; but the manuscript was in such condition that it could be made ready for the press by one of my assistants.

Yours, very respectfully,

G. BROWN GOODE.

Prof. SPENCER F. BAIRD,

Commissioner of Fish and Fisheries.

Blank page retained for pagination

TABLE OF CONTENTS.

VOLUME I.

Page.

List of illustrations (see also Atlas of plates) XI

PART I.—THE HALIBUT FISHERIES:

1. The Fresh-Halibut Fishery. By G. BROWN GOODE and J. W. COLLINS 3–89
2. The Salt-Halibut Fishery. By N. P. SCUDDER 90–119

PART II.—THE COD, HADDOCK, AND HAKE FISHERIES:

1. The Bank Hand-Line Cod Fishery By G. BROWN GOODE and J. W. COLLINS 123–133
2. The Labrador and Gulf of St. Lawrence Cod Fisheries. By G. BROWN GOODE and J. W. COLLINS. 133–147
3. The Bank Trawl-Line Cod Fishery. By G. BROWN GOODE and J. W. COLLINS 147–187
4. The George's Bank Cod Fishery. By G. BROWN GOODE and J. W. COLLINS 187–198
5. The Cod Fishery of Alaska. By TARLETON H. BEAN 198–224
6. The Gill-Net Cod Fishery. By J. W. COLLINS 225–233
7. The Haddock Fishery of New England. By G. BROWN GOODE and J. W. COLLINS 234–241
8. The Hake Fishery. By G. BROWN GOODE and J. W. COLLINS 241–243

PART III.—THE MACKEREL FISHERY. By G. BROWN GOODE and J. W. COLLINS:

1. The Mackerel Purse-Seine Fishery 247–272
2. The Spring Southern Mackerel Fishery 273–275
3. The Mackerel Hook Fishery 275–294
4. The Mackerel Gill-Net Fishery 294–298
5. Early Methods of the Mackerel Fishery 298–300
6. Legislation for the Protection of Mackerel 301–304
7. Statistics of the Mackerel Fishery 304–313

PART IV.—THE SWORDFISH FISHERY. By G. BROWN GOODE 315–326

PART V.—THE MENHADEN FISHERY. By G. BROWN GOODE and A. HOWARD CLARK 327–415

PART VI.—THE HERRING FISHERY AND THE SARDINE INDUSTRY. By R. EDWARD EARLL:

1. The Herring Fishery of the United States 419–439
2. The Frozen-Herring Industry 439–458
3. The Pickled-Herring Trade with Magdalen Islands, Anticosti, Newfoundland, and Labrador 459–472
4. The Smoked-Herring Industry 473–488
5. The Sardine Industry 489–524

PART VII.—THE SHORE FISHERIES OF SOUTHERN DELAWARE. By J. W. COLLINS:

Page.

1. The Squeteague or Trout Fishery 527–533
2. The Spot Fishery 533–538
3. The Rock and Perch Fishery 538–540
4. The Sturgeon Fishery of Delaware Bay 540–541

PART VIII.—THE SPANISH MACKEREL FISHERY. By R. EDWARD EARLL 543–552

PART IX.—THE MULLET FISHERY. By R. EDWARD EARLL 553–582

PART X.—THE RED-SNAPPER AND HAVANA MARKET FISHERIES. By SILAS STEARNS:

1. The Red-Snapper Fishery 585–592
2. The Havana Market Fishery of Key West, Florida 592–594

PART XI.—THE POUND-NET FISHERIES OF THE ATLANTIC STATES. By FREDERICK W. TRUE 595–610

PART XII.—THE RIVER FISHERIES OF THE ATLANTIC STATES:

1. The Rivers of Eastern Florida, Georgia, and South Carolina. By MARSHALL MCDONALD 613–625
2. The Rivers and Sounds of North Carolina. By MARSHALL MCDONALD 625–637
3. The Fisheries of Chesapeake Bay and its Tributaries. By MARSHALL MCDONALD 637–654
4. The Fisheries of the Delaware River. By MARSHALL MCDONALD 654–657
5. The Fisheries of the Hudson River. By MARSHALL MCDONALD 658–659
6. The Connecticut and Housatonic Rivers and Minor Tributaries of Long Island Sound. By MARSHALL MCDONALD 659–667
7. Rivers of Massachusetts and New Hampshire. By FREDERICK W. TRUE and W. A. WILCOX 667–673
8. The River Fisheries of Maine. By C. G. ATKINS 673–728

PART XIII.—THE SALMON FISHING AND CANNING INTERESTS OF THE PACIFIC COAST. By D. S. JORDAN and C. H. GILBERT 729–753

PART XIV.—THE FISHERIES OF THE GREAT LAKES. By LUDWIG KUMLIEN .. 755–769

Index 771–808

VOLUME II.

List of illustrations (see also Atlas of plates) xlx

PART XV.—THE WHALE FISHERY:

1. History and Present Condition of the Fishery. By A. HOWARD CLARK 3–218
2. Whalemen, Vessels, Apparatus, and Methods of the Fishery. By JAMES TEMPLEMAN BROWN 218–293

PART XVI.—THE BLACKFISH AND PORPOISE FISHERIES. By A. HOWARD CLARK 295–310

PART XVII.—THE PACIFIC WALRUS FISHERY. By A. HOWARD CLARK 311–318

PART XVIII.—THE SEAL AND SEA-OTTER INDUSTRIES:

Page.

1. The Fur-Seal Industry of the Pribylov Islands, Alaska. By HENRY W. ELLIOTT 320–393
2. The Fur-Seal Industry of Cape Flattery, Washington Territory. By JAMES G. SWAN 393–400
3. The Antarctic Fur Seal and Sea-Elephant Industries. By A. HOWARD CLARK 400–467
4. The Sea-Lion Hunt. By HENRY W. ELLIOTT 467–474
5. The North Atlantic Seal Fishery. By A. HOWARD CLARK 474–483
6. The Sea-Otter Fishery. By HENRY W. ELLIOTT 483–491

PART XIX.—THE TURTLE AND TERRAPIN FISHERIES. By FREDERICK W. TRUE 493–504

PART XX.—THE OYSTER, SCALLOP, CLAM, MUSSEL, AND ABALONE INDUSTRIES. By ERNEST INGERSOLL:

1. The Oyster Industry 507–565
2. The Scallop Fishery 565–581
3. The Clam Fisheries 581–615
4. The Mussel Fishery 615–622
5. The Abalone Fishery 622–626

PART XXI.—THE CRAB, LOBSTER, CRAYFISH, ROCK-LOBSTER, SHRIMP, AND PRAWN FISHERIES. By RICHARD RATHBUN:

1. The Crab Fisheries 629–658
2. The Lobster Fishery 658–794
3. The Crayfish Fishery 794–797
4. The Rock-Lobster Fishery 798–799
5. *The Shrimp and Prawn Fisheries* 799–810

PART XXII.—THE LEECH INDUSTRY AND TREPANG FISHERY. By RICHARD RATHBUN 811–816

PART XXIII.—THE SPONGE FISHERY AND TRADE 817–841

Index 843–881

Blank page retained for pagination

LIST OF PLATES TO SECTION V.

[Engraved by the Photo-Engraving Company of New York City.]

(Page references to Volumes I and II of text.)

THE FRESH HALIBUT FISHERY.

	Vol.	Page.
1. Halibut schooner under jib, foresail, and double-reefed mainsail; nests of dories on deck amidships; rigged for fall and winter fishing Drawing by Capt. J. W. Collins.	I,	7
2. Halibut schooner in summer rig, two topmasts up and all sails spread Drawing by Capt. J. W. Collins. (Engraved by Photo-Electrotype Company.)	I,	7
3. FIG. 1. Sectional plan of halibut schooner. (See page opposite plate for explanation) FIG. 2. Deck plan of halibut schooner. (See page opposite plate for explanation) Drawings by Capt. J. W. Collins.	I, I,	7 9
4. Sectional plan of well-smack employed in the fresh halibut fishery on George's Bank, 1836 to 1845. (See page opposite plate for explanation) Drawing by Capt. J. W. Collins.	I,	41
5. FIG. 1. *Bait chopper* FIG. 2. Bait slivering knife FIG. 3. Halibut killer and gob stick FIG. 4. Woolen hand nipper FIG. 5. Halibut gaff FIG. 6. Trawl buoy and black ball FIG. 7. Canvas skate for section of trawl FIG. 8. Dory scoop Drawings by Capt. J. W. Collins.	I, I, I, I, I, I, I, I,	12 12 17 10 17 11 11 10
6. FIG. 1. Hurdy-gurdy to haul trawls in deep water FIG. 2. Dory showing mode of attaching and using the hurdy-gurdy FIG. 3. Trawl roller attached to dory gunwale for hauling trawls in shoal water Drawings by Capt. J. W. Collins.	I, I, I,	10, 11, 16 10, 11, 16 10
7. Cutting bait and baiting trawls on halibut schooner at anchor on the fishing grounds Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	12
8. Dories and crew on the way to haul the trawls; the schooner at anchor under riding sail Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	13–16
9. Halibut dory and crew hauling the trawl, gaffing and clubbing the halibut Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	16
10. *Dory and crew caught to leeward in a storm while hauling the trawl; trawl-buoy and line drifted* astern of the vessel for their rescue Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	16, 80
11. Halibut schooner at anchor on the Grand Bank in winter, riding out a gale Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	84
12. Halibut schooner "lying-to" in a gale on the Bank, under riding sail and double-reefed foresail. Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	77
13. Halibut schooner tripped by a heavy sea Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	71
14. Halibut schooner in winter, head-reaching under short sail Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	20

	Vol.	Page.
15. Old-style halibut schooner, hand-line fishing from deck, 1840 to 1850 Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	29–43
16. Dressing halibut on deck of schooner for icing in the hold From photograph by T. W. Smillie.	I,	19
17. FIG. 1. Halibut cutting knife	I,	19
FIG. 2. Scraping knife to remove muscle and flesh from backbone after cutting	I,	19
FIG. 3. Squillgee for pushing ice in pen	I,	19
FIG. 4. Oak mallet for breaking ice	I,	19
FIG. 5. Oak broom for scrubbing halibut Drawings by Capt. J. W. Collins.	I,	19
18. General view of schooner discharging fare of fresh halibut at Gloucester, Mass. Drawing by Capt. J. W. Collins.	I,	21
19. Hoisting halibut from hold of schooner at Gloucester, Mass From photograph by T. W. Smillie.	I,	21
20. Weighing and selling halibut on deck of George's Bank hand-line cod schooner Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	22
21. Handling fresh halibut at Gloucester, Mass.; weighing, unheading, and packing in ice for shipment by rail Drawing by H. W. Elliott.	I,	22
22. Packing fresh halibut at Gloucester, Mass.; preparing ice with pick and grinding machine; nailing covers on the boxes; use of devil's claw Drawings by H. W. Elliott.	I,	22
THE BANK HAND-LINE AND TRAWL COD FISHERIES.		
23. Old style Grand Bank cod schooner; crew at rails hand-line fishing Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	125, 126
24. Hand-line dory cod fishing on the Grand Bank Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	126
25. Deck plan of schooner Centennial, of Gloucester Drawing by Capt. J. W. Collins.	I,	149
26. Dory and crew setting cod trawls on the Bank Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	152, 176
27. Undermining cod trawls; two methods of setting trawl for underrunning Drawing by Capt. J. W. Collins.	I,	177
28. Newfoundland fishermen catching squid for sale as cod bait to United States vessels Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	152, 184
29. Dory crew of cod fishermen catching birds for bait Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	152
(For illustration of cod schooners discharging cargoes see Section on Preparation of Fishery Products.)		
THE GEORGE'S BANK COD FISHERY.		
30. Gloucester schooner at anchor on George's Bank in winter; hand-line fishing for cod; rigged without topmasts for rough weather From painting by Paul E. Collins, Boston, Mass.	I,	190–193
31. Cod hand-line gear	I,	192
FIG. 1. Lead sinker with brass horse and swivels.		
FIG. 2. George's Bank gear with sling-ding, &c.		
FIG. 3. Hand-line gear for shoal water.		
Drawings by Capt. J. W. Collins.		
32. George's Bank crew hand-line fishing, gaffing fish over the rail, cutting out tongues Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	194
33. Dressing cod on deck of fishing schooner Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	156, 180, 195
34. Discharging fare of George's Bank cod at Gloucester wharf Drawing by H. W. Elliott, 1882.	I,	195
35. Splitting and washing George's Bank cod at Wonson's wharf, Gloucester, Mass Drawing by H. W. Elliott, 1882.	I,	195
THE COD FISHERY OF ALASKA.		
36. Natives in boats fishing with hand-lines	I,	230

THE GILL-NET COD FISHERY.

	Vol.	Page.
37. Method of hanging cod gill-nets in Norway. (Explanation with plate) ..... From Bulletin U. S. Fish Commission Vol. I. Drawing by Capt. J. W. Collins.	I,	227, 228
38. FIG. 1. Method of attaching glass floats to top of nets	I,	228
FIG. 2. Method of fastening sinkers to foot of nets. (Explanation on plate) ..... From Bulletin U. S. Fish Commission, Vol. I. Drawing by Capt. J. W. Collins.	I,	228
39. Norwegian method of setting gill-nets at bottom. (Explanation on plate) ..... From Bulletin U. S. Fish Commission, Vol. I. Drawing by Capt. J. W. Collins.	I,	228
40. Norwegian methods of setting nets to get position of fish. (Explanation on plate) ..... From Bulletin U. S. Fish Commission, Vol. I. Drawing by Capt. J. W. Collins.	I,	228
41. Norwegian method of attaching stone anchors and buoy lines to end of gangs of nets. (Explanation on plate) ..... From Bulletin U. S. Fish Commission, Vol. I. Drawing by Capt. J. W. Collins.	I,	228
42. *Way in which cod gill-nets are set at the bottom on the east coast of Newfoundland.* (Explanation on plate) ..... From Bulletin U. S. Fish Commission, Vol. I. Drawing by Capt. J. W. Collins.	I,	230
43. The ordinary way in which cod gill-nets are set floating at Newfoundland. (Explanation on plate) ..... From Bulletin U. S. Fish Commission, Vol. I. Drawing by Capt. J. W. Collins.	I,	230
44. Way in which cod gill-nets are set for underrunning in Ipswich Bay, Massachusetts. (Explanation on plate) ..... From Bulletin U. S. Fish Commission, Vol. I. Drawing by Capt. J. W. Collins.	I,	232
45. Underrunning cod gill-nets in Ipswich Bay, Massachusetts ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	232

THE INSHORE COD FISHERY.

46. Block Island boat and crew hand-lining for cod ..... Drawing by H. W. Elliott and Capt. J. W. Collins.		
47. Pink stern schooner and boats hand-line fishing off Cape Ann, Massachusetts ..... From photograph by T. W. Smillie.		

THE HADDOCK FISHERY.

48. Baiting trawls on deck of Gloucester haddock schooner Mystic, Captain McKinnon ..... From photograph by T. W. Smillie.	I,	237
49. Baiting trawls at night in hold of haddock schooner ..... Drawing by H. W. Elliott, 1882.	I,	237
50. Setting haddock trawls from schooner under sail; set at right angles to course of the vessel ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	238

THE HAKE FISHERY.

51. Fishermen's dories on the rocks at Folly Cove, Cape Ann, Massachusetts ..... Drawing by H. W. Elliott.	I,	241
52. Fishermen in dory hauling trawl; a dogfish caught ..... From photograph by T. W. Smillie.	I,	242
53. Overhauling trawls in fish-house at Rockport, Mass ..... Drawing by H. W. Elliott.	I,	242

THE MACKEREL PURSE-SEINE FISHERY.

54. Mackerel schooner under full sail, bound out ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	248
55. The cabin of mackerel schooner John D. Long of Gloucester, Mass ..... Drawing by H. W. Elliott.	I,	247
56. Deck plan of mackerel schooner. (Explanation on plate) ..... Drawing by Capt. J. W. Collins.	I,	248
57. Seine boat; purse davit and blocks; oar-rests; purse weight and purse blocks; bow fittings	I,	250
58. Seine boats in winter quarters at Gloucester, Mass ..... From photograph by T. W. Smillie.	I,	250
59. FIG. 1. Diagram showing the *different sections of a purse-seine*	I,	252
FIG. 2. Diagram showing the form of a purse-seine when spread in the water ..... Drawings by Capt. J. W. Collins.	I,	252

	Vol.	Page.
60. Mackerel schooner cruising in Massachusetts Bay; lookout at foretop on the watch for schools .. From photograph by T. W. Smillie.	I,	255
61. Lookouts aloft on schooner on the watch for mackerel ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	255
62. Mackerel seine-boat and crew "paying out the seine" ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	256
63. Mackerel seine-boat and crew pursing the seine ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	256
64. Mackerel schooner with crew at work bailing mackerel from the purse-seine ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	258
65. Mackerel schooner with pocket or spiller shipped at sea ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	265
66. Mackerel schooner just arrived from cruise; crew dressing and salting the fish ..... From photograph by T. W. Smillie.	I,	267
67. Culling and packing mackerel at Portland, Me ..... From photograph by T. W. Smillie.	I,	267
THE MACKEREL HOOK FISHERY.		
68. Surf-fishing in boats for mackerel ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	275
69. Mackerel jigs and jig molds. (Explanation on plate)	I,	278
70. Jigging mackerel over the vessel's rail ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	284
71. Gaffing mackerel over the vessel's rail ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	279
72. FIG. 1. The old method of chopping mackerel bait	I,	279–283
FIG. 2. The modern mackerel bait-mill ..... Drawings by H. W. Elliott and Capt. J. W. Collins.	I,	279–283
73. Throwing bait to toll mackerel alongside the vessel ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	284
74. Deck scene on mackerel hand-line schooner; jigging mackerel, slatting in the barrel, throwing toll-bait ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	284
75. Mackerel-packing on shipboard ..... FIG. 1. Splitting, cleaning, and washing. FIG. 2. Pitching, salting, and plowing. Drawings by H. W. Elliott and Capt. J. W. Collins.	I,	287
THE MACKEREL GILL-NET FISHERY.		
76. Mackerel drag-nets set at night off coast of Maine ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	294
77. Cape Cod mackerel drag-boat lying to at night ..... From sketch by J. S. Ryder.	I,	294
78. Dory fishermen picking mackerel gill-nets ..... From photograph by T. W. Smillie.	I,	294
THE MACKEREL FISHERY—EARLY METHODS.		
79. Old style Chebacco boats drailing for mackerel ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	299
80. Angling with poles for mackerel from an old Noank, Conn., sloop ..... Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	299
STATISTICS OF THE MACKEREL FISHERY.		
81. Diagram showing the catch of mackerel by citizens of Massachusetts between the years 1804 and 1881, inclusive ..... From Report U. S. Fish Commission, Part IX, 1881.	I,	312

THE SWORDFISH FISHERY.

	Vol.	Page.
82. Sword fishermen in position for action From Report U. S. Fish Commission, Part VIII, 1880.	I,	318
83. Methods of swordfish capture in the Mediterranean Sea From Report U. S. Fish Commission, Part VIII, 1880.	I,	318

THE MENHADEN FISHERY.

84. Map illustrating geographical distribution and periodical movements of the menhaden; also the locations of the fishing grounds and oil and guano factories in the year 1878. (No factories now in Maine; many in Chesapeake Bay) From Report U. S. Fish Commission, Part VI, 1878.	I,	331, 343
85. Menhaden steamer Joseph Church approaching oil and guano factory at Tiverton, R. I. From photograph by T. W. Smillie.	I,	334
86. Menhaden steamer William Floyd cruising for fish From sketch by Capt. B. F. Conklin.	I,	334
87. Lookouts at mast-head of menhaden steamer watching for schools of fish From sketch by J. S. Ryder.	I,	338
88. Fleet of menhaden steamers *en route* to fishing grounds on south side of Long Island, N. Y. From sketch by Capt. B. F. Conklin.	I,	338
89. Fleet of menhaden steamers on the fishing grounds; seining crews at work From sketch by Capt. B. F. Conklin.	I,	338
90. Crew of menhaden steamer surrounding a school with purse-seine From sketch by Capt. B. F. Conklin.	I,	337–339
91. Pursing the seine around a school of menhaden From sketch by Capt. B. F. Conklin.	I,	337–339
92. Menhaden crew at work; pursing of the seine nearly completed From sketch by H. W. Elliott, 1878.	I,	339
93. School of menhaden surrounded with purse-seine and fish striking the net From sketch by Capt. B. F. Conklin.	I,	339
94. Bailing menhaden from purse-seine into steamer's hold From sketch by J. S. Ryder.	I,	337, 340
95. Menhaden steamer bailing in the catch From sketch by Capt. B. F. Conklin.	I,	340
96. Haul-seine fishing for menhaden at Long Island, 1790 to 1850. Setting the seine From sketch by Capt. B. F. Conklin.	I,	341, 368, 371
97. Haul-seine fishing for menhaden at Long Island, 1790 to 1850. Hauling thes eine on the beach by horse-power From sketch by Capt. B. F. Conklin.	I,	341, 368, 371
98. Haul-seine fishing for menhaden at Long Island, 1790 to 1850. Taking out the fish From sketch by Capt. B. F. Conklin.	I,	341, 368, 371
99. Menhaden purse and mate boats and two carry-away boats starting for the fishing grounds From sketch by Capt. B. F. Conklin.	I,	334, 368
100. Menhaden purse and mate boats FIG. 1. Going down to the fish. FIG. 2. Working to windward of the fish. From sketches by Capt. B. F. Conklin.	I,	334, 368
101. Purse and mate boats encircling a school of menhaden; carry-away boats in waiting From sketch by Capt. B. F. Conklin.	I,	334, 368
102. Menhaden boats and crew pursing the seine; the fish striking the net From sketch by Capt. B. F. Conklin.	I,	334, 368
103. Menhaden sloops cruising for fish. One of the sloops is for the crew to live on and to tow the seine-boats; the others to carry fish to the factory From sketch by Capt. B. F. Conklin.	I,	334, 368, 375, 376
104. Menhaden sloops and steamers in Gardiner's Bay, Long Island From sketch by Capt. B. F. Conklin.	I,	399
105. Menhaden carry-away sloops bailing in the catch From sketch by Capt. B. F. Conklin.	I,	376, 377
106. Menhaden fishermen signaling to shore-crews the approach of a school of fish	I,	367

	Vol.	Page.
107. Crew of menhaden schooner, in old style seine-boat, throwing the purse-seine	I,	336, 338
108. Carry-away boat with haul of menhaden on the way to oil factory From sketch by Capt. B. F. Conklin.	I,	373
109. Menhaden steamer discharging its catch at oil and guano factory, Tiverton, R. I. From photograph by T. W. Smillie.	I,	337
110. Gang of Portuguese in hold of menhaden steamer filling the hoisting tubs From photograph by T. W. Smillie.	I,	337
111. Fish pens on top floor of menhaden factory; the fish are led through a trough to the cooking tanks From photograph by T. W. Smillie.	I,	337
112. Menhaden steamer discharging its catch at oil and guano factory. Incline railway to carry fish to cooking tanks From sketch by Capt. B. F. Conklin.	I,	337
113. Menhaden floating factory. An old vessel fitted as an oil factory and moved from place to place near the fishing grounds Drawing by H. L. Todd.	I,	345, 373
114. Slivering menhaden for bait From Report U. S. Fish Commission, Part V, 1877.		
115. Menhaden oil and guano factory at Milford, Conn.; steamers unloading fish at the wharf; incline railway to carry fish to cooking tanks on upper floor of factory; oil tanks and storage sheds in foreground; platform for drying scrap in rear of factory, connected with building by elevated railway From a photograph.	I,	342
(Interiors of oil factories will be illustrated in Section on Preparation of Fishery Products.)		

THE HERRING FISHERY AND SARDINE INDUSTRY.

116. Herring schooner bound for Wood Island, Maine; outfit of salt and barrels on deck From photograph by T. W. Smillie.	I,	426
117. Herring pinkey bound for the fishing grounds; nets hanging over bowsprit and stern; net dories on deck From photograph by T. W. Smillie.	I,	426
118. Torching at night for spurling or small herring in Ipswich Bay, Massachusetts From sketch by J. S. Ryder.	I,	428
119. Torching herring at night near Eastport, Me From photograph by T. W. Smillie.	I,	429
120. Fishermen mending herring gill-nets at House Island, Casco Bay From photograph by T. W. Smillie.	I,	430
121. Irish fishermen of Boston picking their herring nets in Gloucester Harbor. The typical "Irish market boat" From photograph by T. W. Smillie.	I,	430
122. Cape Ann herring fishermen landing their gill-nets after a night's fishing From photograph by T. W. Smillie.	I,	430
123. Fishermen in quoddy boat hauling herring gill-nets Drawing by H. W. Elliott and Capt. J. W. Collins.	I,	430

THE SMOKED HERRING INDUSTRY.

124. Boat landing; fish houses; herring smoke-house; fisherman's dwelling and farm From photograph by T. W. Smillie.	I,	476
125. Old style herring smoke-house (without roof ventilators) at Lubec, Me From photograph by T. W. Smillie.	I,	476
126. Herring "horse" loaded with smoked fish on sticks From photograph by T. W. Smillie.	I,	478
127. Herring smoke-house at Eastport, Me.; smoke ventilators on roof; sticks of herring inside From photograph by T. W. Smillie.	I,	480

THE SARDINE INDUSTRY.

128. Shore herring weir near Eastport, Me.; the common form of brush weir From photograph by T. W. Smillie.	I,	501
129. Bar herring weir near Eastport, Me.; escape of fish prevented by receding tide From photograph by T. W. Smillie.	I,	500

	Vol.	Page.
130. Channel herring weir near Eastport, Me.; controls channel between islands From photograph by T. W. Smillie.	I,	501
131. Section of ballasted weir near Eastport, Me.; for rocky bottom From photograph by T. W. Smillie.	I,	502
132. Fishing a herring weir at low tide, near Eastport, Me From photograph by T. W. Smillie.	I,	503
133. General view of sardine cannery at Eastport, Me From photograph by T. W. Smillie.	I,	508
134. View of sardine cannery at low tide, showing the employés at work From photograph by T. W. Smillie.	I,	508
135. Herring boat landing fish at a sardine cannery, Eastport, Me From photograph by T. W. Smillie.	I,	509
136. Sardine steamer for collecting herring and towing weir boats From photograph by T. W. Smillie.	I,	510
137. Children at sardine cannery cutting off the heads and tails and cleaning small herring for canning From photograph by T. W. Smillie.	I,	510
138. Washing, draining, and flaking herring at sardine cannery, Eastport, Me From photograph by T. W. Smillie.	I,	512
139. Spreading herring on flakes for drying in the sun or in an oven From photograph by T. W. Smillie.	I,	511
140. Herring drying on flakes in the sun; landing, cleaning, washing, &c., at sardine cannery, Eastport, Me From photograph by T. W. Smillie.	I,	513
141. Fish-drying frames on roof at sardine cannery, Eastport, Me From photograph by T. W. Smillie.	I,	512
142. Frying room in sardine cannery, Eastport, Me.; herring frying in pans of oil From photograph by T. W. Smillie.	I,	514
143. Packing room at sardine cannery, Eastport, Me.; packing herring-sardines in tin boxes From photograph by T. W. Smillie.	I,	515
144. Soldering room at sardine cannery, Eastport, Me.; solderers sealing the cans From photograph by T. W. Smillie.	I,	516
145. Bathing room at sardine cannery, Eastport, Me.; bathing vats at the left; men at right venting cans From photograph by T. W. Smillie.	I,	517
146. Making sardine cans at Eastport, Me From photograph by T. W. Smillie.	I,	518
THE SPANISH MACKEREL FISHERY.		
147. Methods of setting Spanish mackerel gill-nets FIG. 1. "Straight set." FIG. 2. Circle set. FIG. 3. Crooked set. FIG. 4. "Hook set." FIG. 5. "T set." FIG. 6. "Square set." FIG. 7. "Triangle set." FIG. 8. "Harpoon set." From Report U. S. Fish Commission, Part VIII, 1880.	I,	546
148. Chesapeake Bay Spanish mackerel pound-net From Report U. S. Fish Commission, Part VIII, 1880.	I,	548
THE MULLET FISHERY.		
149. Camp of mullet fishermen, North Carolina From a photograph.	I,	562
THE POUND-NET FISHERIES OF THE ATLANTIC STATES.		
150. Diagram of pound-net at Bald Head, Maine. (By Capt. J. W. Collins)	I,	596
151. Diagram of pound-net at Small Point, Maine. (By Capt. J. W. Collins)	I,	598

	Vol.	Page.
194. Whalemen's harpoons. FIG. 1. Improved harpoon or toggle-iron now in general use. FIGS. 2, 3. First form of toggle-iron made by Lewis Temple. FIG. 4. One-flued harpoon with hinged toggle. FIG. 5. One-flued harpoon. FIG. 6. Two-flued harpoon. FIG. 7. Toggle-iron invented by Provincetown whaleman; not in use.	II,	250
195. English harpoons. FIG. 1. Old-style hand-harpoon; now little used. FIG. 2. Hand-harpoon in general use about 1857. FIG. 3. Hand-harpoon now in general use on Scotch whalers. Drawings by Capt. William Adams, Dundee, Scotland.	II,	250
196. FIG. 1. English harpoon-gun and gun-harpoon now in use on Scotch whalers	II,	252
FIG. 2. An early form of English whaling-gun	II,	252
FIGS. 3, 4, 5. Mason and Cunningham mounting boat-gun; a recent invention. (Explanation with plate)	II,	252
197. FIG. 1. Pierce and Cunningham darting-gun; a combined harpoon and lance used largely by Arctic whalemen. (Explanation with plate)	II,	254
FIG. 2. Cunningham and Cogan gun; length, 33 inches; weight, 27 pounds; used by Arctic steam whalers with bomb lance	II,	253
FIG. 3. Brand muzzle-loading whaling-gun and bomb lance	II,	253, 254, 255
198. FIGS. 1, 2, 3, 4. Pierce bomb-lance. (Explanation on page opposite plate)	II,	254, 267
FIG. 5. Pierce and Eggers breech-loading gun. (Explanation on page opposite plate)	II,	253, 267
199. Whaling rocket. (Explanation on page opposite plate)	II,	254
200. Boat fastened to whale by harpoon and line; killing the whale with bomb lance. From painting by J. S. Ryder.	II,	262, 267
201. Natives harpooning the beluga, or white whale, at Cook's Inlet, Alaska. Drawing by H. W. Elliott, 1883.	II,	61
202. Aleuts planting glass, obsidian, and jade darts in a school of humpback whales at Akoon Island, Bering Sea. Drawing by H. W. Elliott, 1883.	II,	61, 62
203. Makah Indians whaling at entrance to Fuca Straits. Drawing by H. W. Elliott, 1883.	II,	62
204. Cutting in the bowhead and sperm whales. (Explanation on page opposite plate) Drawings by Capt. C. M. Scammon and Capt. W. M. Barnes.	II,	277, 286
205. FIG. 1. Boat spade to stop running whale	II,	264
FIG. 2. Narrow cutting spade or thin boat spade	II,	281
FIG. 3. Flat or round shank spade	II,	281
FIG. 4. Cutting spade for scarfing blubber	II,	281
FIG. 5. Cutting spade for leaning up	II,	281
FIG. 6. Half-round spade	II,	281
206. Cutting blocks and tackle. (Explanation on page opposite plate)	II,	277–281
207. A ship on the northwest coast of America cutting in her last right whale. Drawing by H. W. Elliott from a French lithograph designed by B. Russell, of New Bedford.	II,	277
208. "Bailing in the case" of a sperm whale. Drawing by H. W. Elliott from a French lithograph designed by B. Russell, of New Bedford.	II,	277
209. FIG. 1. Blubber mincing-knife. FIG. 2. Boarding-knife. FIG. 3. Monkey-belt. FIG. 4. Wooden toggle. FIG. 5. Chain-strap. FIG. 6. Throat-chain. FIG. 7. Fin toggle. FIG. 8. Head-strap. FIG. 9. Blubber-hook.		
210. Whale-ships at New Bedford wharf; ship hove down for repairs; oil-casks. From photograph by U. S. Fish Commission.	II,	289, 290
THE BLACKFISH AND PORPOISE FISHERY.		
211. Capture of a school of blackfish in Cape Cod Bay. Drawing by H. W. Elliott from a sketch by J. S. Ryder.	II,	295, 307

	Vol.	Page.
212. Indian porpoise hunters of Passamaquoddy Bay. *Canoe, rifle, and lance for capture of porpoise.* From photograph by T. W. Smillie.	II,	303
213. Passamaquoddy Bay Indians lancing and securing a porpoise. From photograph by T. W. Smillie.	II,	308
THE PACIFIC WALRUS FISHERY.		
214. Innuits of Saint Lawrence Island, Alaska, surprising and harpooning a herd of walruses. Drawing by H. W. Elliott.	II,	313
215. The walrus "coup." Eskimo lancing the exhausted walrus, Saint Lawrence Island, Bering Sea. Mahlemut dresses, bidarka, baidar, &c., of Alaska. Drawing by H. W. Elliott.	II,	313
216. Innuits of Saint Lawrence Island, Alaska, hoisting a walrus. Drawing by H. W. Elliott.	II,	313
THE FUR-SEAL INDUSTRY OF ALASKA.		
217. Map of Saint Paul's Island, Pribylov Group. Surveyed and drawn, April, 1873, to July, 1874, by Henry W. Elliott.	II,	322
218. Map of Saint George Island, Pribylov Group. Surveyed and drawn, April, 1873, to July, 1874, by H. W. Elliott.	II,	322
219. Profiles of the east coast of Saint Paul's Island. Drawing by H. W. Elliott.	II,	322, 336
220. Ordinary attire of men on the killing ground and of women and young children in the village. Drawing by H. W. Elliott.	II,	320
221. The north shore of Saint Paul's Island, looking W.SW. from the summit of Hutchinson's Hill. Drawing by H. W. Elliott.	II,	336
222. The North Rookery, looking west to Starry Arcel, Saint George Island, village of Saint George. Drawing by H. W. Elliott.	II,	348
223. Natives selecting a "drive." View over hauling grounds of "holluschickie" or bachelor seals at English Bay, looking west from Tolstoi sand-dunes. Drawing by H. W. Elliott.	II,	363
224. Natives driving the "holluschickie." The drove passing over the lagoon flats to the killing grounds, *under the village hill*, Saint Paul's Island. Drawing by H. W. Elliott.	II,	363
225. The killing gang at work. Method of slaughtering fur-seals on the grounds near the village, Saint Paul's Island. Drawing by H. W. Elliott.	II,	365
226. Preparing fur-seal-skins for shipment. FIG. 1. Interior of salt-house, Saint Paul's Island; natives salting and assorting the pelts. FIG. 2. The flensed carcass of a fur-seal and the skin as taken therefrom. FIG. 3. A bundle of skins ready for shipment.	II,	369
THE ANTARCTIC SEA-ELEPHANT FISHERY.		
227. Sketch map of Herd's Island, Antarctic Ocean. Lat. 53° 10′ S., Long. 73° 30′ E.	II,	419
228. Working sea-elephants at northeast point, Herd's Island. Drawing by H. W. Elliott after Capt. H. C. Chester.	II,	419, 435
229. Stripping sea-elephant blubber and rolling it in barrels to try-works; southwest beach, Herd's Island. Drawing by H. W. Elliott after Capt. H. C. Chester.	II,	419, 435
THE SEA-LION HUNT ON PRIBYLOV ISLANDS, ALASKA.		
230. Natives capturing the sea-lion; springing the alarm. Drawing by H. W. Elliott, 1873.	II,	468
231. Shooting the old males; spearing the surround; the drive. Drawing by H. W. Elliott, 1873.	II	468, 469, 471
232. Natives corraling sea-lions at the Barrabora, under Cross Hill, northeast point Saint Paul's Island. Drawing by H. W. Elliott.	II,	469
233. Oil-pouches of sea-lion stomach; seal meat frame; bidarrah covered with sea-lion skins; sealer's houses. Drawing by H. W. Elliott.	II,	471, 473

	Vol.	Page.
194. Whalemen's harpoons. FIG. 1. Improved harpoon or toggle-iron now in general use. FIGS. 2, 3. First form of toggle-iron made by Lewis Temple. FIG. 4. One-flued harpoon with hinged toggle. FIG. 5. One-flued harpoon. FIG. 6. Two-flued harpoon. FIG. 7. Toggle-iron invented by Provincetown whaleman; not in use.	II,	250
195. English harpoons. FIG. 1. Old-style hand-harpoon; now little used. FIG. 2. Hand-harpoon in general use about 1857. FIG. 3. Hand-harpoon now in general use on Scotch whalers. Drawings by Capt. William Adams, Dundee, Scotland.	II,	250
196. FIG. 1. English harpoon-gun and gun-harpoon now in use on Scotch whalers	II,	252
FIG. 2. An early form of English whaling-gun	II,	252
FIGS. 3, 4, 5. Mason and Cunningham mounting boat-gun; a recent invention. (Explanation with plate)	II,	252
197. FIG. 1. Pierce and Cunningham darting-gun; a combined harpoon and lance used largely by Arctic whalemen. (Explanation with plate)	II,	254
FIG. 2. Cunningham and Cogan gun; length, 33 inches; weight, 27 pounds; used by Arctic steam whalers with bomb lance	II,	253
FIG. 3. Brand muzzle-loading whaling-gun and bomb lance	II,	253, 254, 255
198. FIGS. 1, 2, 3, 4. Pierce bomb-lance. (Explanation on page opposite plate)	II,	254, 267
FIG. 5. Pierce and Eggers breech-loading gun. (Explanation on page opposite plate)	II,	253, 267
199. Whaling rocket. (Explanation on page opposite plate)	II,	254
200. Boat fastened to whale by harpoon and line; killing the whale with bomb lance. From painting by J. S. Ryder.	II,	262, 267
201. Natives harpooning the beluga, or white whale, at Cook's Inlet, Alaska. Drawing by H. W. Elliott, 1883.	II,	61
202. Aleuts planting glass, obsidian, and jade darts in a school of humpback whales at Akoon Island, Bering Sea. Drawing by H. W. Elliott, 1883.	II,	61, 62
203. Makah Indians whaling at entrance to Fuca Straits. Drawing by H. W. Elliott, 1883.	II,	62
204. Cutting in the bowhead and sperm whales. (Explanation on page opposite plate) Drawings by Capt. C. M. Scammon and Capt. W. M. Barnes.	II,	277, 286
205. FIG. 1. Boat spade to stop running whale	II,	264
FIG. 2. Narrow cutting spade or thin boat spade	II,	281
FIG. 3. Flat or round shank spade	II,	281
FIG. 4. Cutting spade for scarfing blubber	II,	281
FIG. 5. Cutting spade for leaning up	II,	281
FIG. 6. Half-round spade	II,	281
206. Cutting blocks and tackle. (Explanation on page opposite plate)	II,	277–281
207. A ship on the northwest coast of America cutting in her last right whale. Drawing by H. W. Elliott from a French lithograph designed by B. Russell, of New Bedford.	II,	277
208. "Bailing in the case" of a sperm whale. Drawing by H. W. Elliott from a French lithograph designed by B. Russell, of New Bedford.	II,	277
209. FIG. 1. Blubber mincing-knife. FIG. 2. Boarding-knife. FIG. 3. Monkey-belt. FIG. 4. Wooden toggle. FIG. 5. Chain-strap. FIG. 6. Throat-chain. FIG. 7. Fin toggle. FIG. 8. Head-strap. FIG. 9. Blubber-hook.		
210. Whale-ships at New Bedford wharf; ship hove down for repairs; oil-casks. From photograph by U. S. Fish Commission.	II,	289, 290
THE BLACKFISH AND PORPOISE FISHERY.		
211. Capture of a school of blackfish in Cape Cod Bay. Drawing by H. W. Elliott from a sketch by J. S. Ryder.	II,	295, 307

	Vol.	Page.
212. Indian porpoise hunters of Passamaquoddy Bay. Canoe, rifle, and lance for capture of porpoise. From photograph by T. W. Smillie.	II,	306
213. Passamaquoddy Bay Indians lancing and securing a porpoise. From photograph by T. W. Smillie.	II,	308
THE PACIFIC WALRUS FISHERY.		
214. Innuits of Saint Lawrence Island, Alaska, surprising and harpooning a herd of walruses. Drawing by H. W. Elliott.	II,	313
215. The walrus "coup." Eskimo lancing the exhausted walrus, Saint Lawrence Island, Bering Sea. Mahlemut dresses, bidarka, baidar, &c., of Alaska. *Drawing by H. W. Elliott.*	II,	313
216. Innuits of Saint Lawrence Island, Alaska, hoisting a walrus. Drawing by H. W. Elliott.	II,	313
THE FUR-SEAL INDUSTRY OF ALASKA.		
217. Map of Saint Paul's Island, Pribylov Group. Surveyed and drawn, April, 1873, to July, 1874, by Henry W. Elliott.	II,	322
218. Map of Saint George Island, Pribylov Group. Surveyed and drawn, April, 1873, to July, 1874, by H. W. Elliott.	II,	322
219. Profiles of the east coast of Saint Paul's Island. *Drawing by H. W. Elliott.*	II,	322, 336
220. Ordinary attire of men on the killing ground and of women and young children in the village. Drawing by H. W. Elliott.	II,	320
221. The north shore of Saint Paul's Island, looking W.SW. from the summit of Hutchinson's Hill. *Drawing by H. W. Elliott.*	II,	336
222. The North Rookery, looking west to Starry Ateel, Saint George Island, village of Saint George. Drawing by H. W. Elliott.	II,	348
223. Natives selecting a "drive." View over hauling grounds of "holluschickie" or bachelor seals at English Bay, looking west from Tolstoi sand-dunes. Drawing by H. W. Elliott.	II,	363
224. Natives driving the "holluschickie." The drove passing over the lagoon flats to the killing grounds, under the village hill, Saint Paul's Island. Drawing by H. W. Elliott.	II,	363
225. The killing gang at work. Method of slaughtering fur-seals on the grounds near the village, Saint Paul's Island. Drawing by H. W. Elliott.	II,	365
226. Preparing fur-seal-skins for shipment. FIG. 1. Interior of salt-house, Saint Paul's Island: natives salting and assorting the pelts. FIG. 2. *The flensed carcass of a fur-seal and the skin as taken therefrom.* FIG. 3. A bundle of skins ready for shipment.	II,	369
THE ANTARCTIC SEA-ELEPHANT FISHERY.		
227. Sketch map of Heard's Island, Antarctic Ocean. Lat. 53° 10′ S., Long. 73° 30′ E.	II,	419
228. Working sea-elephants at northeast point, Heard's Island. Drawing by H. W. Elliott after Capt. R. C. Chester.	II,	419, 435
229. Stripping sea-elephant blubber and rolling it in barrels to try-works; southwest beach, Heard's Island. Drawing by H. W. Elliott after Capt. R. C. Chester.	II,	419, 435
THE SEA-LION HUNT ON PRIBYLOV ISLANDS, ALASKA.		
230. Natives capturing the sea-lion; springing the alarm. Drawing by H. W. Elliott, 1873.	II,	468
231. Shooting the old males; spearing the surround; the drive. Drawing by H. W. Elliott, 1873.	II	468, 469, 471
232. Natives corraling sea-lions at the Barrabora, under Cross Hill, northeast point Saint Paul's Island. Drawing by H. W. Elliott.	II,	469
233. Oil-pouches of sea-lion stomach; seal meat frame; bidarrah covered with sea-lion skins; *sealer's houses*. Drawing by H. W. Elliott.	II,	471, 473

THE SEA-OTTER FISHERY OF ALASKA.

	Vol.	Page.
234. Aleuts sea-otter hunting south of Saanak Island; the bidarkies waiting for the otter to rise again. Drawing by H. W. Elliott.	II,	490

THE TURTLE FISHERY.

235. Diving for loggerhead turtle; Morehead City, N. C. Drawing by H. W. Elliott, 1883.	II,	495

THE OYSTER INDUSTRY.

236. Oyster dredging steamer at work in Long Island Sound	II,	523, 535
237. Chesapeake Bay oyster dredges. From specimens in U. S. National Museum.	II,	523
238. Oyster tongs and nippers	II,	551
239. FIG. 1. Inclosed dock for oyster vessels at Perth Amboy, N. J	II,	546
FIG. 2. "The Creek" at Keyport, N. J., with oyster boats, skiffs, and scows. Drawings by Ernest Ingersoll.	II,	546
240. A Lake's Bay shipping-house and "platform" for freshening oysters, Smith's Landing, Lake's Bay, New Jersey. Drawing by Ernest Ingersoll.	II,	546
241. Oyster-barges at foot of West Tenth street, North River, New York City. Drawing by Ernest Ingersoll.	II,	555
242. Opening or shucking oysters in Baltimore packing-house. From a photograph.	II,	560
243. Baltimore oyster-shucking trough. Oyster knives of diverse patterns, used in New England, New York, and the Chesapeake region	II,	559

THE CLAM INDUSTRY.

244. Clam-diggers' boats and shucking-houses at Essex, Mass. From photograph by T. W. Smillie.	II,	585
245. Opening or shucking clams at Essex, Mass. From photograph by T. W. Smillie.	II,	585

THE CRAB FISHERY.

246. Negroes trawling for crabs on the Virginia and North Carolina coasts. Drawing by H. W. Elliott.	II,	633

THE LOBSTER FISHERY.

247. Dory fishermen hauling lobster pots off Cape Ann, Massachusetts. From photograph by T. W. Smillie.	II,	666, 677, 773
248. Lobster fishing-boats of Bristol, Me. Drawing by H. W. Elliott and Capt. J. W. Collins.	II,	669, 677, 769
249. Lobster Cove at Lanesville, Cape Ann, Massachusetts, showing fishermen's boat-houses and gear. From photograph by T. W. Smillie.	II,	666, 773
250. Summer village of lobster fishermen at No Man's Land, Massachusetts. Drawing by H. W. Elliott, 1882.	II,	781
251. Lobster fishermen's gear at No Man's Land, Massachussetts. (Explanation on plate). Drawing by H. W. Elliott.	II,	665, 672, 781
252. Lobster-boiling apparatus at Portland, Me. From photograph by T. W. Smillie.	II,	684

THE FLORIDA SPONGE INDUSTRY.

253. Sponges as landed by the fishermen at Key West, Fla., and ready for sale. From a photograph.	II,	826
254. Sponge-loft at Key West, Fla. From a photograph.	II,	828
255. Sorting, trimming, and baling sponges at Key West, Fla.	II,	828

PART I.

THE HALIBUT FISHERIES.

1. THE FRESH-HALIBUT FISHERY. By G. Brown Goode and J. W. Collins.

1. General review.
2. The *fishing grounds.*
3. The fishermen.
4. The halibut vessels.
5. Apparatus and methods of fishing.
6. The manner of dressing and icing the catch.
7. The run for the market.
8. Disposition of the catch.
9. *Financial profits and extent of the fishery.*
10. History of the fresh-halibut fishery.
11. Historical notes and incidents of the fresh-halibut fishery.
12. Journal of fresh-halibut trips to the Grand Bank in 1878 and 1879.

2. THE SALT-HALIBUT FISHERY. By N. P. Scudder.

1. General discussion of the fishery.
2. The fishing grounds.
3. The fishermen.
4. The vessels.
5. Apparatus and methods of fishing.
6. Dressing and salting the catch.
7. Tabular view of a season's work in the Davis Strait fishery.
8. The halibut in its relations to the fishing.

Blank page retained for pagination

PART I.

THE HALIBUT FISHERIES.

1.—THE FRESH-HALIBUT FISHERY.

By G. Brown Goode and J. W. Collins.

1. GENERAL REVIEW.

In the year 1879 there were forty vessels, of 3,168 tons, from Gloucester, Mass., employed exclusively in the fresh-halibut fishery. Vessels hailing from New London and the eastern end of Long Island were also employed, except during the winter months, in the capture of halibut, which they carried to New York; these vessels, however, take a considerable quantity of codfish. In addition to the Gloucester vessels already mentioned, which fish for halibut throughout the year, there were eight vessels, of 647 tons, which fished for halibut in the winter season and engaged in other fisheries, generally the cod fishery, from May to November.*

The vessels of the George's fleet, though their chief object is the capture of cod, catch considerable quantities of halibut, which are brought to Gloucester fresh; a few also are sometimes taken by the Western Bank cod fleet, and a still smaller quantity by the Boston Market fleet. In 1879, and probably in 1880, there were a few small vessels on the coast of Maine which engaged in the fresh-halibut fishery for three or four months in the summer, carrying their fish chiefly to Portland. The total catch of halibut on the New England coast for 1879 was estimated at 14,637,000 pounds, distributed as follows:

	Pounds.
Gloucester halibut fleet	8,300,000
Gloucester vessels fishing in winter only	1,000,000
New York halibut catchers	3,000,000
Gloucester, George's fleet (incidental)	2,000,000
Western Bank cod vessels (incidental)	37,000
Small vessels on the coast of Maine and Massachusetts	300,000
Total	14,637,000

In this chapter it is proposed to discuss in detail only the operations of the schooners engaged exclusively in the capture of halibut.

* Since 1879, at which time the fresh-halibut fishery was at its greatest activity, there has been a very marked decline in the quantity of fish taken if not in the number of vessels employed. The product of this fishery has seldom been larger than it was in the above-named year, but since that time halibut have gradually become scarcer on all of the old and well known grounds, until now a "big trip"—of 70,000 or 80,000 pounds of fish—is seldom made, and 40,000 to 45,000 pounds of halibut constitute a "good fare." In 1885, at the time this paper is being printed, the fresh-halibut fleet does not probably include more than 40 vessels, and the total catch is estimated not to exceed 5,000,000 pounds; for the first three months of the year the Bank fleet landed only 612,000 pounds.

2. THE FISHING GROUNDS.

The fishing grounds frequented in 1879–'80 by the Gloucester fleet were (*a*) upon the outer slope of Banquereau, in 100 to 400 fathoms of water; (*b*) on the slope to the south and west of the Grand Bank, Green Bank, and Saint Peter's Bank, in 75 to 350 fathoms of water; (*c*) upon the southern and eastern slopes of Western or Sable Island Bank, and in the "Gully" between this and Banquereau, in 70 to 350 fathoms of water; (*d*) on the southern slope of La Have Ridges, in 100 to 400 fathoms of water; (*e*) in the deep water to the south of the western part of Newfoundland, in 150 to 250 fathoms of water; (*f*) north of Saint Peter's Bank, in 130 fathoms of water; (*g*) on the west coast of Newfoundland, in the vicinity of Green Point, near Bonne Bay, in 10 to 15 fathoms of water; (*h*) on the eastern slope of George's Bank and on the southern slope of Brown's Bank, in 200 to 275 fathoms of water.*

On the grounds mentioned under the letters *f*, *g*, and *h*, the fisheries are, comparatively, of much less importance than in the other localities.

The New York halibut vessels fish on George's Bank and on Nantucket Shoals, in 25 to 100 fathoms; also on Brown's Bank, Seal Island Ground, La Have, and occasionally, though rarely, on the Western Bank, but in much shallower water than that frequented by the Gloucester schooners, seldom as deep as 150 fathoms.

Since the culmination of the halibut fishery on George's Bank, in 1848 to 1850, the halibut vessels have been constantly changing their fishing grounds. At first they caught the halibut on the shoaler parts of the several grounds visited, seeking the fish first upon the banks which were nearest home, then upon those which were remoter, something in the following order: (1) The Seal Island Ground, (2) Brown's Bank, (3) La Have Bank and La Have Ridges, (4) Western Bank, (5) Grand Bank, (6) Saint Peter's Bank and the "Gully," (between Banquereau and Sable Island Bank), the grounds off Flint Island and Scatari, Cape Breton, the Miquelon Beach, Pass Island, Saint George's Bay, Red Island, and other points on the south and west coasts of Newfoundland, the coast of Southern Labrador, and Anticosti Island. At times in the past halibut have also been taken about Cape North.†

In 1873 and one or two succeeding years a few fares of halibut were obtained in the vicinity of the Magdalen Islands. The following notice of the first trip taken in that locality was thus referred to in the Cape Ann Advertiser of August 15, 1873:

"*New halibut grounds.*—Schooner Notice, of this port, arrived here on Saturday, August 9, with a fare of halibut caught off Bird Rocks, near the Magdalen Islands, Bay of Saint Lawrence. The halibut were of good quality, and weighed off 32,000 pounds, her stock amounting to $2,400. Not a bad four weeks' work."

A few good trips have also been obtained on various shoals between Western Bank and the Nova Scotia shore; occasionally in the vicinity of Bryer's Island, which was for some time a favorite fishing ground for the Connecticut vessels, and also at one or two points on the southern coast of Nova Scotia, in the vicinity of Liscomb Harbor; but fishing on these grounds is now and for several years past has been abandoned by large vessels.

---

*Since the above was written, new halibut grounds have been discovered on the eastern slope of the Grand Bank, between the parallels of 43° 30′ and 44° 30′ N. latitude. In the summer of 1885 this locality was the one chiefly resorted to by the fresh-halibut catchers, since fish were very scarce on other grounds. A full account of this discovery is given in succeeding paragraphs.

†Some big halibut came from Cape North on Sunday. Three of these weighed 540 pounds.—*Cape Ann Advertiser*, May 31, 1861.

Considerable quantities of halibut were also taken in the vicinity of Cape North, Cape Breton, as previously mentioned, chiefly, however, by the cod fishermen, who flitched and salted them.

Prior to 1874 the fresh-halibut fishery was, as a rule, carried on in water from 20 to 75 fathoms deep, though the fish taken off Pass Island, Newfoundland, were caught in 160 fathoms.

In 1873 Capt. John Dago, while on a "salt trip," caught a large number of halibut on the extreme southern part of the Grand Bank, in 160 fathoms of water. His vessel was anchored in 130 fathoms, in latitude 42° 57′ north, and longitude 50° 28′ west. He had previously taken halibut on the Flemish Cap, while fishing for cod, in a depth of 100 to 120 fathoms. He claims to have been the first to fish for halibut in deep water on the Grand Bank.

In 1874 the schooner G. G. Kidder, as well as a number of vessels engaged in the salt-halibut fishery, being anchored in about 70 or 80 fathoms on the western slope of the Grand Bank, found that the halibut shifted their position slowly, going in a westerly direction, and that, after a day or two, the best fishing was obtained on the trawls which were set in the deepest water. This, therefore, induced the captains to change their positions, so they moved out into 90 or 100 fathoms. This was the beginning of a change in the method of fishing on the Banks. In the spring of 1875 the fresh halibut vessels were driven from the shoal water of the bank by drifting field-ice, and one of them having anchored in a depth of 83 fathoms, found good fishing on trawls which were set still farther out, and as a result the vessels in that vicinity anchored in a depth of water varying from 110 to 140 fathoms and made excellent catches.

Although fares of fresh halibut had been previously taken at a depth of 160 fathoms near Pass Island, in Fortune Bay, Newfoundland, and Captain Dago had, during the previous season, obtained part of a fare of flitches in a similar depth on the southern extremity of the Grand Bank, this was practically the beginning of the deep-water fishing for this species on the banks, and since that time the halibut fishermen have been setting their trawls farther and farther down upon the edge of the continental slope, and fares have been caught in waters as deep as 400 fathoms, the vessels being anchored in depths varying from 200 to 275 fathoms, and, in one instance, in no less than 315 fathoms. There is no other food-fish fishery in the world in which fish are sought at so great a depth, and for no other purpose are vessels habitually anchored in such deep water. An extraordinary instance of deep-water fishing may be cited here, the case of the schooner Davy Crockett, of Gloucester, which, it is said, on one occasion, in the winter of 1878, set trawls in 600 or 700 fathoms of water on the western slope of the Grand Bank, in latitude 43° 30′, and caught many halibut.

Prior to the extensive halibut fishery on George's Bank, which was carried on from 1830 to 1850, the species were very abundant in Massachusetts Bay and off Cape Cod, so much so as to be sometimes regarded as a decided nuisance by cod fishermen, and before 1830 those who wished to catch halibut had no difficulty in finding an abundant supply within a few miles of shore. They were gradually exterminated in the bay, the history of which, together with an account of the vessels betaking themselves to George's Bank for the capture of halibut, will be presented later, in the paragraph upon the history of the early halibut fisheries.

Though a fleet of Connecticut vessels have long pursued the halibut fishery, they rarely have gone to the distant grounds, north and east of La Have Bank, but for many years they have engaged in fishing along the southern and western coasts of Nova Scotia.

3. THE FISHERMEN.

The fishermen employed upon the halibut schooners are chosen men, and a man is seldom shipped on board of one of these vessels who is not well known or at least recommended as a good

fisherman and a reliable man. It is not a rare occurrence to find among the crew of a halibut schooner several men who have been masters of vessels. In the Gloucester fleet were employed, in the census year, 646 men, a large percentage (187) of whom were of New England birth, with a still larger percentage (393) of Provincials, a considerable number (103) of Scandinavians, and a very few Portugnese, French, and Irish. Some vessels are commanded by Swedes and Norwegians and manned almost entirely by men of the same nationality, men of these countries seeming to take very kindly to this branch of the fisheries. A number of the most enterprising skippers are natives of Maine. There is no branch of the fisheries which demands of the men employed in it more skill, endurance, and courage than the halibut fishery.

The crews of the Connecticut and Long Island vessels are made up, in large part, of men from the ports to which the vessels belong, especially the three or four men who are sharesmen. The remainder of the men are hired, and are less responsible, and, as a rule, less efficient and daring than those employed in the Gloucester fleet.

4. THE HALIBUT VESSELS.

The schooners which are employed in the fresh-halibut business have always been chosen from among the stanchest and swiftest in the Gloucester fleet. Their average tonnage is from 75 to 80 tons, and they are, as a rule, better vessels than even those now employed in the George's fishery. The smallest vessel employed in the fresh-halibut fishery in 1880 was the Alice G. Wonson, of 64 tons, while others registered nearly 100 tons. A writer in the Barnstable Patriot of March 25, 1856, says: "The Gloucester vessels now engaged in the halibut fishery on the Banks number forty-six. They are generally fine vessels of about 80 tons, and are manned by hardy, experienced, and bold crews of about twelve men each."

A vessel engaging in this fishery is fitted out in a somewhat peculiar manner. To enable her to anchor in great depths of water and to ride out furious gales, which she is sure to encounter in the winter, she is provided with a cable of great size and strength. This cable is of manila, 8½ to 9 inches in circumference, and from 375 to 425 fathoms in length, spliced together in "strings," each of which is usually 50 to 100 fathoms long. Most of the cable is coiled upon the port side, forward, where it fills the entire space between the forecastle companion-way and the rail, the coil being 6 to 7 feet in width, 9 to 10 feet in length, and having a height of about 3½ or 4½ feet. This mass of rope seems immense, and would weigh, when wet, probably about 4 tons. A new cable (dry) of 400 fathoms weighs 6,266 pounds. As a rule, 50 or 75 fathoms of this cable are coiled on the starboard side of the companion-way, in order that it may be ready to bend on the starboard anchor, which is rarely or never kept bent at sea.

The anchors are, of course, unusually heavy. They are the ordinary long-shanked anchors carried by fishing schooners, with a wooden stock which passes through an eye in the end of the shank. These anchors weigh from 525 to 725 pounds, according to the size of the vessel. A vessel of 80 tons would carry three anchors averaging about 675 or 680 pounds in weight. One of the three, which is taken for a "spare anchor," is kept ready for emergencies, being stowed upon the deck. Some of the halibut vessels are provided with unusually large and powerful windlasses, for use in very deep water.

The hold is fitted up in a peculiar manner, as shown in the accompanying diagram of the port side of a halibut schooner, of which the following is an explanation:

DESCRIPTION OF SECTIONAL DRAWING OF HALIBUT SCHOONER, SHOWING PORT SIDE OF SCHOONER.

(1) Hawse-hole; C, knight-heads. (2) Inside part or "heel" of bowsprit. (3) End view of the middle part of the windlass, between the patent and windlass-bit on starboard side, showing position of the whelps on windlass. (4) Pawl-bit. (5) Position of the windlass beam. (6) Position of jib-sheet traveler. (7) Foremast. (8) Forward companion-way. (9) Fore-hatch; this is used for the purpose of hoisting in and out water and provision barrels; in moderate weather it is covered with a grating and serves the purpose of ventilating the forehold and forecastle. (10) The forehold, where the stores and water are kept; the water (28 to 30 barrels) is stowed in different ways to suit the ideas of the cook or skipper, but generally on the starboard side—oftentimes two large casks are carried amidships—and a pantry is built on the port side, where the "heavy stores" (flour, beef, &c.) are stowed on the head, that is, such as are open and being used, while the "small stores" (butter, lard, sugar, &c.) are kept in firkins, half-barrels, &c., and secured from being upset by setting in places built for them as shown in the drawing. A coal-pen is built between the pantry and forward bulkhead to the ice-house. The coal-pen is sometimes built on the starboard side next to the forecastle bulkhead. (11) Forecastle steps. (12) Cupboard, from deck to locker; there is another of the same size on the starboard side, just forward of the foremast. (13) After section of the table with the leaf turned up; this also turns back against the mast, the leaves folding alongside of the mast. (14) Locker on port side. (15) Forecastle floor. (16) Forward section of table; this is stationary, the forward end fastening to the pawl-bit, and the after end supported by an upright standard. (17, 18, 19, 20, 21, and 22) Positions of the upper and lower berths on port side; No. 22, being in the fore-peak, is small, and is not used for sleeping purposes, but is used for the storage of lanterns, kerosene-cans, &c.; there are only two rows of sleeping bunks on the starboard side; the berths abreast of the after row are used by the cook as lockers for putting his cooking utensils, &c., in. (23) The position in which the cook-stove stands on the starbord side (the stove is always carried on starboard side). (24) Pawl bit, under deck. (25) Forward pen in the ice-house, with pen-boards up, or shipped in place. (26) Forward bulkhead to ice-house, built of double boards, with tarred paper between, from side to side of vessel. (27) Stanchion and partition between the forward and second pen. (28) Second pen, showing how the ice is stowed. (29) Shows how halibut are iced in a pen, always white side up, and lying upon each other, so that they are slanting instead of flat in the pen; one-half of the tier is stowed head towards the side of the vessel, and the other half out, as shown in the drawing, both forming what is called a tier. (30) After pen in forward ice-house. (31) Bulkhead between the forward and after ice-house, built same as the forward one. (32) Pumps. (33) Ballast under the plank floor of the ice-house; this plank floor is laid on sleepers, which extend from side to side of the hold; these sleepers are, or ought to be, supported by stanchions under them. (34) Forward pen in after ice-house. (35) After pen. (36) Salt-pen; it is larger than this in some vessels. (37) Checker-plank. (38) Main hatch. (39) Checker-plank. (40) Break of the quarter deck. (41) Mainmast. (42) After hatch; (*a*) skylight on fop of house; (*b*) stovepipe. (43) After, or cabin, companion-way. (44) Wheel. (45) Wheel-box. (46) Taffrail. (47) Vacant place aft of cabin, under deck; used for the storage of gear, rope, &c. (48) Cabin stairs, called "steps" by fishermen. (49) After berth. (50) Partition between the berths. (51) Forward berth. (52) Locker, or seat, going around the cabin. (53) Stove. (54) Position of trap-door in the cabin floor, by which the coal is reached.

The above is the general arrangement, though in the matter of the ice-house a few vessels may have some slight differences of construction that are of minor importance.

The ballast, of which a vessel of 80 tons would carry 28 to 40 tons, is usually stone or shingle, though some vessels are partly ballasted with iron. In all cases it is covered with a plank floor (2 to 2½ inches thick) laid on sleepers, and firmly secured by stanchions, which extend from the deck-beams to the ice-house floor, forming the frame-work of the pens. In the forward part of the hold, and communicating with the forecastle by a door, is arranged the store-room for provisions, fuel, and water (as shown in the diagram), and this is separated from the ice-house by a double bulkhead of unplaned boards, having tarred paper between them. The store-room, which is also the cook's pantry, usually has a floor just high enough to cover a tier of water-barrels stowed each side the keelson, when larger casks are not used. In most, if not in all, halibut schooners the ice-house is divided into two sections by a bulkhead running across it aft of the mainmast. By this arrangement one portion of the ice-house can be kept closed while the other is being filled.

It is still further subdivided into "pens," a series of five or six of which are constructed on each side of a passage-way in the center of the ice-house, which is called the "slaughter-house," though this specific name generally applies more directly to those portions of the passage-way immediately beneath the hatch-ways. This "slaughter-house" is so arranged that it can be divided into pens, five or six in number, corresponding to those on each side, and these are called "slaughter-house" pens. This ice-house, with its compartments, fifteen to eighteen in number, will hold from 35 to 50 tons of ice in a vessel of 80 tons register, and from 75,000 to 115,000 pounds of halibut packed in ice. While fishing is being carried on, the pens are, in succession, emptied of the ice, its place being supplied by layers of halibut packed in ice, as will be described further on. The order in which the pens are emptied of ice and filled with halibut varies upon different vessels, but as a general rule the side pens are first occupied, beginning with the after ones in the forward section of the ice-house. It should be stated that the slaughter-house is not often completely filled with ice except on rare occasions in summer, since this is the passage-way by which access is gained to the pens, on either side. By the arrangement which has just been described, the vessel is provided essentially with two distinct ice-houses, called the forward and after ice-houses—the former reached through the main hatch, the latter through the after hatch. The forward ice-house is usually filled first, the after one being kept closed, and, when the forward ice-house is full, it is closed and the after ice-house is opened. In many cases, however, it may be necessary to pack some of the halibut in the after ice-house before the forward one is filled, in order to keep the vessel in proper trim.

In common with the vessels engaged in the salt-halibut fishery and those trawling for cod on the Banks, the halibut vessels have their main deck fitted up with an arrangement of planks called the checker-boards, dividing the deck into small pens or bins by planks crossing each other at right angles. The space occupied by this construction, which is called the checker-board or "Checkers," is the whole width of the vessel, from 21 to 23 feet, and a length of about 20 to 25 feet forward of the quarter deck, extending from the break of the quarter nearly to the fore-hatch. These compartments are divided by 2-inch plank set on edge. These planks are generally 8 to 10 inches wide. There are also nailed to the top of the planks extending fore and aft (and on some vessels on the athwartship planks also) other planks in a horizontal position 8 to 12 inches wide, forming covers over the lateral edges of the bins. The object of these compartments is to prevent the fish sliding from side to side as the vessel rolls in a sea way.

The top of the house is fitted up with bait planks. These planks are 2 inches thick and 10 to 12 inches wide, nailed round the sides and ends of the top of the house. The object of this is to provide a place where the men can cut up bait without marring the wood work of the vessel.

The accompanying diagram, which shows a deck plan of a halibut schooner, will assist the reader in a better understanding of the peculiar arrangement just described. The following is

an explanation of the diagram: (1) Bowsprit. (2) Pawl-bit. (3) Starboard windlass bit. (4) Port windlass bit. (5) Windlass. (6) Jib-sheet traveler. (7) Foremast. (8) Port cable tier. (9) Starboard cable tier. (10) Forecastle companion slide. (11) Stove-pipe funnel, usually of cast iron, firmly secured to the deck, with sheet-iron cap. (12) Fore hatch, showing grating. (13) Main hatch. (14) "Break" of quarter deck, or grub beam. (15) Mainmast. (16) Starboard pump. (17) Port pump. (18) After hatch. (19) Trunk or cabin house. (20) Stove funnel. (21) Skylight. (22) Companion slide. (23, 24, 25, and 26) Bait planks around top of house. (27) Wheel-box. (28) Wheel. (29 and 30) Bit-heads for belaying mainsheet, &c., to. (31) Taffrail. (A, A, A, A, *a*, *a*, &c.) Checker planks. (*b*, *b*, &c.) Checkers. (*c*, *c*) Dotted lines showing position of dories when on deck.

The halibut vessels, like other trawlers, are provided with a "reefing plank," which is lashed across the ends of the davits upon the stern. This is used by the fishermen to stand upon in reefing the mainsail. When not in use the riding sail is tied up snugly, and generally lashed on top of the reefing plank.

Like all vessels which carry dories upon deck, they are provided with dory tackles on both sides, these being simple whip-purchases, with two single blocks, attached to the fore and main rigging on each side. They almost invariably carry a jib-boom, excepting in the winter season, and are always provided, like all other bankers, with a riding sail. A few of them, in the summer, carry a fore topmast with foregaff-topsail and "balloon jib."

In the chapter on fishing vessels the general features of the fishing schooner are fully discussed, therefore such description is omitted here.

These vessels are usually provided with more complete outfits of nautical instruments than those in other branches of the fisheries, this being necessary from the fact that halibut are often sought on small and isolated patches of ground, and that it is of special importance for the men engaged in this fishery to make good land-falls when running for home. In other respects these schooners are always fitted out as thoroughly as fishing vessels of any other class.

The Connecticut and New York halibut vessels used to have their ice-houses arranged in a somewhat different manner from that just described.

The walls of the compartments of these were often sheathed with zinc, the fishermen of that section claiming that the halibut would keep longer than on the Gloucester vessels. In former years many welled sloops from Noank, New London, and Greenport were engaged in the halibut fishery, but at the present time only schooners are employed in this industry from those ports, these being of a larger size than the other vessels of the New York fleet, though smaller than those of Gloucester. The schooner Scotia, of New London, the largest of the Connecticut halibut fleet, registers about 65 tons, while her companions average about 45 tons.

Mr. Charles P. Tripland tells us that previous to 1858 halibut were caught by the Connecticut vessels wholly on hand-lines and only welled smacks were employed, the fish being taken to New York alive. But with the introduction of the method of trawling, the practice of keeping the fish in ice began, and tight-bottomed crafts were used, many of the old smacks having their wells removed and their bottoms plugged up. For several years, he says, after the fishermen of the ports on Long Island Sound began to ice halibut, they resorted to many schemes to keep the fish fresh a long time. One method was to sheathe the ice-pens with zinc; another to line the sides of the pens with straw, packed in about two inches thick, this being held in place by laths nailed over it. Some vessels also had a false ceiling beneath the beams for the purpose, as supposed, of preventing the heat striking through the deck upon the fish. None of these methods, however, proved satisfactory, and after having been thoroughly tested they have all been abandoned. One of the latest experiments, and one which seemingly has much merit, is to build the ice-house—plat-

form and all—of planed hard pine. The pitchy nature of this wood prevents it from becoming water-soaked, as either white pine or spruce will, and consequently it does not absorb the bad odors that come from stale fish, and which, carried on from trip to trip, doubtless aid very much in causing the rapid deterioration of fish packed in pens made of spruce or white pine. In other respects the ice-houses of the Long Island halibut schooners do not, at the present time, differ materially from those of the Gloucester fleet, though, of course, as they are smaller vessels than the latter, they have a less number of pens and smaller space for cargo.

5. APPARATUS AND METHODS OF FISHING.

THE APPARATUS.

BOATS AND THEIR FITTINGS.—Every Gloucester halibut-catcher, with perhaps one or two exceptions, carries six dories. Most of them are of Salisbury build, and are 15 feet in length on the bottom. They are now sometimes made with an extra set of timbers and stouter gunwales than those ordinarily used in the cod fishery. They are stowed in the usual manner, being "nested" three on a side, on the main deck. When the vessel is making a passage they are usually turned bottom up and lashed, and this is frequently done in heavy weather when the schooner is at anchor on the Bank to insure the greater safety of the boats. In addition to the trawl-lines, each dory, when it leaves the vessel on the banks to set a trawl, is supplied with the following articles: Painter, stern-becket, stern-painter, two or three pairs of woolen nippers, "hurdy-gurdy" or trawl-winch, trawl-roller, sail (a sail is not always taken), compass, water-jug, thole-pins, two pairs 9-foot ash oars, iron gaff, dory knife, one or two halibut killers, bailing scoop, dory plug, two anchors, two buoy-lines, and two buoys. A sail is rarely carried except in summer; not always then. Some dories are not provided with a compass or a water-jug, though most halibut fishermen carry one.

For description of articles which form the equipment of a dory, such as nippers, hurdy-gurdy, trawl roller, &c., see chapter on fishing apparatus, where also may be found descriptions of the various apparatus used on the vessel which have not been mentioned here.

The New York halibut catchers formerly carried no dories, but instead three open, square-sterned, clinker-built, round-bottomed, keel boats of the yawl pattern, about 15 or 16 feet in length. The term "yawl pattern," as used here, applies to the ordinary form of yawl boat carried at the stern davits of coasting and fishing vessels. It is quite distinct from the "yawl" of British writers, which is always a sharp-sterned boat. Two of these were stowed on the deck, one on each side, and one was swung on the davits at the stern. Their construction renders it impossible to nest them. The practice of carrying dories was adopted, however, in 1874, according to Tripland, and at this time he says they are exclusively used, each vessel carrying two or three of these boats.

TRAWL-LINES.—A trawl is composed of several parts: (1) the "ground-line," which is anchored at each end and lies on the bottom; (2) the "gangings" (pronounced ganjings), which are about 5 feet long, have the hooks attached to one end of them, while the other end is bent into the "beckets" on the ground-line; (3) the beckets, made of short pieces of manila line, and are fastened to the ground-line; (4) to mark the position of each end of the trawl when it is set, a line, called the "buoy-line," extends from the anchor at the end of the ground-line to a buoy at the surface of the water.

The ground-lines are commonly tarred cotton, weighing from 28 to 32 pounds to the dozen. The ganging-lines weigh from 14 to 16 pounds to the dozen. A section of line 25 fathoms in length is called a "line." Fishing-lines are generally arranged in packages containing twelve of these, or their equivalent, six "double lines," each of which is 50 fathoms long. Such a package is

called "a dozen lines," and the standard of size is determined by the weight. Manila lines, however, such as the buoy and becket lines, are exceptions to this rule.

The buoy-lines are 6-thread tarred manila, and are somewhat larger than the ground-lines. The becket-line is manila and about the size of the ganging line.

The ground-line is made up of several parts or lines, each of which is either 25 or 50 fathoms long. A wall-knot is tied in one end of these lines, so that they will not unlay, and an eye-splice is taken in the other end. The knotted ends are then bent into the looped ends of the other lines. By bending a greater or less number of these sections together the trawl can be made of any desired length, but the rule is generally to "rig" the trawl in sections, each of which is composed of seven and a half double lines, or their equivalent, fifteen single ones.

The becket-lines are cut in lengths of a foot each. These are placed at intervals of 15 feet apart on the ground-line by tucking their ends through the line and then hitching around, leaving a bight or becket of 3 to 5 inches projecting from the ground-line. Into each of these one end of a ganging is bent, while the hook is fastened to the other end of the ganging with tarred twine. Each skate of trawl has one hundred and fifty hooks attached to it. A full-length trawl is composed of four of these sections, which are called "tubs of trawl," or "skates of trawl," these names being derived from the receptacles in which the lines are coiled. The phrases "tub of trawl" and "skate of trawl" are synonymous. Formerly halibut trawls were placed in tubs made of a section of a flour barrel, but at present an article constructed of canvas and rope and called a "skate" is used for this purpose. A skate is a piece of canvas about 15 to 18 inches square, when it is hemmed, with two small ropes each 9 or 10 feet long, crossed at right angles on the canvas and fastened at each corner and in the center. The trawl is coiled on this, and is tied up with the ropes.

The buoys are either common half-barrels or kegs, of uniform size, and made for the purpose, sometimes of soft wood, at others of hard wood, and iron bound. A hole is first bored through the center of the keg, large enough to admit the staff, which is 1 inch in diameter and about 6 feet long. This must be driven in as tight as possible to secure the buoy from leaking, leaving about 18 inches projecting on the lower side of the buoy, the remainder going through and above the upper side, to which a flag is attached, so that it can be seen at a distance. On the buoys farthest from the vessel (commonly called the outer buoys) there is generally a supplementary staff shipped, like a topmast, to the larger staff. On the top of this there is a circular black flag, called a black ball, which has attached to it a wooden or metal swivel to allow it to revolve with the wind around the staff. This flag can be seen for a considerable distance, and enables the fishermen to find their buoys in a rough sea, when it would otherwise be almost hopeless to look for them. Two parts of the buoy-line are next made fast to the staff—after it has been driven through the keg and tightened—close to the buoy on the upper side, and are then brought down around on each side and secured to the lower end of the staff, where a swivel is also fastened for the buoy-line to bend into. This swivel allows the buoy to turn in the tide and sea-way without kinking the buoy-line. The buoy-lines are generally cut in 50-fathom sections, bent together in the same manner as the ground-lines, and as many of these are used as the depth of the water may require.

The anchors need very little preparation—merely a strap in the ring with two bights, into which the buoy-line and trawl are bent.

The trawls used by the New York halibut vessels are each provided with about 380 hooks, placed 25 feet or more apart, with gangings 4 or 5 feet in length. When trawling was first introduced manila ground-lines and snoods were used, according to Tripland, and a line having

180 to 200 hooks was called a "big trawl"; now each dory has from 350 to 380 hooks. At first the hooks were put 15 feet apart on the ground-line by the Long Island Sound fishermen, but at present they are placed 25 feet apart. All of the ground-line is stowed in one tub made for the purpose, instead of being divided into sections and coiled in skates. Lager-beer kegs were formerly used to some extent by the sound fishermen for buoys, but now iron-bound, hard-wood kegs specially designed for the purpose are made for buoys.

BAIT.—A vessel starting on a fresh-halibut trip to the Banks generally carries a few barrels of herring, mackerel, or menhaden, and occasionally, instead of these, 2,000 or 3,000 pounds of cod, haddock, and hake. This is for bait to begin the trip with, and may be obtained at the home port, or at some point on the Nova Scotia coast. Sometimes bait, especially mackerel, is bought from vessels at sea. After fishing is begun such material as is caught on the trawls—cod, haddock, hake, &c., and occasionally even halibut are used instead of herring, being cut into strips 5 or 6 inches in length and about 2 inches wide. This is called "gurry bait," and is preferred for Bank fishing, although it cannot be used advantageously when fishing in shallow water near the land, fresh herring being considered indispensable for that purpose.

Halibut, when in-shore, are generally much more difficult to please in the matter of bait than when they are on the outer banks. They will not touch herring that are the least bit stale, and some captains claim that the fish can discriminate between bait which has been caught in different localities. The skipper of the Willie M. Stevens told us that it was his opinion, from what he saw while on a northern trip, that halibut on the northwest coast of Newfoundland would not bite nearly as well at herring caught in any other place besides Bay of Islands and Boone Bay. He avers that he experimented repeatedly on the same ground with the trawls set side by side and across each other, and saw others try it, and every time those trawls with the bay herring on them got fair fishing, and the others, baited with herring from distant localities, got nothing or next to it.

In winter, the bait taken from home is usually frozen herring which are packed in straw in one of the ice-house pens, this method of packing being adopted to keep the frost in the fish. In summer, however, the first installment of bait is generally obtained at some port in Nova Scotia or on the coast of Maine, and this is carefully iced in one or more of the pens. It is never eviscerated by the Gloucester fishermen. Formerly, the fishermen about Long Island Sound generally dressed and sometimes soaked the "bony fish" (menhaden) before icing it for bait. Prepared in this way the fish would keep hard and sweet much longer than if iced round with the viscera in them. The Cape Ann men were frequently ridiculed for icing bait before it was dressed, but experience proved that the latter is the best method, for bait that is iced round is by far the most attractive to either cod or halibut, due, so the fishermen think, to the blood being retained in it, and the retention of the natural flavor which is lost when the fish are eviscerated.

The bait is cut up on the top of the cabin, with large, heavy knives. Thick planks are nailed on the top of the cabin for this purpose, as has been explained, and the men who go in each dory have their places for chopping chosen by lot. After enough bait is cut for the occasion the fisherman lifts a skate of trawl upon the cabin and, after untying the ropes, the skate is taken away from the coil and spread out on the deck below. The fisherman then begins at the top of the coil, and, baiting the hooks as he proceeds, recoils the trawl on the skate. The baited hooks are thrown into the center of the coil. The trawls when baited and tied up are ready for the water, and, if the set is to be made immediately, they are at once placed in the dories. Great expertness is shown by the fishermen in baiting their trawls, but there is, however, a limit to the speed with which this

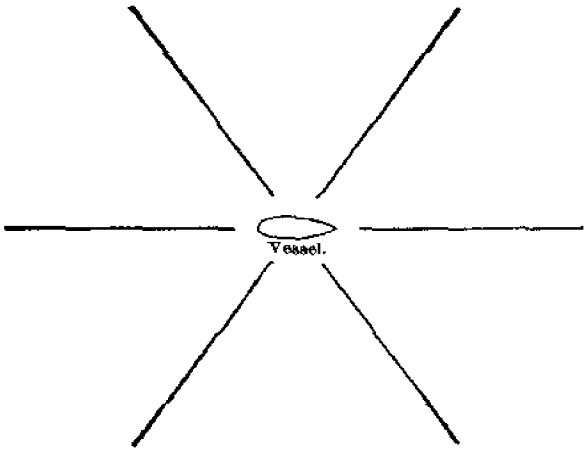
can be done well, and, as a rule, many of those who accomplish the task quickest are not always the best fishermen, as they are apt to do their work in an incomplete manner.

METHODS OF FISHING.

SETTING TRAWLS.—The ordinary manner of setting a trawl is in a straight line, and is performed by two men, though in special emergencies three men may be required. When a set is to be made the buoys, buoy-lines, and anchors are put in their proper places in the dories before the boats are hoisted off deck. When the dory is in the water, one man gets into her, and another reaches him the trawls that have previously been baited (and may be two, three, or four skates, according to circumstances). When, however, the dories are out, and at the stern, as is usually the case in the day-time, when a vessel is at anchor on the bank, the performance varies somewhat from the foregoing, and is accomplished in the following manner:

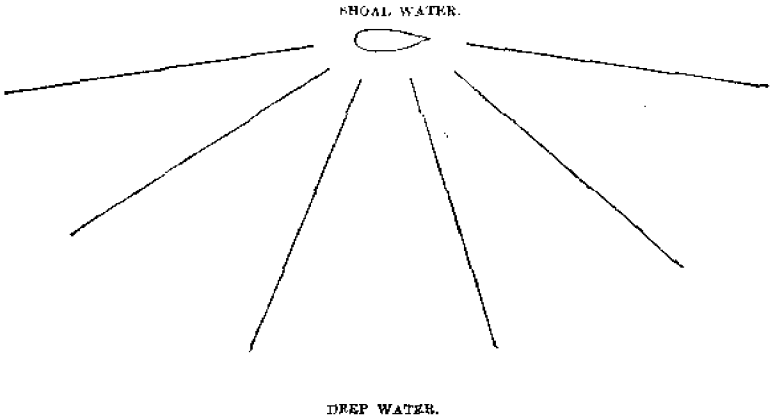
First, the dory is hauled alongside on the quarter, and one man jumps into her, while his dory-mate lifts the trawls upon the rail, and, watching the proper chance, lets them drop into the middle of the boat. After the trawls are in, one man takes the oars and pulls, while, as soon as the proper position is reached, the one aft throws out the buoy, then pays out the buoy-line, and when he gets it all out, lifts a skate of trawl upon the thwart in front of him, unties the skate-ropes, makes the end of the trawl fast to the anchor (the buoy-line is always, on the bank, made fast to the anchor), which he heaves overboard, and then throws out hook after hook of the trawl as he comes to them. When one skate is out another is lifted into its place, the ends of the line are tied together, and the performance goes on until all of the trawl is out, when the end of it is made fast to the second anchor, which is let go, the buoy-line is paid out, and lastly the buoy is thrown overboard, which completes the operation of setting. If the trawl must be set to windward of the vessel, the method differs in this respect: both men sit down to their oars as soon as they leave the schooner, and row until they reach a position about the length of their trawl to windward, where they begin to set.

When trawls are set for the first time in a berth they are usually spread around the vessel in the form of a star, as illustrated by the following diagram:

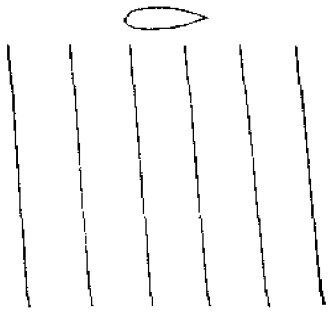


Since each of these lines is from 1 to 2 miles or more in length, it will readily be perceived that a large area of sea bottom, more or less nearly approximating to the form of a circle, of which the vessel is the center, is covered by the gear; and one set of the trawls made in this manner usually determines whether or not there are any halibut of importance within 1½ to 3 miles on either side of where the schooner is lying at anchor. This method is varied in seasons when halibut are only found in deep water and the schooner is lying at anchor on the edge of a bank, perhaps in 150 fathoms. (There can be no general rule laid down about the depth, as it varies in different localities, from less than 100 to 250 fathoms, where the vessels anchor.)

The manner of setting trawls in such cases is commonly as follows: It is well known to be of little use to try on the shoal-water side of the vessel, so they are set in the form of a fan, as in the figure.



These methods of setting trawls "try the ground," and it often happens that a good catch is obtained on one or more of them, while only a few fish are taken on the others. In that case, the next time all of the trawls are set for the "spot," in parallel lines as shown by the figure.



If the "spot" is sufficiently large, and there is a favorable opportunity to set the gear, it generally happens that good fishing is obtained on all or nearly all of the trawls, though in some cases the ground occupied by the halibut is so small that it is very difficult to set all the apparatus fairly upon it.

It frequently happens that when a vessel has just arrived on the bank, or is about to try for fish on a part of the ground where the results to be obtained are doubtful, a "flying-set," or "set under sail," is made. This method of setting, which obviates the necessity of anchoring, may be described as follows: As the dories sit nested on deck, when under way, the trawls, buoys, and anchors are all put in the top boats, that being the most convenient place for them, as they are off from the deck and out of the way. As the vessel nears the place where the skipper intends to set under sail, he shouts the order, "Get the top dories ready." This sets all hands on the alert, especially the crews of the top dories, who quickly take the surplus buoys and anchors out of their boats, and, having rigged their "black ball" and arranged their buoy-line for running, they hook on the tackles and hoist the top dories out over the rail, letting them hang on the tackles with the bow and stern made fast and their bottoms just below the top of the vessel's rail. They are generally left hanging in this way until the middle dories are ready, when, if the vessel is quite near the ground, they are dropped into the water (the vessel being luffed to, to deaden her way, if there be a fresh breeze), and as they drop aft on the quarter they are held there for a few minutes while one man jumps into each dory and another hands him the trawls. When haddock fishing, the trawls are usually put in the dories before the latter are hoisted out (when setting under sail), but halibut-gear is so heavy when baited that it is rarely if ever put in the boats until after they are in the water. As soon as the trawls are in, the other man jumps in and the dory is dropped astern, the painter being made fast to the davit. Meanwhile the middle or second dories have been hoisted out, and while the men are getting their gear in, the two bottom dories are being made ready to hoist out. These two last are usually left hanging on the tackles until some of the others have begun to set. When the proper time arrives, and the dories are ready, the skipper shouts to one of the men in

the first dory, who are towing astern, "Heave out your buoy." He has previously told them on which end of the trawl to put the "black ball." The vessel is now steered on a course parallel with the edge of the bank (if the set is being made in very deep water), and as the buoy-line is being run out the skipper shouts again to the men and points out to them how they must pull while setting the trawl. This is generally to leeward and in a direction abeam of or nearly at right angles to the course steered by the vessel.

As soon as the buoy-line of the first dory is run out, her painter is cast off and the men begin to set, while the men in the next dory get the order to "Heave out your buoy," and their buoy-line is run out in the same way as the others. Sometimes, however, when it is desirable to set the trawls close together, the dories are cast off before all of the buoy-line is towed out. Finally, the last dories are dropped into the water, and, the men having put their gear in, they take their places astern, the cook standing by to cast off the painters at the right moment, and the skipper steering the vessel and watching the boats to see when the men shall throw over the buoys, and when they are far enough apart to begin to set, which is usually from 200 to 400 fathoms. Spread along the edge of a bank in this way, a "gang of trawls" will generally cover 6 or 8 square miles, and sometimes much more. As soon as the last dory is let go the course of the vessel is changed, and she runs for the first dory that began to set, and, having picked her up, takes them in rotation, picking them up in turn. After they are all aboard she generally works back to the weather-buoys (the first ones put out), and lays to with her jib to windward, first on one tack and then on the other, keeping the buoys always in sight until it is time to haul them, when the vessel is run along from buoy to buoy, dropping each dory at or near her own trawl. After the dories are all out, and while the men are hauling the trawls, the vessel lays by with her jib to windward, filling away occasionally and running by all of the dories to see how they are finding fish and whether they need assistance. When the boats get loaded, or have finished hauling their trawls, the men stick up an oar as a signal for the vessel to come for them. When the oar is seen the vessel runs for the dory, and shoots to or tacks close to the boat, lying with her jib to the windward until the gear is out and the halibut discharged. If a dory has finished hauling, she is either taken in on deck or dropped astern and towed until the rest are picked up; but if she has more trawl to haul, she is towed to her buoy and dropped, while the vessel goes off to assist others that may need it.

As a rule, trawls are set under sail only during the day, but it is by no means uncommon for the halibut fishermen in summer to put out their gear in this manner just before night, if the weather is fine and promises to be clear. In this case a lantern is hung on a dory, which is fastened to one of the trawl buoys and left out all night as a guide for the vessel to lay by until morning. The lantern is elevated 7 or 8 feet above the dory on a set of shears made by lashing the ends of two oars together—the lower ends being braced against the sides of the boat—and which are stayed by guy-lines on either side from the bow and stern of the craft. When setting under sail over night great care is required on the part of the watch on board the schooner to prevent the latter from getting too far from the dory upon which hangs the lantern. For, should the lantern by some accident become extinguished, or should the weather grow thick, the whole apparatus might be lost if the exact position of the boat could not be determined. But so hard is the labor of heaving up an anchor in deep water, and so great is the loss of time in doing it, that many skippers choose to take considerable risks in setting under sail rather than anchor where they have little knowledge of the abundance of halibut.

When halibut fishing used to be carried on along the coast of Southern Labrador, and the vessels frequently had to search over large areas to find the fish (though fishing operations were always carried on in shallow water near the land), they very often set under sail. In some cases, we are

credibly informed, a schooner would sail along, dropping her dories 2 or 3 miles apart, and in that way a single set of the trawl-lines, set parallel with the shore, would stretch along 12 or 15 miles of the coast. In this case the dories were provided with sails, and their crews, after hauling their gear, would set sail and steer for the vessel, thus shortening the time of their arrival on board.

The fishermen from the ports on Long Island Sound have adopted somewhat different methods from those just described, which apply more particularly to the Gloucester fishermen, who, par excellence, are *the* halibut fishermen of New England. The former usually fish on George's Bank, Brown's Bank, and the Seal Island Ground, where the tide is strong and the water not of extraordinary depth. In these localities it has been found desirable for the boats, after setting their gear, to remain at its outer end until the tide slacks, which is the time for hauling. This practice, according to Tripland, still continues.

HAULING TRAWLS.—The length of time which a trawl is allowed to remain out before being hauled varies from two to fifteen or eighteen hours, in fine weather. In rough weather several days may elapse before a fitting opportunity offers to perform this operation. If the chances are equally favorable it is customary to begin hauling at the outer end of the trawl, although the direction of the wind or current influences the fishermen in making their choice. The dories may sail or row to the outer ends of the trawls, as circumstances may permit. If the wind is ahead, of course the oars must be depended upon, and, as previously stated, sails are seldom carried in winter. But in summer it is often a lively scene to witness the dories leaving the vessel's side under sail, with a leading breeze, and all starting off on a race for their outer buoys. When the buoy is reached the oars are "shipped" in and placed where they will be least in the way, or on the side opposite to that on which the trawl is to be hauled; sometimes the blades are tucked through the stern becket and the handles shoved well aft.

The hurdy-gurdy or crank-winch for heaving up the trawls is then rigged in its place on the bow of the dory, and the "roller" is placed in position on one side of the bow. A turn is taken with the buoy-line around the barrel of the hurdy-gurdy by the man in the bow of the dory, who reaches the buoy (to which the end of the buoy-line is fastened) to his dory mate in the stern. The latter now takes his place in the after compartment, holding on the buoy-line, hauling and coiling it at the same time, while the man at the bow kneels down, and grasping the handle of the winch, turns it around, over and over, in a laborious manner, until all the buoy line (frequently 350 to 500 fathoms) is hove in, and the anchor is at the bow. The turns are then taken off the hurdy-gurdy, and the anchor pulled in over the boat's bow, and when a few fathoms of trawl are in, the latter is unbent and the anchor placed on the side of the dory, with one arm over the boat's gunwale and the stock resting against her side. The man standing aft now spreads a skate in the bottom of the dory, between his feet, and the trawl, as fast as it is pulled in, is coiled on this skate. Unless there is a very heavy strain on the trawl, it is hauled over the roller, though it often is necessary to employ the hurdy-gurdy to heave in the line, which in many instances becomes so firmly attached to the bottom that it breaks and is lost. No little skill is required in the use of the trawl-winch in rough weather to prevent the dory from being capsized. When the boat has no fish in and sits lightly on the water, she is rather crank, and at such times if she rises quickly on the slope of a wave, with a heavy strain on the line, she is liable to turn over. The man who is holding the line must watch every motion very carefully, for should he fail to slack the line at the right instant, over goes his dory, gunwale under, and he and his companion are thrown into the sea. It is altogether possible that lives have been lost in this manner, as well as by reckless overloading of dories, though it may fairly be assumed that such accidents are rare.

What has been said of setting and hauling trawls (especially the latter) applies more particu-

larly to the deep-water fishing along the outer slopes of the great fishing banks where halibut are now chiefly sought.

The method of hauling in shallow water near the land, where halibut are sometimes found in summer, is quite different. The halibut, following in after the schools of capelin which visit the shores of Western Newfoundland, Southern Labrador, and the islands of Anticosti and Miquelon to spawn, have often been found in great abundance in very shallow water, say not above 5 to 10 fathoms. Here it is frequently possible to notice the fish biting at the hooks, and, of course, no hurdy-gurdy is required, and even the patent roller is little needed. There is comparatively little work in hauling the trawl unless there may be a considerable number of fish on it, in which case the fishermen have a lively time. Halibut that are caught in shallow water are exceedingly active, and frequently make a hard fight. When a fish of 100 to 200 pounds weight is raised from the bottom on a trawl, he will usually start off at great speed, making the dory spin around in his effort to escape. Of course he cannot run far in one direction, for the weight of the gear is too much for him to drag over the bottom. After awhile he is sufficiently tired out to be hauled alongside of the dory, and if the fisherman is expert enough to hit his fish two or three smart raps over the nose with a "killer," the halibut succumbs and is pulled into the boat. It is often the case, however, that considerable difficulty is experienced in effecting the capture of a large fish, and it is by no means an unusual circumstance for one to escape. One of the authors recalls such an episode, which he witnessed in the shallow water near Miquelon Beach.

Two men were out hauling a trawl in about seven fathoms of water, a short distance from the vessel. They worked along quietly for awhile, when suddenly the dory started off at a tremendous speed, towed by a big halibut, which had been started from the bottom, and which, in his efforts to escape, darted about wildly, pulling the boat after him, and careening her at a considerable angle. By dexterous management he was, after awhile, brought to the surface; the man aft quietly pulled up on the ganging until the fish broke water, when an iron gaff was driven into its head. The doryman had made the mistake of gaffing his fish before it was stunned, and as a result no sooner was the gaff in the halibut than the latter made a tremendous splurge, twisted the implement out of the fisherman's hand, and, getting a fair start, made a run to the bottom. Another quarter of an hour was required to again get him alongside of the dory. This time there was no gaff, and to serve in its place the doryman had cast off the trawl anchor from the buoy-line. When he got the halibut's head above water, he drove the fluc of the 16-pound anchor into the fish, which he made sure he would hold that time. But he was mistaken. The halibut, as before, escaped, taking with him the anchor, almost pulling the man out of the boat, which was nearly capsized, and carrying away the hook, which this time he tore from the trawl.

Fishermen who have watched halibut near the land, being able to see them perfectly well in the clear, shallow water, state that these fish exhibit marked peculiarities in biting at baited hooks on a trawl. The halibut will advance to the bait, apparently smell of it, and then retreat 4 or 5 feet from it, always lying on the bottom, head toward the bait, as if watching it. After repeating this performance several times—generally three or four—the fish seems to make up its mind to eat the bait, and, suddenly darting toward it, swallows it down with a gulp.

The George's hand-line fishermen believe that halibut often strike the baited hooks with their tails. It is not uncommon on board a George's man to hear a fisherman remark, "There's a halibut around; I felt him strike my gear." When a halibut has announced his presence in this way it is scarcely necessary to say that every effort is put forth by the fisherman to attract the fish to his hooks, and if the man is sufficiently skillful he generally succeeds in capturing the fish.

UNLOADING THE DORIES.—When a load of fish is brought alongside of the vessel, two of the

crew, who are generally the captain and the cook, hold the stern and bow painters. The man in the bow of the boat jumps on deck, while the other hooks the fish with a gaff and hands them up to his dorymate standing ready to haul them in over the vessel's rail.

The operation of pulling halibut from the dory over the schooner's rail is much facilitated by the rolling of the vessel; the man who hauls in the fish watches the motion, and by a sudden exertion of strength at the right moment is able to take a fish on deck which a novice, unacquainted with the "knack," could not raise at all. Should there be some heavy fish in the boat, the skipper generally assists to pull them on deck. Sometimes the skipper chooses to haul the whole, or nearly all, of the fish over the rail, and we have heard of a cook who made a practice of doing this work.

The methods adopted by the hand-line George's fishermen are, of course, radically different from those just described. It may be remarked incidentally that the George's fishermen are paid in accordance with the amount of fish which each catches, while the trawlers all share equally in the proceeds. It naturally follows that, when halibut are bringing a high price, the hand-line fisherman who catches a considerable quantity of these fish makes much more money than his shipmates. Consequently there is much rivalry in a vessel's crew when it is known that halibut are on the ground where she is lying, and every known device is adopted to entice the fish to bite at the hooks. Strips of newly-caught haddock, with the fresh blood still on them, are considered the best bait. These are usually about 6 to 8 inches long, an inch or so wide at one end, and tapering to a point at the other. Two, three, or more of these pieces are put on a hook, the latter being passed through the thickest ends of the strips, while the pointed ends of the bait are left to float about in the water. Where there is a tide running these closely resemble the movements of small fish. The hooks are usually "pointed" with herring bait. After the bait is on the hooks, many fishermen add (as they believe) to its attractiveness by mopping it in the slime of a halibut, if one has been previously caught. This is done by rubbing the baited hook back and forth over the fish. The lure thus prepared the fisherman lowers his apparatus to the bottom, and by a skillful manipulation tries to induce the fish to bite. Sometimes he will let the tide sweep his "gear" along the bottom, and again he will endeavor to give his baits the appearance of life by slowly pulling them up a short distance from the ground. If he finally succeeds in hooking a halibut, all his art is required to bring the fish to the surface and land it safely on deck. If it be a large fish it almost invariably makes a desperate fight to escape. It may, perhaps, come up easily for 10 or 15 fathoms, when it suddenly takes a plunge downward. Surge! surge! goes the line through the hands of the fisherman, who knows very well that he must "play" his fish or else his line will be snapped like pack thread. This operation may be repeated several times, and it is not uncommon for a large and particularly "wild" halibut to go almost to the bottom after having been hauled nearly to the surface of the water. At last the fish is alongside, and the shout of "Gaffs! gaffs here!" brings two or three of the nearest men to the side, armed with long-handled gaffs. If the fish is exhausted the gaffs are quickly hooked into his head and he is dragged unceremoniously over the rail and falls with a heavy thud on deck, which usually resounds with the strokes of his powerful tail until he is stunned by repeated blows with a killer. On the other hand, if the halibut is still active when he comes alongside, much dexterity is required to gaff him. He makes desperate attempts to escape, and thrashes the water into foam with his tail. Sometimes, but not often, halibut escape after being brought alongside.

When the fish is on deck and killed, his captor cuts his mark in a conspicuous manner, generally on the white surface of the halibut, which is the under portion when the fish is in the water, but is invariably turned upward after it is taken on deck; this method being adopted to prevent the blood from settling on that side and thus making the fish look dark colored or gray.

The George's fishermen frequently bleed their halibut by making a cut across the tail. This is also done to make the fish look white, but we have not known of this method ever having been adopted by the trawlers. The halibut are dressed and iced in the same manner as elsewhere; the separation of the fish caught by each man takes place after the vessel reaches port, those belonging to each "lot" being selected by their respective marks. The above methods of capture by handlines, which are common to the George's cod-fishermen, who only catch halibut incidentally, have been adopted by the handliners, which, about 1876–'77, engaged exclusively in the halibut fishery off the eastern slope of George's Bank.

6. THE MANNER OF DRESSING AND ICING THE HALIBUT ON THE VESSEL.

THE GLOUCESTER METHOD.—A crew of men engaged in "dressing down" a deck of halibut are always clothed in "oil-skins" or rubber jacket and trousers. Five of the men—the two "cutters," the two "blooders," and the "icer"—tie their oil or rubber jacket sleeves tight around their wrists *with rope yarns to keep their other clothing free from the gurry and slime. And in rough weather* (occasionally at other times) the oil-trousers' legs are tied tightly around the boots to prevent the water with which the deck is often filled from wetting the feet and legs of the fishermen. Two of them, with sharp knives, begin to cut. Grasping the halibut by the gills with the left hand, they haul the fish's head up from the deck; one quick stroke of the knife separates the gills from the head at the throat; another stroke severs the gills from the napes; another rips the fish down the belly, and two more cuts and a quick yank with the left hand take the gills and entrails out. Now the "blooder" grabs the halibut, and, sitting or kneeling on deck, hauls the fish toward him with his left hand, while with his right, which is bare, he pulls the ovaries or spermaries from their cavities and the blood from the back-bone with a quickness that would surprise a novice. Then the "scrub gang" takes the fish in charge. There are two gangs and three men in each. One man armed with two iron gaffs hooks one of these into the head of the fish and the other into its nape, and holds it up and open while the scrubber, with a broom specially prepared for this purpose, scrubs off any loose blood, slime, &c., which may be left on the backbone and in the spawn cavities by the blooder. One man stands by with a draw-bucket full of water, and when the "scrubber" sings out "water" he souses it into the fish and completely rinses him out. Now the halibut is clean and ready to go into the hold, and directly the cry comes up from the ice-house crowd, "Heave down your halibut!" In obedience to this order one of the deck gang, who is generally known as the "idler," takes a gaff, and hooking one fish in the head and another in the tail, as the case may be, hauls them over the hatch, letting them fall down. They strike with a dull thud on the floor of the ice-house, where they are taken in charge by the men below and finally disposed of. In the ice-house there are three men hard at work. One is pounding ice with a wooden beetle or mallet; another, the "icer," is in one of the pens placing the halibut in tiers and filling the cavities, where the entrails, gills, &c., were taken out, with fine ice. When he gets a tier prepared in this manner he throws some ice, with a shovel, around their heads and the sides of the pen, but none on top of the fish, and then begins another tier. The third man reaches him the halibut and ice until the pen is full enough, when the fish are covered with from 6 to 12 inches of ice, according to the season. A layer of pounded ice is put under the bottom tier of fish in each pen, the thickness of this layer depending somewhat on the season, more ice, of course, being required in summer than when the weather is cold.

THE NEW LONDON METHOD.—The New London halibut catchers have a somewhat different method. "In the first place," said one of them, "we leave one tier of block ice in the bottom of the pen, if the ice does not exceed 8 inches in thickness. The first tier of fish is laid on

this, and every layer of halibut is covered with 4 inches of fine ice, previous to which the bellies and heads are also filled with the finest ice. The fish are packed in the pens in the same manner as by Gloucester fishermen—half a tier heads out, the other half heads in toward the vessel's side, and overlapping each other; but on these vessels more care is observed to prevent the tails or any other portion of them coming in contact with the wood of the sides of the pens or the ceiling of the vessels. After the pens are filled the fish are covered with ice varying from 6 to 12 inches in thickness. All, or at least most, of the sound fishermen pack their halibut square, next to the side of the vessel, and not to conform to the shape of the bilge, filling in behind the fish with ice."

It is claimed that halibut packed in this manner can be kept in good condition from three to five weeks, and the New London men think there is considerable advantage in cleaning the fish with scrubbing-brushes or brooms that are made of coir, which they believe is far better for this work than the hickory and oak brooms in common use by the Gloucester fishermen. The advantages that might be derived from having different scrubbing-brooms, and in adopting the method (in summer) of putting a layer of unbroken ice in the bottom of a pen, is worthy of the careful consideration of all interested in this business; but the experience of the Gloucester fishermen has taught them that no beneficial results can be obtained by putting ice between tiers of fish; indeed, it is believed that halibut so iced will soon grow "sour."

EARLY METHODS.—The fishermen who first went to George's for halibut did not "blood" the fish or scrub them, thinking it would be an injury instead of a benefit. Instances have occurred where a full fare has been caught in one day on that bank, and a fair and strong breeze springing up about the time the day's fishing was completed, the halibut were thrown into the hold and taken to market (either Boston or Gloucester) before they were dressed. At such times the passage was usually made in less than twenty hours, and the weather was too rough to take the fish on deck. In the beginning of the George's fishery the halibut were simply eviscerated and thrown in the hold, on the stone ballast; but as it was found that those underneath, when treated in this manner, had a "jammed up" appearance the fishermen next resorted to the expedient of driving spikes and ring-bolts on the side of the hold, just under the deck, and to these the first fish were hung up by their tails. The next expedient tried was to keep them alive in well-smacks, after which came the ice and the present system of keeping fish by refrigeration. At first, however, no attempt was made to ice halibut, as that term is now understood, they being simply thrown down on the platform of the hold, the fishermen of that day believing that a small amount of ice stored in one part of the ice-house, to "keep the fish cool," was all that was necessary for their preservation. They were firmly convinced that halibut would soon spoil if packed in ice in the style of the present day.

7. THE RUN FOR THE MARKET.

In the chapter on the dangers to which the fishermen and their vessels are exposed considerable space was devoted to describing the peculiar risks taken by the halibut fishermen in running from the fishing grounds to the market, and in the logs of two voyages, which are appended to this chapter, are mentioned a series of experiences such as are ordinarily met with every winter by the crew of every Gloucester halibut vessel.

As has already been remarked, no class of fishermen take greater risks than those of whom we are now writing. The vessel once loaded with fish everything is made subordinate to the desire to reach home in as short time as possible. There is a strong emulation between the crews of the different vessels, each desiring to get the biggest trip of fish in the shortest time; the professional reputation of the skipper and the crew as well as their profits depend upon accomplishments of this kind. In addition to this motive there is the still stronger one of getting to market in advance of

other vessels which may be on the bank at the same time, and thus be able to dispose of the cargo of fish at a higher price than could be realized if several vessels arrived together. The average length of a run from the Grand Bank to Gloucester, a distance of 800 miles, is, in the winter, about eight days, excepting under specially unfavorable circumstances. Some winters there is a constant succession of heavy northerly and westerly gales, in which case a vessel will take a longer time to make the run. On one occasion, in the winter of 1875, the schooners Howard, J. S. Presson, and William H. Foye, were from fifteen to seventeen days making the passage, and many others were fully as long in getting home; one vessel, the schooner S. H. Putnam, of Beverly, engaged in the fresh halibut fishery that winter, took forty-two days to complete her homeward passage. One of the shortest runs home from the Grand Bank, which is on record, occupied five days only, although the passage to the bank from Gloucester has been frequently made in a little over four days, the prevalence of strong westerly winds in winter favoring an eastern run, but retarding a vessel bound home from the bank.

In summer, a few of the vessels carry two topmasts, and light sails to correspond. When there is a leading wind all sail is crowded on, and there are few finer nautical scenes than that of a full-rigged halibut schooner running for market in a brisk breeze.

8. DISPOSITION OF THE CATCH.

UNLOADING AND PACKING FOR SHIPMENT.—On the arrival of a halibut vessel at Gloucester, she is anchored in the harbor, and the skipper, having gone ashore, visits the offices of the several halibut companies, taking offers for his fish at so much per pound for white, so much for gray, and so much for sour. It often happens, though, that the fish are sold "right through," that is, for a fixed price for all sweet fish, and occasionally the halibut are bought so that the dealers take all at one price per pound, and assume the risk of any being unfit for market. Sometimes there is a competition between the buyers, and then the cargo is sold to the highest bidder. At other times, however, the companies pool their interests and fix a price which the fishermen must accept, since, in such cases, nothing can be done but to submit to the dictation of the combination. Formerly, the "hawkers," as the halibut buyers are called, when anxious to buy a vessel's cargo, were accustomed to go off in boats and meet the schooners as they came in the harbor; at present this is rarely done. The cargo having been sold the vessel is hauled up to the wharf.

The unlading of a halibut vessel is a very interesting operation to any one to whom it is novel. The schooner having been hauled up to the wharf of one of the halibut companies, the hatches are opened and a strong tackle is attached to the fore and main staysail-halyards and adjusted over one of the hatches. Two or three men are stationed in the hold. The fish are "broken out of the pens" and dragged beneath the hatch, and each one has a "strap" of buoy line fastened around the slender part of its tail. This strap is about 3 feet long, with the ends spliced together to form a ring. This is dexterously fastened to the tail in a kind of slip-noose; by passing one bight through the other and into the loose part a hook from the hoisting tackle is easily caught. Three or four, or even more, fish are thus attached to the same hook, and then the pendant, slimy group is hoisted. Now a similar hook attached to another rope on the wharf, called an "outhauler," is thrown down and fastened into the eye of one of the fishes, which are both hoisted and hauled on to the wharf at the same time. As the fish are lifted and pulled to the wharf the hoisters suddenly let go and the halibut fall sprawling over the floor of the fish-house. Here a sturdy gang armed with gaff-hooks are waiting. The fish are culled into grades, and either the white or gray ones, as the case may be, are tossed into a tray pendant from a pair of large steelyards. Their weight ascertained, they are dumped again on the floor, their heads cut off, and then they are ready for pack-

ing. Other men with gaffs seize them and drag them over the slippery floor to the end of the building. Here a stout spruce or pine box is waiting, standing on platform scales. One by one the fish are lifted into the box, and a shovelful of ice is poured into the abdominal cavity. The box is filled, its weight noted and marked in large figures in one corner, and then it is transferred to wooden rollers and handed over to the carpenter, who nails the cover on, using a peculiar instrument, very appropriately called a "devil's claw," if we accept the idea that the devil has an unyielding clutch.

If, as frequently happens, the fish are taken from the vessel, weighed, and beheaded faster than they can be boxed, they are dragged aside and thrown in heaps according to the several grades. It is not an uncommon thing to see 30,000 to 40,000 pounds of halibut piled up on the floor of a large packing establishment, and in some instances a much larger quantity is heaped together.

When taking out halibut the average rate of progress is from 7,000 to 10,000 pounds an hour; the speed depends somewhat on the height of the tide. "The best time we ever made," says Mr. John F. Bickford, foreman of the Atlantic Halibut Company, "was in the summer of 1878 when we took a trip of 103,000 pounds of halibut out of the schooner William Thompson in 9 hours and 15 minutes, and had an hour's nooning out of the time. The actual time at work was a little more than 8 hours." These fish were bought "right through," and, being in good order, needed no culling, and consequently could be handled very rapidly.

A full working gang in the building is eleven men, all told. These are divided as follows, namely: A weigher (who is usually the foreman), the culler and assistant at the scale, the header, a man to haul the fish away, three men boxing and weighing the fish, two men nailing the boxes and wheeling them away, and one man grinding ice. One of the "boxers" assists the "ice-grinder" in dragging away the baskets of ice, &c. With a gang like this at work boxing, the fish can be put up ready for shipment nearly as fast as they are usually taken out of a vessel. The boxes hold an average of 425 pounds of halibut.

Mr. B. W. Griffin, culler at the New England Halibut Company's establishment, and Mr. Thomas Tarr, foreman of the same, gave the following information:

"We take out anywhere from 8,000 to 10,000 pounds of halibut an hour, under ordinary circumstances; generally more if the chance is favorable. The best we ever did was in 1878, when we took a trip of 42,000 pounds out of the George P. Whitman in an hour and three-quarters. With a full gang at boxing, which includes six men—three boxers, two nailers, and one ice-grinder—we can box, ready for shipment, 40,000 pounds of halibut in four hours, but in some instances we do even better than this. Some years ago the schooner Wm. T. Merchant came in with a trip of halibut that had been sold to arrive, at a high price, and we were anxious to get the fish on the market. She hauled alongside of the wharf at 5 o'clock p. m., and at 9 p. m. we had her trip of 50,000 pounds boxed and all on the steamboat wharf, ready for shipment."

It seems appropriate in this place to allude to the system of "culling fish" which is in practice among the merchants of Gloucester who buy fresh halibut from the fishermen. They have established three grades of halibut, known as "white," "gray," and "sour"; the white halibut are those which have their under sides immaculate, the gray halibut are those whose under sides are more or less tinged with gray or drab, while the sour halibut are those which are slightly tainted in the vicinity of the abdominal cavity. The largest halibut are almost invariably gray. The price allowed to the fishermen for gray halibut is considerably less than that for "white," frequently not more than one-half. The price of sour halibut, again, is considerably less than that of gray. For instance, when white halibut sell for 5 cents per pound, gray will sell for from 3 to 3½ cents per pound,

and sour for from 1½ to 2 cents per pound. The distinction between sour halibut and that which is not sour is doubtless a valid one, but that between white and gray is of little importance, since, in the hands of the retail dealers, there is seldom, if ever, any difference in price. There is no reason why the gray halibut, as they are called, should not be exactly as firm in flesh and delicate in flavor as the white. The distinction was first made by the Gloucester Halibut Company, established in 1848, in order to avoid the carrying out to the letter of their contracts with the fishermen, and since that time it has uniformly been made use of, to the disadvantage of the fishermen. It is not our intention to criticise the motives of the halibut merchants in this respect, but simply to call attention to the fact that the existence of an arbitrary distinction of this sort is extremely unfortunate, since it gives to the capitalists the opportunity of treating the fishermen with great injustice. The cullings are made entirely by the purchaser and the fishermen have no right to criticise their judgment, and no right to appeal. The manner of culling is varied arbitrarily, from time to time, in accordance with the necessities of the buyers. At times a very large percentage of the catch of a vessel will be counted as gray, or even as sour, and paid for at reduced rates. If the terms of the bargain previously made with the fishermen were justly carried out, the value would be very much greater than that which was actually paid for the fish. We do not deny that the buyers feel some necessity for some such safety-valve as this in the present condition of the halibut fishery, since sometimes eight or ten large cargoes of fish are brought in at one time, glutting the market to an uncontrollable extent;* at the same time some more equitable means of regulating the price in accordance with the supply is very much to be desired. Under existing circumstances, perhaps the most desirable remedy would be the appointment of some inspector who would cull the fish in accordance with some uniform rule, thus doing away with the feeling of injustice which is constantly felt by the fishermen. In the winter of 1878 the feeling against this system of culling was so strong among the owners and masters of the Massachusetts halibut vessels in Gloucester, that an attempt was made to organize a company of fishing firms, which should take the matter of handling the fresh halibut into its own hands. This, however, was unsuccessful, owing to the lack of unanimity among the fishing capitalists. The manner of weighing the halibut is also open to objection of the same kind. Fish are bought from the vessels with their heads on and weighed, and 14 per cent. of the total weight is deducted, this being supposed to represent the weight of the heads. This percentage, however, is considerably too large; then, too, the weighing is done by the purchaser with beam scales, and the fishermen complain that undue advantage is taken by the weighers. The employment of some impartial person as weigher would do much to allay the dissatisfaction felt and expressed by the halibut fishermen.

9. FINANCIAL PROFITS AND EXTENT OF THE FISHERY.

THE LAY.—The "lay," or division of the proceeds of the voyage, is given in detail in the chapter on "Lays and Outfits." Briefly stated it is as follows: From the gross receipts of money obtained from the sale of the fish are deducted certain "stock" charges, these embracing expense for ice, bait, towing by steam-tug, woolen nippers, &c. The balance is called the "net" stock, and this is equally divided, the vessel receiving one-half, while the other half, after charges for splitting wood, filling water, medicine chest, tarring rigging, painting spars, and one-half of 1 per cent. for widows' and orphans' fund, are deducted, is divided equally between the members of the crew, the captain and cook included. In addition to his share obtained by this division the captain receives a percentage on the net stock, this being usually 4 per cent., though in some cases a

*This statement applies more particularly to the fishery previous to 1881, at which time a larger fleet was employed and more fish were taken than at present (1885); nevertheless what is said of the method of culling and weighing halibut applies equally well now, and it is not less objectionable now than in former years.

higher rate is paid to favorite skippers. The cook also generally makes extra pay, since he is entitled to half of any fish he may catch on a hand-line, or short trawl set from the vessel, and also, in some instances, has been permitted to save and sell for his own benefit the swim-bladders of the hake (*Phycis*) captured on the trawl-lines set for halibut. This latter privilege is now, however, rarely accorded.

The owners of the vessel must fit her with all material for the proper prosecution of the voyage, including food, gear, &c., their profit being the difference between the expense so incurred and their half of the proceeds of the voyage.

THE "STOCK" OF THE GLOUCESTER HALIBUT FLEET IN 1880.—The following list shows the net stock of the vessels composing the fresh-halibut fleet of Gloucester in 1880:

Vessels in the Gloucester halibut fleet in 1880, with a statement of the net stock of each.

Name of vessel.	Net stock.	Name of vessel.	Net stock.
Augusta H. Johnson	$14,650 00	Laura Nelson	$10,700 00
Alice M. Williams	16,000 00	Lizzie	11,300 00
Bessie Somes	16,116 38	Mary F. Chisholm	11,033 78
Chester R. Lawrence	11,413 76	Nathaniel Webster	12,000 00
David A. Story	13,708 84	Notice	10,000 00
Epes Tarr	13,800 50	Plymouth Rock	10,900 00
Frederic Gerring	14,487 24	Polar Wave	14,322 00
Gatherer	17,234 00	Procter Brothers	9,821 14
G. P. Whitman	10,003 84	Thresher	8,126 73
Grace L. Fears	12,155 26	Wachusett	15,110 23
Guy Cunningham	16,500 00	Willie M. Stevens *	20,959 06
Isaac A. Chapman	19,846 45		

* The gross stock of the last-named vessel, the amount her fish sold for, was $22,107.25; the crew shared to each man $706.06. As will be seen, the Gloucester halibut fleet was much smaller in 1880 than in 1879, numbering only twenty-three vessels against forty-eight schooners in the latter year.

An addition of about $1,000 to $1,200 to the net stocks given will show approximately the amount obtained for each vessel's catch. The Procter Brothers and Thresher made only six trips each for halibut, being employed elsewhere or hauled up the remainder of the year. The stock given is that realized from the sale of halibut.

RECEIPTS OF HALIBUT IN 1878.—The following detailed statement of the amount of fresh halibut landed at Gloucester, Mass., for the year 1878, by vessels engaged in the fishery from that place, will give a fair idea of the catch and value of halibut during the several months of the year:

Month.	Gross weight.	Net or market weight.	Average value per pound.	Total value.
	Pounds.	*Pounds.*		
January	347,694	299,017	$.0905	$27,166 05
February	1,359,030	1,168,766	.0226	26,475 82
March	1,531,258	1,316,882	.0287	37,820 08
April	1,817,916	1,563,408	.0201	31,474 62
May	817,075	702,685	.0323	22,697 36
June	1,081,022	929,679	.0285	26,505 32
July	1,261,330	1,084,744	.0228	24,685 24
August	821,902	706,636	.0257	18,173 08
September	894,080	768,909	.0261	20,047 53
October	718,186	617,640	.0317	19,582 48
November	273,872	235,530	.0648	15,266 46
December	318,852	274,213	.0526	14,418 10
Total	11,242,218	9,668,307	.0294	284,302 13

Add to the above quantity the halibut landed at Boston by Gloucester vessels, estimated at 1,125,000 pounds gross weight, and valued at about $28,500, and we have the total catch of the

Gloucester fleet 12,367,218 pounds, gross, valued at $312,802.13. The market weight is found by deducting 14 per cent. for the heads.

HALIBUT PURCHASED BY THE NEW ENGLAND FISH COMPANY, 1873 TO 1878.—The following statement of the amount of fresh halibut bought, during a series of years, at Gloucester, Mass., by one firm, the New England Fish Company, from vessels engaged in the fishery from that place, is of interest in this connection:

Year.	Gross weight.	Net weight, after deducting 14 per cent. for heads.	Average value per pound.	Total value.
	Pounds.	*Pounds.*		
1873	3,647,142	3,136,542	.0612	$192,141 94
1874	3,473,995	2,987,636	.059	176,226 19
1875	3,368,696	2,897,079	.0512	148,519 59
1876	3,988,511	3,430,378	.044	152,148 27
1877	3,302,112	2,839,817	.0415	117,906 70
1878	6,216,492	5,346,184	.0302	161,514 60

Each year ends March 1. This firm represented seventeen wholesale Boston firms and seven at New York in the year ending March 1, 1878; previously Boston firms alone. Seventy-five per cent. of the above shipments from Gloucester in 1877–'78 were to Boston and 25 per cent. to New York. The shipments in the preceding year were mostly to Boston. In 1878, 2,112,581 pounds of fresh halibut were sold by the New England Company to "cutters" in Gloucester for smoking.

LARGEST STOCK.—The Cape Ann Advertiser of March 24, 1882, contains the following account of the largest halibut trip ever made, so far as financial results are concerned. It says: "The best halibut fare received at this port for several years was landed Wednesday (March 22) by schooner Grace L. Fears, Capt. Nathaniel Greenleaf. Her fare was taken by the Atlantic Halibut Company, and she weighed off 98,825 pounds halibut and 3,000 pounds codfish, 101,825 pounds in all, stocking $6,016.60. Her crew shared $206.30. The cook's share was $253.94. She was gone five weeks and one day, during which time she was frozen up for eight days at Canso. This is the largest stock ever made on a halibut trip, although larger fares have been received several years ago."

SUCCESSFUL TRIPS IN 1874–'75.—We are indebted to Messrs. Clark & Somes, of Gloucester, for the following detailed account of some of the most successful years' work accomplished by schooners employed by them in the Bank halibut fishery:

SCHOONER F. W. HOMANS.

1874.	Gross weight.	Gross stock.	1874.	Gross weight.	Gross stock.
	Pounds.	*Dollars.*		*Pounds.*	*Dollars.*
January 21	20,954	1,845 60	September 23	21,982	1,456 94
March 2	51,859	2,818 90	November 6	50,908	2,539 19
March 27	73,820	2,856 82	December 12	22,475	1,802 37
April 30	55,023	2,836 72	*Total*	399,224	18,702 89
May 28	62,500	1,225 08			
August 10	89,603	1,293 28			

SCHOONER LIZZIE K. CLARK.

January 22	23,551	1,963 13	August 10	41,786	1,137 91
February 27	55,087	3,493 74	September 15	40,199	3,340 26
March 25	85,810	4,726 50	November 3	26,363	1,414 70
April 21	53,733	2,259 95	November 28	11,809	979 93
May 20	29,409	644 70	Total	418,111	19,088 82
June 30	50,364	1,623 99			

SCHOONER JOHN S. PRESSON.

1875.	Gross weight.	Gross stock.	1875.	Gross weight.	Gross stock.
	Pounds.	*Dollars.*		*Pounds.*	*Dollars.*
February 20	62, 210	4, 144 99	August 27	*191, 206	5, 814 90
March 19	97, 313	3, 138 58	November 22	*141, 113	3, 735 67
April 28	74, 189	2, 703 89	Total	651, 731	21, 785 99
May 25	85, 700	2, 247 98			

SCHOONER LIZZIE K. CLARK.

January 17	24, 178	1, 709 56	August —	43, 348	3, 481 98
February 17	18, 135	1, 573 70	September 27	43, 606	4, 469 49
March 21	40, 957	2, 953 64	November 5	7, 970	703 47
April 29	20, 418	1, 022 43	Total	280, 316	18, 186 48
June 23	19, 514	561 27			
July 22	42, 190	2, 410 94			

SCHOONER GERTIE E. FOSTER.

February 8	38, 110	3, 363 18	September 10	86, 051	2, 912 37
March 14	113, 646	3, 937 66	October 7	102, 906	3, 496 59
April 20	39, 965	1, 667 40	November 16	29, 326	1, 331 03
May 19	64, 626	2, 241 06	December 9	24, 036	2, 860 36
June 15	83, 614	2, 883 78	Total	686, 168	27, 470 53
August 11	83, 868	2, 767 10			

SCHOONER CHESTER R. LAWRENCE.

February 5	21, 722	2, 239 96	November 5	96, 556	3, 094 66
March 16	136, 046	4, 708 29	December 11	24, 090	1, 893 12
May 6	129, 688	3, 933 71	Total	634, 999	24, 124 16
June 19	*133, 887	3, 824 97			
September 24	*176, 144	4, 728 45			

*Cod.

HALIBUT FARES FROM 1831 TO 1877.—The following items are quoted from Cape Ann newspapers of various issues during the last half century:

1831.—"*Good Luck.*—The schooner Nautilus, Wonson, of this port, in one week caught and sold 136 halibut. Time occupied in taking them, twelve hours."—(Gloucester Telegraph, March 12, 1831.)

1839.—"The schooner Majestic, Edgar, of this port, returned on Saturday evening from a cruise to the George's with upwards of 100 halibut. This is believed to be the first successful trip ever made to the Banks, within the month of February, by any vessel belonging to Gloucester. Since Sunday some dozen or more vessels have sailed and others are ready and actively preparing for the spring business. Owing to the poor success which has attended the mackerel fishery for several years past, it is probable that fewer vessels will be engaged in that pursuit the coming season than Gloucester has had employed in it for the last quarter of a century."—(Gloucester Telegraph, February 27, 1839.)

1846.—"Three vessels, schooners Mount Vernon, Oregon, and Clarissa Story, sailed on Thursday for George's Bank after halibut. They are the first this season."—(Gloucester Telegraph, January 17, 1846.)

1848.—"*Fresh Halibut.*—The first trip of halibut this season arrived on Monday from George's Bank in the schooner Centurion, Captain Bailey. Captain B. was absent ten days, and obtained about 100 halibut and a quantity of fish (codfish). No vessel has ever been after halibut at so early a period previous to this."—(Gloucester Telegraph, January 5, 1848.)

The remarkable increase in the importance of this fishery during the past eighteen years may perhaps best be illustrated by quoting the following paragraph from the Cape Ann Advertiser of January 16, 1863, and comparing it with what follows:

"*The schooner Marengo, from Western Banks, arrived at Gloucester with 17,000 pounds of* halibut, which sold for $1,300. The schooner William Parkman, with 11,000 pounds, selling for $900, and the Madame Rolland, with a trip amounting to $600, making a gross amount of $2,800 for the three trips. This," remarks the editor, "is what we call doing the thing up brown."

We will now compare the big trips above mentioned with the following references to other large fares during the last twelve years, as recorded in the Cape Ann Advertiser:

"The schooner Daniel McFee arrived at Gloucester May 4, 1860, with 45,000 pounds of halibut, which sold for $1,125.

"The schooner Cyniska arrived May 10, 1860, from Western Banks, with 40,000 pounds.

"The schooner Mohenie arrived February 3, 1860, from George's Bank with 13,000 pounds of halibut, which sold for $1,240."

In April, 1867, schooner Aphrodite arrived at Gloucester from Western Bank and landed one of the most profitable trips ever made by a Gloucester vessel. She was absent twenty days, and brought in 41,000 pounds of halibut and 2,000 pounds of codfish, the gross stock amounting to *$4,246.37. Net stock, $4,126.72. The crew shared $171.51 apiece. There had been larger fares* brought in up to this time, but never so large an amount of money realized from the sales, halibut *then being very scarce and commanding a good price.*

A trip of 80,000 pounds of halibut was brought to Gloucester in May, 1867, by schooner Flying Fish.

The schooner James G. Tarr arrived at Gloucester in July, 1867, from the Grand Bank with 140,000 weight of halibut and codfish. There were upward of 100,000 pounds of halibut weighed off, the largest amount up to that time ever landed from a single fare. The vessel stocked about $4,000.

The Cape Ann Advertiser of May 29, 1868, says: "Schooner Mary G. Dennis, which arrived from Western Banks last week, brought in 75,395 pounds of halibut, and 9,950 pounds of codfish. Her net stock amounted to $3,604.85, and the crew shared $143.85 each. Time absent, four weeks."

The same paper for June 19, 1868, says: "Schooner Montana, Welsh, arrived from a four weeks' cruise to the Grand Banks last week, with 95,773 pounds of halibut and 2,250 pounds of codfish, the net stock amounting to $3,265. The Montana, in her two trips to the Grand Banks, has stocked $6,000." And the Advertiser of July 24, in the same year, says: "Schooner *Montana* arrived from her third trip to the Grand Banks on Friday last, with 65,227 pounds of halibut and 2,100 pounds of codfish, her net stock amounting to $2,329.02. The Montana has stocked in her *five trips $10,311.02, which is the highest net stock made this season by any Gloucester vessel.*"

The Cape Ann Advertiser of September 24, 1869, says: "Schooner C. B. Manning, of this port, which arrived from the Grand Banks on Sunday, brought in 49,000 pounds of halibut and 14,000 *pounds of codfish, having been absent but four weeks. The halibut were sold for* $12 and $8 per hundred-weight, her net stock amounting to $4,033.44. Crew shared $116.06 each.

In 1869, the schooner Sarah P. Ayer, Captain Thurlow, owned by Dennis & Ayre, stocked $4,251 from a trip of thirty-five days. This was one of the biggest trips of that time. In five trips that year she stocked $12,000. In 1871 the schooner Mary G. Dennis, owned by Dennis & Ayre, brought in 116,000 pounds of halibut, which sold for $2,400.

The schooner Lizzie K. Clark, of Gloucester, Capt. Edwin Morris, arrived in March, 1874,

with 85,810 pounds of halibut, and stocked $4,676. The time of the trip was seventeen days, the shortest ever made to the Grand Bank.

The schooner Ossipee, Captain O'Brien, arrived at Gloucester from the Grand Bank April 6, 1874, with 90,628 pounds of halibut, the largest cargo of the season. Prices were low, and the stock, which amounted to $2,533, was not so large as some made during the previous months.

Schooner Gertie E. Foster, Captain Morris, which arrived from her first trip to the Grand Banks on Monday, September 14, 1874, brought 40,199 pounds of halibut, and sold for 12½ cents; stocked $3,340.20.

The Cape Ann Advertiser, December 4, 1874, states that Capt. Edward Morris, who has followed the Grand Bank halibut fishery in the Lizzie K. Clark and Gertie E. Foster, has stocked $20,000, the largest stock but one ever made from this port. The largest was made by the Racer, Capt. Walter M. Falt, who in 1866 stocked $22,000. In the three years 1873 to 1875, inclusive, Captain Morris stocked $64,996.78 in the halibut fishery.

The Forest and Stream, March 18, 1875, prints the following:

"Schooner Edward Grover, Captain Wheeler, arrived from the Grand Banks on Wednesday with 45,000 pounds halibut, having made the trip in three weeks, a remarkably short time considering the rough weather."

The Forest and Stream, March 25, 1875, states as follows:

"Schooner Chester R. Lawrence, Capt. Thomas F. Hodgdon, which arrived at Gloucester from the Grand Banks on Monday, weighed off 126,566 pounds of halibut and 5,480 pounds of codfish, the largest fresh fare ever landed up to that time at this port, and stocked $4,708.20, the fish selling for $6⅜ and $3 per hundred-weight for white and gray. On both trips he has brought in 147,946 pounds of halibut and stocked $6,892.22."

The record of the Centennial while under the command of Captain Murphy is a very remarkable one. She sailed from Gloucester on her first trip February 15, 1876, and between that time and August 28 made six voyages to the Grand Bank, bringing home about 600,000 pounds of fish, caught in from 60 to 150 fathoms of water. She then stopped halibut fishing and went with a load of herring to Gottenberg, Sweden. February 25, 1877, she again started halibut fishing, and between that time and October made four trips, with the average fares of 100,000 pounds.

The Cape Ann Advertiser of March 3, 1876, thus records the largest halibut trip from George's Bank:

"Schooner Pioneer, Captain Osier, from George's on Monday, February 27, 1876, weighed off 65,000 pounds of halibut, stocking $2,960.12, which is the largest trip of halibut ever landed from George's. On her former trip she landed 30,000 pounds, stocking $1,107, making an aggregate of $4,067.12 for the two trips. These halibut were caught on hand-lines in what is known as deep-water George's fishing, which is from 100 to 150 fathoms in depth, and this is the first season in which this kind of fishing has been pursued with any marked success. The cook's share was $167; high-line, $181. Time absent, three weeks."

The Advertiser of April 28, 1876, says: "Schooner Epes Tarr, Robert Grant master, left Gloucester, March 28, 1876, put into Halifax, March 31, and sailed April 1 for the Grand Banks. She returned Wednesday, April 19, and landed 54,500 pounds of white halibut and 24,442 pounds gray, the stock aggregating $3,161. The crew will clear $120 to a man. All her fish were caught in four days, and had it not been for the moderate wind on her homeward voyage, which occupied nine days, she would have made the quickest trip on record."

The same paper of March 28, 1876, records the following: "Week ending April 28, 1876,

halibut trips from the Banks: Carrie P. Morton, 114,540 pounds; Davy Crockett, 99,980 pounds; Edwin C. Dolliver, 95,000 pounds; Notice, 70,000 pounds; Howard, 95,000 pounds."

May 22, 1877, the schooner G. P. Whitman, Capt. Jerome McDonald, of Gloucester, arrived from the "Gully," after four weeks' absence, with 137,510 pounds of halibut, which sold for $3,254.54.

With the exception of the above, the largest cargo of fresh halibut ever brought into Gloucester, and without doubt the largest ever taken, was that brought in by the schooner Centennial, Capt. D. C. Murphy, in 1877. The fare amounted to 137,000 pounds, over 100,000 pounds of which were white halibut. These fish were taken on the Grand Bank in latitude 43° 30′ north, longitude 52° 04′ west, at a depth of 87 fathoms.

In 1868, schooner William T. Merchant, Capt. Nelson A. McKenney, stocked $4,200 on a fare of 48,310 pounds of halibut, caught on a trip of twenty-six days. The same year the Merchant caught a fare at Miquelon Beach of 103,450 pounds of halibut, being absent from home twenty-five days.

The schooner Mary Carlisle, Capt. William Thompson, made nine trips to the Banks in 1871. Her catch was 350,188 pounds of halibut and 58,759 pounds of codfish; her net stock amounted to $17,275.53 for about eleven months' work, from December 27, 1870, to November 21, 1871. On one trip in the spring she brought in 58,553 pounds of halibut and 6,900 pounds of codfish, her net stock reaching the sum of $4,738.75, and her crew sharing $236.25 each from a voyage of thirty-four days. She had ten men in her crew, each of whom during the season shared $858.62. In three years this vessel stocked a total of $46,871.53, divided as follows: 1869, $17,549; 1870, $12,047; 1871, $17,275.53.

The highest stock ever made from a single trip of fresh halibut, until recently, was that of schooner N. H. Phillips, Capt. William McDonald, in the fall of 1871. She secured a fare of 47,650 pounds of halibut and 9,370 pounds of codfish. The gross stock amounted to $5,361. She was absent five weeks, and the crew shared $213.42 each. In two trips, both occupying nine weeks, she stocked a total of $9,142, and the men shared $363.42 each.

"The largest amount of halibut ever received in Gloucester in a single week was for the week ending February 10, 1881, when the receipts were 740,000 pounds from the Banks and 122,509 pounds from George's, 862,500 pounds."*

10. HISTORY OF THE FRESH-HALIBUT FISHERY.

THE EARLY HALIBUT FISHERY ON GEORGE'S.—In the early part of the present century halibut were exceedingly abundant in Massachusetts Bay, and were considered by the fishermen *to be troublesome pests, as are dogfish at the present time. Their abundance, even as late as* 1837, may be judged from the following account of a fishing trip in the bay quoted from the Newburyport Herald by the Gloucester Telegraph of June 3, 1837: "Four men went out fishing from Marblehead a few days since, and returned, after an absence of two days, with four hundred halibut, for which they obtained $1.50 each, or nearly $600." The Gloucester Telegraph of March 22, 1837, contains the following, which is additional evidence of the occasional abundance of halibut near the coast: "Our hardy fishermen," says the account, "have been unusually successful in their pursuit of this noble fish [halibut] within the past week or two. One boat, we are informed, during an absence of only two days, took 15,000 weight."

The fishing vessels of Cape Ann at that period were mostly pinkies, or "jiggers," and chebacco boats, or "dog-bodies," as they were then called; and it was the practice of the fishermen, when

* Fisherman's Own Book, p. 30.

halibut were troublesome, to string them on a line and hang them over the stern of the vessel. Halibut were occasionally brought home, but they were generally thrown away. Before 1825, however, a considerable demand for halibut sprang up in Boston, and small vessels were accustomed to carry cargoes to that market. The supply of fish on the inshore grounds slowly diminished, and about 1830 the announcement that halibut were abundant on George's Bank led several vessels to make trips thither in their pursuit. The present George's cod fishery sprang up in connection with the halibut fishery, the latter being the original inducement for vessels to visit that region; and in early days, at the season when halibut occurred on the Bank, it is stated that it was often impossible to catch many codfish, if desired, on account of the great abundance and voracity of the halibut. The following account of the inception of the halibut fishery on George's is taken from the Fisherman's Record Book, pages 77 and 78:

"It is claimed by a large majority of those interested in the fisheries that the schooner Nautilus was the first vessel which ever ventured to George's on a halibut trip. There are others who assert that the schooner Romeo is entitled to the claim of being the pioneer schooner in this branch of the fisheries. We have made the most careful inquiries, and from one of the crew of the Nautilus we obtain the date of her sailing, and several interesting particulars of the trip. We could not obtain any date of the sailing of the Romeo, although we interviewed one of her crew. He felt confident that there was not many days' difference in their time of sailing, and was rather inclined to the opinion that the Nautilus was the first. Our informant is positive that he is correct in his dates, and as he is a man of undoubted veracity, and in the absence of any contradictory statements, we publish his narrative. The vessel was commanded by Capt. John Fletcher Wonson, recently deceased, one of the most able and careful skippers among those of the olden time.

"In 1828, while coming home in the Nautilus from Wilmington, N. C., he noticed on the chart used on board the vessel a picture of a halibut, under which were printed the words, 'Good halibut grounds here.' This he remembered, and two years after concluded to give the halibut catching a trial. On the 5th of March, 1830, the vessel started out of the harbor on her trip for halibut. Among her crew were the following persons, all of whom but the last named are now living: John W. Wonson, Nathan F. Wonson, Samuel G. Wonson, Daniel Douglass, and Benjamin Marble. The result of this trip was twenty halibut, which were landed, but met with a dull sale. The schooner Romeo, Capt. Henry Pew, sailed soon after, and brought in a trip of upwards of 3,000 pounds, which were sold for 3 cents per pound. Other vessels soon followed, but the business did not amount to much until it had been prosecuted five or six years, when it began to assume considerable importance and became established as a regular branch of the fisheries.

"This first trip of the Nautilus came very near being the last of one of her crew, Mr. Marble, and gave a little foretaste of the dangers accompanying the vocation. The vessel was lying to, the crew having succeeded in finding some halibut, when Mr. Marble launched the dory, and, throwing over his anchor, commenced fishing by himself. It was quite moderate, and the vessel, drifting with the current, was soon some distance off. This was thought nothing of in the excitement attending fishing, until one of the crew remarked that Marble was about out of sight, and he thought it queer that he didn't row for the vessel, especially as night was coming on and there were indications of a storm. All hands then began to talk it over, and thought that something must have happened to him. A man was sent aloft to keep the dory in sight, and a little breeze springing up, the vessel was got under way, and they succeeded in reaching him just before the darkness and storm came on. It seems that in the hurry of launching the dory he forgot the oars, and this accounted for his not attempting to regain the vessel. There lay the oars on the vessel's deck, and not one on board had observed them. If they had, the mystery of Marble's not

attempting to regain the vessel would soon have been solved. Soon after he had been picked up, the storm came on in all its fury, a regular George's blow, with all the accompaniments, which would have proved certain death to any one exposed to its fury in a dory."

The above paragraphs are supplemented by the following reminiscences of Mr. Samuel G. Wonson: "Before this time (1830) a good many halibut were taken between Gloucester and Cape Cod, especially on the southeastern part of Middle Bank. They were taken to Charlestown, Mass., and traded off to the farmers for produce. Mr. George Wonson, father of Samuel G. Wonson, used to take a good many in those early times. During the first of the season, before it was time for the herring to come in, all fresh fish (halibut were sold fresh then) were taken to Charlestown and traded off, alewives being brought back for bait; but later, when herring were plenty and they were not obliged to go to Charlestown for alewives, the halibut were cut away, not being landed at all, as there was no market nearer than Charlestown. After the first trip of the Nautilus to George's, finding halibut scarce, she made two or three trips off Nausett (Cape Cod), and at times found halibut plenty, the fish being sold, as before, to Mr. John Hareling, of Charlestown. Went to George's again in June for cod, but found halibut so plenty that they took a trip of about 130 fish and run into Salem, where they disposed of part; another portion was sold to parties to take to Marblehead, and the remainder thrown overboard, as they could not sell them. They fished in from 20 to 50 fathoms, generally on bottom, but at times could take them up in the water.

"The first smack for bringing in halibut alive was owned by John F. Wonson, and went first about 1835 or 1836. These smacks used to carry seven men and average a round trip a week, a trip being what the vessel would carry alive, or about 12,000 pounds." The quickest time of taking a trip that he recalls was by anchoring at 10 a. m., and getting under way at sundown with 14,000 pounds (about 300 fish in number).

"About 1838," according to Mr. Wonson, "a little ice was taken by the smack Mount Vernon to put in the napes of such fish as might be accidentally killed."

The following additional facts concerning the early George's fisheries have been obtained from interviews with Captains William Tarr and John Pew, of Gloucester. These gentlemen, who were formerly actively employed as fishermen, were two of the crew of the pinkey Romeo on her first trip to George's Bank in the spring of 1830. This trip of the Romeo was the second made to George's for halibut by a Gloucester vessel, that of the Nautilus being the first. While going out of the harbor the former met the latter vessel coming in, having on board only a few halibut. The Romeo caught a good fare, and may therefore be given the credit of making the first successful voyage to George's for halibut.

During the first five or six years of the George's halibut fishery, that is to say, previous to 1836, the vessels never anchored on the Bank, but "fished at a drift," the men fearing the tide would run them under if they should be unwise enough to anchor. When halibut were found abundant, as was generally the case at that time, it was a common occurrence for a vessel's crew to catch a full fare—12,000 to 15,000 pounds—in one day's fishing. In some cases, when the fish could be caught "pair and pair," a part of the men would not put out any lines, finding enough to do in assisting their shipmates to gaff in the halibut which were hauled up. It often happened, too, that halibut which were free would follow those which were hooked to the surface of the water, and the fishermen with their gaffs frequently succeeded in catching them. Indeed, it is stated by some of the old fishermen that it was not unusual for one-half of the fish to be taken in this manner. After the day's fishing was over the halibut were eviscerated, washed out, but not blooded or scrubbed. They were then thrown into the hold on top of the stone ballast, where they remained until the vessel reached a market. Sometimes, owing to bad weather, the fishermen

were unable to dress their catch, but had to throw the fish in the hold just as they came from the water. Mr. Pew relates an instance of this kind that happened on board of the pinkey Paul Pry, which he commanded, in the spring of 1837. The vessel lay at anchor on George's Bank. Early in the morning halibut were found to be very abundant, and, notwithstanding the prevalence of a strong easterly wind and a thick snow storm, the men kept on fishing. The weather was so rough that the fish were thrown in the hold as fast as they were caught. After the day's fishing was over, a full fare having been secured, the vessel started for the land. The wind was free for the little pinkey, and she was driven along at her utmost speed. Since it continued, however, to blow nearly a gale while the passage was being made, the fishermen were unable to take the halibut on deck, and consequently carried the fish into Boston without being dressed.

From 1828, for a period of twenty years, the halibut fishery was carried on almost exclusively upon George's Bank, but after the immense captures of 1847 and 1848, which resulted in the establishment of the Gloucester Fishing Company, and its collapse on account of the great oversupply of fish, the quantity of halibut on George's began to fall off rapidly, and after 1850 or 1852 the fishery ceased to be remunerative. From this time to 1861 the fisheries were prosecuted chiefly on the shallow parts of the Seal Island Ground, Brown's Bank, and Western Bank. More or less halibut have, however, always been taken on George's by the hand-line cod fishermen from Gloucester, even up to the present time, and this bank has been resorted to in the spring by the halibut trawlers from the ports on Long Island Sound.

The general character of the fishery upon George's Bank during the first decade of its existence may be appreciated from the following account of what was at the time considered a very remarkable trip, as well as from others previously quoted:

"In March, 1833, Capt. Chester Marr went to George's Bank in the schooner Clarion. He left Gloucester Harbor on Friday at 1 p. m., and on Sunday at 1 p. m. was again at anchor in the harbor, with a fare of 17,000 pounds of fish. From this trip he realized about $500. Two years later he brought in a cargo consisting of 17,000 pounds of fresh halibut and 5,000 weight of salted flitches, which he sold for $38. Captain Marr began halibut fishing on George's in 1832.

"We have succeeded," writes Mr. George H. Procter in 1873, "in obtaining a carefully compiled statement of the doings of the winter fishing fleet on George's during the season of 1846. There is such a contrast between the business then and now that we feel assured the details will be of interest to the reader.

"The entire fleet which followed winter fishing at that time comprised twenty-nine vessels, as follows: Schooners Mount Vernon, Clarissa Story, Oregon, Hosea Ballou, Huntress, Columbia, Adeline, Champion, Union, William Wallace, Hannibal, Clarion, Alabama, Concordia, H. A. Holbrook, Canton, Centurion, Constitution, Clinton, Pilot, Richmond, Sarah, Napoleon, Zanoni, William Penn, Emerald, Revenue, Cinderella, and Science. Their average measurement was 62 tons [old measurement]; average value, $2,800, and were considered the staunchest vessels belonging to the port. The greater number of these vessels have either been lost or sold from this district. The first ten of the above list left for George's January 5, and averaged five trips each during the season. Their net stock amounted to [a total of] $11,870, and the average net earnings of the vessels were $151.50. The largest fares brought in were the first two trips of the William Wallace, Capt. James Pattillo, amounting, respectively, to $500 and $610. The arrival of these trips produced quite a sensation, and was the theme of conversation in the stores, on the wharves, and on the street. The William Wallace was the lucky craft, and to her captain and crew was accorded the honor of being high liners of the Georgesmen. She stocked $2,135 for her season's work.

"The next eleven vessels of the list did not go so early in the season, but deferred their departure

till February 6. Their stock was $8,844, and each vessel averaged $128.36 net earnings. The remaining eight started March 2 and netted $110 each. The total stock of the fleet to April 15 amounted to $23,106, and the average share of each man was $62.16.

"In those days halibut comprised the principal fish caught on George's, and the amount of codfish caught was small. Now it is reversed, and codfish are the most plentiful." *

The following additional notes on the early halibut fishery may be of interest: "The schooner Alabama, of Gloucester, arrived at this port this morning from George's Bank, with 140 *live* halibut. —(Gloucester Telegraph, June 16, 1841.)

"*A quick halibut trip.*—A subscriber informs us that in 1848 the schooner Huntress, Capt. Arthur Cain, made a much quicker trip than the one reported in our last issue. She left port on Thursday at 11 o'clock, arriving in Boston on the following Monday morning, with 330 halibut, having accomplished the trip in less than four days."—(Cape Ann Advertiser, July 6, 1866.)

HALIBUT FISHING IN MASSACHUSETTS BAY.—The following notes on halibut fishing in Massachusetts Bay were obtained from Captain N. E. Atwood, of Provincetown:

Captain Atwood was the first to undertake fishing for halibut in the gully between Race Point and the Middle Bank. This was in 1840, and many very large fish were taken there. On the first trip there were ten fishermen on the schooner. It was not good fishing weather, but they tried for a short time, one man getting three, one getting two and several getting one fish apiece. Altogether, in an hour they took 13 halibut, and finding they could fish no longer bore up and went to Boston, where they found they had 2,043 pounds of the largest ever seen. In 1843 they began setting trawls. These were 60 fathoms long and had only about a dozen hooks. The "scrawl-body," or ground line, was of 6-thread manila line, such as is called worm line, not much larger than cod line, and the hooks were placed 4 or 5 fathoms apart on snoods 4 or 5 feet long. One anchor was used at the farthest end of the trawl, while the end nearest at hand was kept down by a heavy stone. In 1843 and 1844 Captain Atwood went in his little sloop-smack, the Mars, on Nantucket Shoals after halibut. There were many New London smacks there at that time. The New London fishermen were very careful to keep the halibut alive and handled them with the greatest delicacy. When they had pulled them on deck they would throw a canvas over them, and, lying down on them to hold them still, would carefully work the hooks out from their mouths and then throw them into the well. When they were fishing in a skiff they would carefully reeve a rope through the gill of each fish they caught and tow them astern of the vessel until they were placed alive in the well. It was not convenient to do this way, so Captain Atwood and his men killed the halibut, as they supposed, with their clubs and threw them into the well, and when they came to dress them they were all alive. Always after that, when fishing in a well-smack, they were in the habit of stunning the fish so that they were apparently limp, and dead, but found that they never failed to come to life after they had remained for a time in the water.

Capt. Epes W. Merchant tells us that at the time of his first acquaintance with the fisheries of Massachusetts Bay, from 1810 to 1830, halibut were so plenty that they were considered to be an annoyance. Vessels lying in the bay or on the Middle Bank, fishing for codfish, would often string up on a rope, at the stern, all the halibut caught on hooks and keep them there until they were ready to go home, in order to prevent them from annoying the fishermen again. They were never carried home except as a favor to friends on shore who wanted them.† They first came into

* Fisherman's Memorial and Record Book, 1873, p. 69.

† At the present time, and, indeed, for many years past, halibut have generally been so scarce on the New England coast, more particularly in Massachusetts Bay, that the capture of one or two has been considered a sufficient novelty for the fact to be chronicled in the newspapers.

demand about 1830. Capt. Harry Pew, in the pinkey Romeo, and Capt. John F. Wonson, in the Nautilus, went in the same year (1830), but he is uncertain which went first. At that time halibut were beginning to be scarce in Massachusetts Bay, and as there was always a small demand for them in the Boston markets, vessels began to go to George's after them. The first adventurers went in March, but others soon began to go in January. Quite a fleet grew up after two or three years, and in 1848 there were sixty-five vessels which brought halibut to the Gloucester Halibut Company, which was started in January of that year, and continued in business until the last of April, when it suspended operations, the supply exceeding the demand a hundred fold. Sometimes there would be twenty vessels, each with 30,000 or 60,000 pounds of halibut in its hold lying at the halibut company's wharf, waiting to unload, while there was no possible sale for any. In warm weather the whole fleet went after mackerel, starting about the 4th of July for the Gulf of Saint Lawrence. There were certain favorite grounds for the halibut fishing. They used first to make the shoals of George's and then run southeast until they struck the southern slope of the Bank sounding, and "trying" as they went.

Captain Marr is of the opinion that the first trips to George's after halibut were made in 1828. Capt. John F. Wonson, he says, went in March of that year, and Capt. Harry Pew went at about the same time.

Captain Marr first went in March and April, 1832. As early as 1834, vessels were accustomed to make their first trips to the Banks after halibut about the 1st of January. For bait they used herring, which they caught in gill-nets on the Banks.

EARLY HALIBUT FISHING BY NEW LONDON VESSELS.—Many New London vessels came to George's as early as 1840. These were small sloops, each with a crew of four men. The following statements relative to the early history of the halibut fishery pursued by the New London vessels have been obtained from Mr. Tripland. He says that when well-smacks were first employed in the halibut fishery from the sound ports the fish were caught with hand-lines from the decks of the vessels and immediately put in the well. The halibut were gaffed carefully in the under jaw so that they would not be injured enough to cause their death. A stout iron gaff ($\frac{1}{2}$-inch iron) $2\frac{1}{2}$ to 3 feet long, with an eye at the top, was used to gaff wild or large halibut, which were hoisted on board by a tackle hooked into the eye of the gaff. Shovel-handled gaffs, he says, were also used for pulling in halibut, as well as a few with long handles made of saplings.

The few halibut that died were iced, but little money was, however, realized from the sale of these. While live fish brought 6 or 7 cents a pound in the market, those which were dead were not worth more than 1 cent to $1\frac{1}{2}$ cents a pound, and it frequently happened that a whole fish sold for a very insignificant sum.

Twenty-five to thirty years ago a full fare of halibut could often be taken on George's in two or three slack tides with a crew of five men, all told. A fare for the New London vessels of that date would be about 150 to 200 fish, of an average weight of 80 pounds. Halibut were then also abundant about Nantucket shoals in spring and early summer, say from March to July, in from 7 to 35 fathoms of water. On George's the sound vessels generally fished in 45 to 50 fathoms, except when they tried about the Great Southwest Shoal and the Cultivator Shoal, when they generally fished in 10 to 15 fathoms. The halibut taken about the shoals were not so large as those caught in deeper water, therefore the smackmen did not like to fish there, more particularly as more or less danger was attached to being in too close proximity to those shoals.

When trawling began, about 1858, tight-bottomed vessels were substituted for the well smacks. The smack George Moon was the last welled vessel employed in halibut fishing from the sound ports and on her last trips her well was plugged up. But though the vessels exclusively employed

in the halibut fishery are tight bottoms, it not infrequently happens that a welled smack fishing for cod off Nantucket may sometimes catch a number of halibut, which are taken to New York alive, and, of course, bring a high price.

MR. JOHN FLETCHER WONSON'S RECOLLECTIONS.—Mr. John Fletcher Wonson tells us that the Gloucester vessels frequently went to New York with fares of halibut in early times, and that this practice was kept up as late as 1849 to 1850. Speaking of the abundance of halibut, he also tells us that at one time he saw ten of them follow the deep-sea lead to the surface, biting at it. He remembers to have taken an ice-bird out of the stomach of a halibut, and at another time some mackerel.

The New London vessels, according to Mr. Wonson, began catching halibut for the New York market on George's somewhere between 1840 and 1845. The New London fishermen cared nothing for cod, and the Wonsons often exchanged with them a few halibut for a boat-load of cod. The New London fleet was first composed entirely of sloops. Mr. Wonson remembers to have counted forty at one time in 1845 or 1846. In 1846 several schooners made their appearance.

In 1845, and until 1850, Mr. Wonson fished chiefly on the northwest part of the Bank in about 28 fathoms, though sometimes in 15 or 16 fathoms. One fare of fish was caught inside of the breakers on the shoals. For bait, the early halibut fishermen used chiefly herring, caught on the Banks.

RECOLLECTIONS OF W. H. WONSON.—Mr. William H. Wonson, of Gloucester, who was engaged in the halibut fishery from 1838 to 1850, and has since been extensively interested in halibut smoking, communicated to us the following facts regarding this fishery:

At that time the fleet was composed of vessels of 50 or 60 tons, many of them with pink sterns. The favorite fishing ground was on the northern edge of the Bank in 30 fathoms of water. The usual length of the trip was ten days. Mr. Wonson has been out and back in forty-eight hours. Leaving Gloucester at 2 o'clock in the afternoon on Saturday, he was back on Monday p. m. with 30,000 pounds of fish caught within 1 or 2 miles of the north shoal.

The year before the halibut gave out, fishermen used to find great pieces of halibut in the throats of the cod; nearly all the cod taken the last year had pieces of halibut in them.

Previous to 1848, when the vessels struck the southern part of the Bank, cod would last one day, then the halibut would gather around and haul the codfish off the hooks. It was not unusual for a vessel to anchor on the Bank at 11 o'clock in the forenoon and at evening heave up anchor with 7,000 pounds halibut on board.

In 1838 10,000 or 15,000 pounds was a fair trip; never more than 20,000 pounds were taken. At that time the fleet of fifteen or twenty sail used to start halibuting in February, run till April, and then go codfishing until July, and after the 4th of July go mackereling. In the beginning the practice was to catch the fish and heave them into the hold. The crew would clean them on the way in. As early as 1840 or 1842 there were one or two well smacks in the business, afterwards half a dozen. After icing was introduced some halibuters ran all summer. At first haddock were always used for bait, thirty or forty of them being taken from home. Subsequently herring nets were carried, and there never was any trouble in getting an abundance of herring in the winter on the Banks.

RECOLLECTIONS OF CAPT. W. H. OAKES.—Capt. W. H. Oakes, of Gloucester, Mass., first went halibut fishing in 1838. Halibut at that time were caught only on George's Bank. In the words of Captain Oakes, "they were like sand on the beach, the more you catched the more there was." He believes that at that time they were accustomed to strike the north side of the Bank at 75 fathoms and "follow it up" till 30 fathoms were reached.

Captain Oakes has laid to on George's Bank and caught 700 halibut in one place, while there were twenty-two sail of vessels fishing around him, the least successful of which caught 22,000 pounds of fish.

In those days prices ranged low. In April, 1852, Captain Oakes sold 10,000 pounds of halibut at the rate of $6 per hundred; this was an unusually high price. At that time no distinction was made between gray and white halibut, only the "loggy fish" were thrown out. All the halibut, he says, were in those days taken at a depth of from 35 to 45 fathoms. No cod were found on the shoal portion of the Bank. The ground was pre-occupied by the halibut. Cod were sufficiently abundant at the depth of 75 fathoms, and very few halibut were found in company with them.

In the early days of halibut fishing on George's the only bait he used was haddock. This was found to be very good and continued in favor until 1841, when the vessels began to catch herring on the Banks, and these were found to be better bait than haddock.

WELL SMACKS.—The early halibut vessels, according to Captain Merchant, were accustomed to carry their fish in bulk, in the hold on top of the ballast. Well smacks had come into use as early as 1845. In this year Mr. Merchant had the schooner Clinton, built in 1837, changed into a welled smack, and for several seasons ran her to Boston market.

TRADE IN HALIBUT.—In or about the year 1849 Capt. A. W. Dodd began the business of buying halibut from the George's cod fishermen and carrying them to Boston, where they were sold in a fresh state; his schooner was called the Neptune. In 1853 Capt. W. H. Oakes entered the same business with the schooner Sarah. The average fare of halibut for George's cod fishermen was about 3,000 pounds. The Sarah sometimes carried 20,000 pounds to Boston at one trip, and never went with less than 8,000 pounds. The price realized at that time was about 2½ cents per pound.

THE HALIBUT SEASON.—The George's halibut fleet was accustomed to begin operations in March and continued until April or May. In 1838 they continued to the 10th of June. After the close of the halibut season the vessels all went mackereling or to the Grand Bank after cod. Captain Oakes once went to George's after halibut in February.

SALT HALIBUT TRIPS.—The practice of salting halibut on the Banks was initiated as early as 1850. Captain Oakes, who at that time was in the schooner Tremont, tells us that he salted a fare of fish in May, 1850. They were "sold to arrive," to Henry Merchant. The schooner lay at anchor for three days and caught a large quantity of enormous halibut, ranging in weight from 100 to 300 pounds. One of them weighed 347 pounds. The results of the trip were as follows: 19,000 pounds of flitched halibut, at $1.25 per 100 pounds; 22 barrels of salted fins, at $5 per barrel; 8,000 pounds of fresh fish, at 75 cents per hundred pounds. Many other trips were quite as successful as this.

HALIBUT FOOD.—Only once during his long experience did Captain Oakes see halibut swimming at the surface. One day in April, 1845, he was on deck early in the morning and saw a large school of halibut playing at the surface. He supposed that they were in pursuit of herring, which were present in large schools at that time.

ABUNDANCE OF HALIBUT.—Captain Marr, of Gloucester, states that when, in the schooner Scarlet Feather, he made the first trip to George's Bank after cod, he caught in 33 fathoms of water, south and east of the north shoals, 10,000 pounds of halibut, besides 75 tubs (about 40,000 pounds) of codfish. This was in February. Before that time no vessel had caught any considerable quantity of cod in this locality because of the abundance of halibut. Some vessels had before this time gone to George's for halibut in February, but none for cod.

Captain Marr also states that no large fares of halibut have been taken on George's since 1848. He thinks that the halibut at that time "shifted off" into deep water.

The following statement, communicated by H. A. S. Dearbon to the secretary of the State of Massachusetts, was printed in the Boston Courier, and again appeared in the Gloucester Telegraph of March 9, 1839:

"Before the construction of the Providence and Stonington Railroad the whole number of halibut annually caught and brought into Cape Ann did not exceed 2,500, which were nearly all sold fresh, for immediate consumption; for not having been in demand when cured in any manner by salt for the domestic or foreign markets, but few were prepared for that purpose; in fact, so worthless were they considered as salted fish that the owners of the vessels employed in the fisheries generally instructed the crews to cut adrift all halibut which were drawn up, and every year many thousands had been thus turned back to the deep with a fatal wound. But such was now the facility for transporting them fresh to the New York market, at least 16,000 were taken and a large portion of them sent to that city by the railroads and steamboats. The average weight of each being 50 pounds, the whole quantity amounts to 800,000 pounds, and as the common price paid to fishermen is 2 cents per pound, this new source of revenue yields an income of $16,000.

"Formerly the halibut was only caught late in the spring and during the summer and autumnal months, on the south shoals of Nantucket, along the coast of Cape Cod, in Barnstable Bay, on Cashe's Ledge, and some other places, where they were most abundant at certain seasons of the year, and always in deep water, being considered, as it is termed, a bottom fish. But since the demand for this American turbot, as it may with propriety be called (for it much resembles that delicious fish in form and flavor), has so vastly increased, the fishermen have made explorations in search of other haunts, and, to their great astonishment, found them in immense quantities on George's Bank, early in March; and what was still more surprising, and a fact wholly unknown to them, they appeared in extensive shoals on the surface of the water like mackerel, and were taken with 3 or 4 fathoms of line, instead of from 26 to 70, which they had been accustomed to use time out of mind in the bottom fishing. The Cape Ann vessels take from 290 to 500 each trip, weighing from 20 to 100 pounds."

In 1848, according to Capt. Epes W. Merchant, halibut were so abundant on George's Bank, east of the Cultivator Shoal, in 25 to 40 fathoms, that they followed the hooks of the fishermen to the surface. Persons on the deck of the vessel could touch them with their hands as they swam about and could gaff them from the surface without difficulty. Vessels could easily catch a fare of 50,000 pounds of fish in two days. Captain Merchant had a vessel which caught a fare in forty-eight hours.

Capt Israel Friend, of Gloucester, tells us that in 1848 he was one of the crew of the schooner Baltic, in which he sailed for George's in March. They fished with hand-lines, but found halibut so plenty that four of the crew kept their lines on deck and did not fish, but employed themselves in assisting to gaff in the halibut that were hauled up by the others. In this way they caught a full fare—240 halibut in number—in one day. The fish were then dressed and iced, and taken to Boston for a market.

Captain Marr thinks that in early days halibut were exceedingly abundant on George's Bank. He has seen a "solid school of them as thick as a school of porpoises" feeding on "lant." At another time "the whole surface of the water as far as you could see was alive with halibut; we fished all night and we did not catch a single codfish. The halibut would not let the hooks touch the bottom; we caught 250 in three hours; the crews of some vessels would go and cut the fins off the fish and let their bodies go. No wonder that they were broken up. We thought they were always going to be so. Never made no calculations that we were going to break them up. The

southern side of George's was a kind of 'mother-place' for fishing halibut. All the halibut there were large 'pea-halibut' of 200 pounds or so. On the north side there were small 'school halibut' of 25 to 80 pounds." There was no great abundance of halibut on George's after 1848.

Captain Marr speaks of some remarkable halibut trips. On a patch of rocky bottom they anchored at sundown in a little smack and the next day caught 570 halibut. He himself caught 80 that day. At another time (as has been mentioned elsewhere), when he was commanding the schooner Clarion, Captain Marr left Gloucester on Friday at 1 p. m., and on Sunday, at 1 p. m., was back in port with a fare of fish. He got to the Bank at daylight Saturday morning and left on the return trip at 8 o'clock in the evening. This cargo he sold in Boston for $500 to Mr. Rogers, of New York, who shipped them in ice to the New York market.

FISHERMEN AFRAID TO ANCHOR ON GEORGE'S.—The first vessels which went to George's Bank never anchored. The fishermen had an idea that it was not safe to do so, for when the tide began to run the eddies were as great as those of another maelstrom. One man came into port with a story that he had come to anchor on the shoal ground of George's and the tide ran so fast that the water began rushing into both hawse-pipes of his vessel, which frightened him so that he cut his cable and came home. The halibut vessels began to anchor in 1835 to 1837.

FIRST USE OF PATENT WINDLASS.—Captain Marr was the first man to carry a patent windlass to George's. This was about the year 1850, when he was skipper of the schooner Julia. The old captain tells the story with a great deal of glee. Before then the vessels all used hand-spikes for heaving up anchor. He had stood five hours at a time, hand-spike in hand, getting up anchor. The patent windlass took his fancy and he determined to try one. His fellow-skippers laughed at him, and said that it would be impossible to heave up anchor in rough weather with such a machine. He was not to be discouraged and started for the Bank with his new apparatus. When he had filled his vessel with fish and was ready to start home he instructed his men to work deliberately and not to convey the impression that they were in a hurry. They began, and, to his dismay, the cable slipped on the barrel of the windlass and the anchor refused to yield. They worked for awhile, and it finally occurred to him that if he put ashes on the barrel it would overcome the tendency to slip, so he sent one of the men to the forecastle for ashes and then the anchor came up merrily, and within half an hour was swung upon the bow, one-tenth of the time usually occupied. His fellow-skippers were very curious when they saw the preparations for a homeward start, and dozens of them came around him to see him heave up his anchor. His triumph was complete, however, and before many months every vessel from the port was fitted with a patent windlass. The skipper would stipulate for them, and fishermen coming down to ship on board a schooner would always first inquire whether there was a patent windlass on board, for the saving of labor to the crew was immense. At one time there were twenty-seven vessels lying at the wharf of the agent waiting to take their windlasses on board.

HALIBUT FISHING FROM MAINE PORTS.—In early days there was also a limited halibut fishery from Southport, Maine, concerning which Mr. Earll has obtained the following information:

The first vessel from Southport to engage in the halibut fisheries was the schooner Pearl, Capt. O. Harris, in 1844. The Pearl was a small square-sterned vessel of about 50 tons (old measurement), carrying four or five men. They went in the fall and fished with hand-lines from the vessel's deck, catching their fish usually in from 30 to 90 fathoms on the northeast edge of George's Bank, generally hanging them up in the hold and spreading them loosely on the floor. They usually could get a trip in from one to three days, when they would start for Portland to sell what they could at from 2 to 3 cents per pound. It frequently happened that they brought in more than they could sell, in which case they threw the balance away. They generally went during the

winter and spring, until time for mackerel hooking on the coast of Maine. Thus with halibuting and mackereling a greater part of the season would be used up. The Pearl was soon joined by schooner Fair Play, Capt. William Harris, and they continued in the business about five or six years.

A third vessel, the schooner Nelson, engaged in the same business as early as 1850, going for three years, after which she gave it up, owing largely to the want of a market for her fish.

No Southport vessels have fished wholly for halibut since that time, and no other towns from this section have ever sent any, except the schooner Columbus, of Booth Bay Harbor, a few years later, for a few trips.

The schooner Queen of the West went for halibut from Georgetown, Me., during the winter of 1857–'58, fishing with hand-lines and selling to Mr. Little, of Portland. She fished on Brown's Bank and Banquereau mostly, in 60 to 90 fathoms.

FIRST ATTEMPTS TO CATCH HALIBUT ON TRAWL-LINES.—As early as 1843, as previously mentioned, Capt. N. E. Atwood, of Provincetown, set trawls for halibut in Massachusetts Bay, and even before that time had been accustomed to make use of a simple form of the apparatus arranged by fastening two or three hooks at intervals along the "rode-line" of his dory close to his anchor, and thus occasionally catching a fish or two when the anchor was pulled in. In 1843 he was in the habit of setting a regular trawl-line 60 fathoms long, with snoods of 4 or 5 feet fastened to it at intervals of 4 or 5 fathoms. According to Capt. Sylvanus Smith, of Gloucester, the dory-fishermen of Cape Ann were also accustomed to fasten two or three hooks to the "rode-lines" of their dories as early as 1839 or 1840, thus occasionally securing a halibut or two in addition to the fish taken on hand-lines. This method of putting hooks on the anchor line was for the express purpose of catching halibut (generally for home use at that period), which could commonly be more surely captured in that manner than by hand-lines, while it was usually desirable to avoid getting a halibut on the hand-lines, which might be broken, and considerable time and labor would, of course, be wasted in securing a fish of less value than cod. The accompanying sketch shows this method of halibut fishing.

Concerning the introduction of the trawl-line into the halibut fishery, which appears to have been nearly at the same time as the introduction of the trawl into the cod-fisheries of the United States, the following information has been obtained in interviews with Capt. Peter Sinclair, of Gloucester:

Captain Sinclair was born in Scotland, and, in his boyhood, engaged in the fisheries from his native place. There, he says, he learned to rig and handle a set-line, or, as it is known to American fishermen, a trawl. While still a young man he came to this country and engaged in the fisheries, sailing from Gloucester. In May, 1849, he was in command of the schooner Brant, of 30 tons, old measurement. He concluded to try trawl fishing as he had seen it done in the "old country." He therefore rigged a small halibut trawl, having only thirty-seven hooks, and set it for the first time a short distance outside of Kettle Island, just off the mouth of Gloucester Harbor, in 7 fathoms of water. Five halibut were caught on the first set. Captain Sinclair continued fishing on the shore grounds of Massachusetts Bay and vicinity during the summer, and, he says, it was a common occurrence to catch halibut any day during the month of May.

Mr. Samuel Atwood, of Provincetown, who was one of the crew of the Brant in the spring of 1849,* conceived the idea that trawls could be profitably employed on George's Bank, and, according to Captain Sinclair, he shipped in the schooner Grace Darling the following year, making an agreement with the skipper that he (Atwood) should have the privilege of using a trawl while on

*This was probably 1850, a year later than Captain Sinclair has put it, for according to his statement Atwood was lost two years later in the Golden Fleece which foundered in 1852. This gives us a point from which to reckon.

the bank. Atwood went two trips in the Grace Darling, setting his trawl when the weather was suitable, and fishing with a hand-line at other times. He did well, making twice as much money as his shipmates.

The good success of Atwood stimulated others to try trawling, and the following spring three of the fleet, one of which was the Grace Darling, fitted out with trawls. These were employed in the same manner as Atwood had used his, being set only in fine weather, while hand-lines were depended on when it was rough or stormy.

In February, 1852, Atwood sailed in the schooner Golden Fleece, taking with him a trawl and dory of his own. His intention was to stay on George's all the spring, changing with his boat and trawl from one vessel to another as fast as they were filled with fish and left the bank for home. This daring and enterprising project was never carried out, for soon after the Golden Fleece reached the bank she encountered a furious gale in which she was lost with all on board.

On the same day that the Golden Fleece sailed on her ill-fated trip the schooner Anna, commanded by Captain Sinclair, also started for George's, having on board two dories and two halibut trawls. Each of the trawls had 100 hooks, placed, as now, 15 feet apart on the ground line. These were managed in the same way as has already been described, being set only while the weather was moderate. The fishermen of that period, according to Captain Sinclair, were not inclined to run much risk in dories, and, compared with the trawlers of the present day, might be called timid about venturing out in rough weather. Nevertheless, a much larger number of halibut were caught on the trawls than on the hand-lines.

In May of the same year the Anna made a trip to the Seal Island Ground for halibut, carrying three trawls and three dories; the trawls were double the size of those used on George's. She was absent from home two weeks and caught a fare of 15,000 pounds of halibut, taking them on a spot of ground about 3 miles northeast of the Lurcher Ledge, which lies off the western part of Nova Scotia. At that time the trawls were stowed in tubs made of flour barrels sawed off above the upper quarter hoops. Later, however, some of the halibut fishermen adopted another method. When they wished to bait their trawls they hoisted the dories, trawls and all, on deck. They then proceeded to bait the gear, coiling the lines in the boat, and when everything was ready the dories were hoisted out again. As may readily be supposed, this way of handling the boats and gear necessitated a vast deal of hard work, and was never practiced to any great extent.

To go back to the Anna again: We are told by Captain Sinclair that, after the trip mentioned above, she went to the Western Bank in June. She brought home 25,000 pounds of halibut, besides a considerable quantity of codfish. She was absent three weeks. This fare of fish was caught on two spots of ground, one of which bears west southwest a distance of 35 miles, and the other northwest 40 to 45 miles from Sable Island. The depth of water in the latter place was 40 fathoms. The halibut were of large size, and mostly gray. That year, says Captain Sinclair, there were five New London halibut schooners on the Western Bank. He can remember the name of only one of these, the R. B. Colman.

This statement seems to conflict with that of Captain Ashby, of New London, who says that the Connecticut vessels did not visit the Western Bank until a much later date.

The following year, 1853, there were three schooners from Gloucester and ten from New London engaged in the fresh-halibut fishery on the Western Bank. Captain Sinclair claims to be the first Gloucester fisherman to visit the Western Bank in pursuit of fresh halibut, though several other skippers also make the same claim. There is no doubt of the sincerity of all these men, and the only reason that can be assigned for so many claiming the same thing is that no one of them knew about the others' going. The second year Captain Sinclair went there he began to fish off the

northeast bar of Sable Island; anchoring in 60 to 90 fathoms on both sides of the bar. He usually went there in June for several years, but, at that time, it was thought to be exceedingly hard and difficult to use trawls in such deep water. Notwithstanding the fact that good catches of halibut were generally obtained, the crews were dissatisfied with the locality as a fishing ground. Patent line-rollers had not come into general use then, and hauling a trawl across the gunwale of a dory, even in a depth of 90 fathoms, was a difficult task, involving much hard labor and fatigue.

CARE OF THE FISH.—As to the care of the fish at that time, we are told that the same methods were employed as at present, though the work was not performed with so much skill and quickness. A few years earlier, however, the process was quite different. Captain Sinclair remembers that as late as 1845–'46 many of the George's halibut schooners (such as were not well smacks) had no platform over their ballast, but were provided with ring-bolts and spikes, which were fastened alongside of the vessel's hold just under deck, these being so arranged for the purpose of "hanging up" the halibut. The fish were suspended by their tails to the spikes and bolts, but in case more were caught than could be hung up, the remainder were thrown on the ballast. In the latter case many of the halibut came out in bad condition. Those which lay next to the rough stone ballast would, of course, have the stones pressed into their under sides, and, if kept in the hold a few days, they had a bad appearance by the time they reached the market. This method was soon followed by the introduction of ice-houses, which quickly superseded all other expedients for the preservation of halibut. The first ice-house that Captain Sinclair knew of being built in a fishing schooner was one which was made on the William Wallace, Capt. James Pattillo, in the spring of 1846. This had double bulkheads, separated 2 or 3 inches, the cavity between them being filled with tan-bark.

Other parties agree in placing the introduction of the ice-house on fishing schooners at an earlier date, and giving the credit of the invention, or rather the conception of the idea, to Capt. George Blatchford.

Among others, Capt. William Pulcifer, of Gloucester, states that the first ice-house used on a Gloucester vessel was built in the pinkey Laurel, of which Capt. George Blatchford was master. This ice-house consisted of a platform over the ballast, and three "shifting planks" running fore and aft in the hold, one of these being in the center and one on each side. A small amount of ice was carried. This was not broken up and put on the fish as at present, but was simply carried to keep the ice-house and fish cool. The fishermen did not at that time know that halibut would keep longer by putting ice in and among them, but thought it would injure instead of preserving the fish.

Captain Marr also remembers that the Laurel was the first Gloucester vessel to have an ice-house. He tells us that the first ice-house he had himself was in the schooner Emblem. This was built forward of the mainmast, was only 14 feet long, and had no divisions other than those made by the shifting planks; pens were not built in the ice-houses until they had been used two or three years. At first Captain Marr carried only about 1,400 pounds of ice. He agrees with Captain Pulcifer in the statement that at first ice was carried solely for the purpose of cooling the ice-house, the impression being general among the fishermen that no good purpose could be gained by putting it among the fish. Captain Marr says: "We put the ice in one corner of the ice-house, away from where the fish were stowed."

In regard to the smacks that were used just previous to the introduction of ice-houses, Captain Marr says: "We used to build our wells about 4 feet deep, extending from just forward of the main hatch nearly to the mainmast. The keelson and ceiling were taken out and about three hundred holes bored in the bottom of the vessel. These wells would hold from 16,000 to 18,000 pounds

of live halibut, if the weather was cold, but not more than half that amount could be kept alive in warm weather."

THE BAIT USED IN THE EARLY HALIBUT FISHERY.—In regard to the bait used by the George's-men and halibut trawlers we have obtained the following statements: "Capt. Ben. Rumby," says Sinclair, "was the first to carry pogie bait in ice to George's Bank. This was in 1847. He bought 1,000 of these fish (an amount then considered a large baiting) from two boats, each of which had one net 14 fathoms long. I and William Gardner were in one of the boats which caught and sold the pogies, and William Rowe and his young son in the other."

Captain Sinclair, while in the schooner Anna, usually carried several pogie gill-nets as part of the outfit in summer. When starting out on a summer trip he would, with these nets, "sweep" pogies for bait, rarely failing to get a full supply either off Cape Ann or along the coast of Maine. For a halibut trip he generally carried about 7,000 pogies in number, and, while using them for bait, caught nearly equal quantities of cod and halibut.

HALIBUT AT SAN FRANCISCO.—The following record of an attempt to prosecute the fresh-halibut fisheries from that port was clipped from a San Francisco paper:

"When the large and abundant supply of this fish is considered, it is a matter of wonder that so small a quantity is smoked or canned for market. There is a prejudice in favor of Eastern halibut, which doubtless to some extent hinders the development of this branch of business. The North Pacific Canning Company can some halibut at Klawack, Prince of Wales Island, and it is said to be of good quality.

"The endeavor to bring fresh halibut to San Francisco from Puget Sound does not appear to have been financially successful. A schooner load suddenly brought into market already fully stocked with fish caused the price to fall to about ten cents per pound, and much of it could not be disposed of at that price."

The Gloucester Telegraph of July 30, 1853, says: "Halibut, in California, is just double the price of salmon—a pound of the sea fish exchanging for two pounds of the river fish. Halibut in the San Francisco market are brought from the Russian settlements, and are similar to those on our coast."

RECOLLECTIONS OF CAPTAIN MARKUSON.—The following statements of Capt. Knud M. Markuson, a veteran halibut fisherman, contain many facts interesting in this connection:

"I began halibut fishing," he says, "in 1861, at which time I was in command of the schooner Silver Spring. I followed the fishery continuously in summer until 1864. I used to go to George's for cod in the winter, but in the spring we would fit out for halibut trawling, and go to La Have Bank, Brown's Bank, or the Seal Island Ground. In 1861 we carried only three dories; the trawls had only 150 hooks each, these being placed 3 fathoms apart on the ground line. We used to catch an average of about 15,000 pounds of halibut each trip, which was considered a good take for the times.

"During the seasons of 1865, '66, and '67 I did not engage in the halibut fishery. In 1868 I took command of the new schooner Notice and went on a halibut trip to Saint Peter's Bank. The schooners Scotland, Isaac Patch, James G. Tarr, and several others had fished for halibut the previous year on Saint Peter's Bank, generally on the northern part, and had met with great success.

"I succeeded in discovering a new halibut fishing ground on the southeast end of Saint Peter's Bank, where fish were generally abundant. This particular locality has somewhat less depth than the other portions of the Bank immediately surrounding it, and is known among the fishermen as the 'Southern Shoal Water.' [This locality is of comparatively small extent, being a ridge about 20 miles long. The bottom is chiefly composed of coarse sand, gravel, and pebbles, among which

are more or less rocks, covered with reddish bryozoans. On most parts of this bank the bottom is generally rocky, the stones being invariably covered, to a greater or less extent, with bryozoans.]

"For four years I used to visit Saint Peter's bank regularly, usually going there between May and September of each year. During this period (1868 to 1872) I generally made three trips to the Shoal Water each season, and one summer I made five trips. Occasionally it would take some time for us to search out the position of the halibut, but when we once found a school of fish we had no difficulty in getting a fare, and rarely fished longer than a week. We averaged about 30,000 pounds of halibut to each trip, though, of course, there was considerable variation in the amount taken on different voyages. We carried twelve men, all told, including myself, and five dories; had three hundred hooks to a trawl.

"During the four seasons I have spoken of no other halibut catchers learned of the abundance of fish on the 'Southern Shoal Water,' or at least did not discover it until 1872. I therefore practically had had the field to myself during this time, and did exceedingly well. After the ground was found out by others, and the halibut fleet began to go there, the schools of fish were soon broken up. One season's fishing reduced the halibut from abundance to such scarcity that the 'Shoal Water' rarely afterwards proved a profitable fishing ground.

"In the meantime I generally used to fish on La Have Bank and the Western Bank in the winter, and commonly made a trip or two each fall to the 'Eastern Shoal Water' of the Grand Bank. In the summer of 1868 I made my first halibut trip to the Magdalen Islands. I made two trips each summer, for that and the two succeeding years, generally visiting the islands in July and August. I went there the fourth summer (1872), but could catch no halibut, or, at best, so few I was compelled to go elsewhere for fish. During the first three years I fished chiefly around Byron Island and on the shoal between Byron Island and the Bird Rocks, the depths varying from 14 to 24 fathoms. The halibut we caught there were nearly all white fish, and as we obtained fares ranging from 25,000 to 35,000 pounds, we made profitable trips."

As will be seen by a perusal of the notes which follow, the grounds visited by Captain Markuson from 1868 to 1872, namely, La Have Bank, Western Bank, the "Eastern Shoal Water" of the Grand Bank, and the grounds around the Magdalen Islands, soon became exhausted, and in place of halibut being in great abundance in those localities, they are now so extremely scarce that their occurrence, even in limited numbers, is looked upon as rather a remarkable event.

11. HISTORICAL NOTES AND INCIDENTS OF THE FRESH-HALIBUT FISHERY.*

By J. W. Collins.

This chapter is based upon observations made in the course of several years' experience in the Gloucester halibut fishery. I have necessarily been obliged to refer to my personal experiences, and this part of it should be read in connection with the appended logs of two actual voyages made in the years 1878 and 1879, which have been selected to show the difficulties which often are met with on a halibut trip, and which frequently prevent its successful issue. While the list of "big trips" which has been given will show one side of the business, these notes are intended not only to give an idea of the reverse, but to enable the reader to comprehend under what difficult conditions this fishery is generally conducted in winter.

I shall endeavor to give as briefly as possible an outline history of the halibut fishery (so far as I can do so from personal recollections and interviews with fishermen and skippers) since vessels first went to the Grand Bank for fresh halibut. It is my opinion that halibut are being reduced in numbers

* All the vessels mentioned in these notes and in the logs of two trips which follow, belong to Gloucester, unless it is otherwise stated.

very fast, and if the present style of fishing is pursued will in a few years become extremely scarce, if not almost extinct. Of course, in the present stage of investigation there may be a doubt whether *the fish are driven from their old haunts by the fishing-gear, or whether their abundance is so far* affected by overfishing as to offer no inducement to fishermen to resort to the "old grounds" in pursuit of them. I incline to the opinion that both causes have their influence, but I think that the latter has emphatically the greater. The inshore grounds, George's Bank, Brown's Bank, Seal Island Ground, La Have, and Western Bank having been fished over, about in the order named, and the halibut on them reduced from plenty to comparative scarcity, the fishermen, who were not then acquainted with the deep-water fisheries, had to resort to other fishing grounds. In the mean time Capt. John McKenzie made a successful trip to Scatari. His vessel lay in Menadon Harbor, and he set his trawls in the narrow strait that divides Scatari Island from the mainland. *In this manner he obtained about 60,000 pounds of halibut. This trip I have not the exact date* of, but think it was in July, 1861. Since that time there have been a few fares taken in the summer at Flint Island and about Scatari, but as the appearance of halibut in that locality is somewhat uncertain, it has never been a favorite fishing ground for large numbers of vessels. Many of the fishermen doubted the practicability of bringing fresh halibut from the Grand Bank in good condition, even after they were aware that those fish could be obtained there in large quantities. To Capt. George Miner, of the schooner Hattie M. Lyons, belongs the honor of being the pioneer of the fresh-halibut fisheries to the Grand Bank.*

At first the vessels resorted to the "Eastern Shoal Water," between the parallels of 44° and 45° N. latitude and the meridians of 49° 30′ to 50° 30′ W. longitude, where they found halibut in large numbers, but after one or two years' fishing in this locality there was a marked decrease in the abundance of these fish, in some cases amounting even to extreme scarcity, and the result was that the fishermen were obliged to seek for new fields. Some new grounds were found by accident or, at least, their discovery was owing to peculiar circumstances, in which there was a certain amount of chance, while the finding of others was due solely to the enterprise of the fishermen. *Among the latter were Saint Peter's Bank, Miquelon Beach, and Pass Island, in* Fortune Bay, Newfoundland. Halibut were never, to my knowledge, found on Saint Peter's Bank so numerous as at many other places, but as they were of superior quality and the fisheries on that bank held out better than on many others, it was resorted to for several years, but finally had to succumb to the fate of other fishing grounds. Halibut followed the capelin in on Miquelon Beach about the 1st of June, and at first were found there in immense numbers close to the shore, and in water so shallow that frequently they could be seen biting the hooks. On one occasion, in 1868, the schooner William T. Merchant, Capt. Nelson A. McKenney, of Gloucester, caught 40,000 pounds there at one set of her trawls. She got a full fare (103,450 pounds of halibut) in a few days, and several other vessels, among which was the Carrie S. Dagle, met with good success. Halibut were not nearly so plenty at the Beach the next summer, and after the second season it has not been profitable to fish there, although occasionally a vessel has got one or two fair catches,

* *First fresh-halibut trip from the Grand Bank; the biggest trip yet.*—We have recorded some pretty big trips the present season, but the schooner Hattie M. Lyons, Capt. George Miner, which arrived from the Grand Bank on Tuesday, eclipses all others in this respect. She was absent but four weeks, and brought in about 75,000 pounds of halibut and 6,000 weight of codfish, and will stock some $4,600. The crew will make from $175 to $200 apiece. The fish were caught on the eastern part of the Bank, and are the first fresh halibut ever brought from that locality. She was a fortnight on her outward passage, and was but five days catching the trip. The Hattie M. Lyons is owned by D. C. Babson & Co. and Captain Miner, who has the honor of making the biggest trip ever brought into this port.—(Cape Ann Advertiser, June 15, 1866.)

The gross stock of the H. M. Lyons, whose arrival we reported last week, was $3,624.—(Cape Ann Advertiser, June 22, 1866.)

but I have never known of one getting a full fare in the locality. In the early part of the summer of 1879 the Alice M. Williams caught nearly 10,000 pounds of halibut at one set on the Beach, but afterwards could get only a few, and was obliged to leave Miquelon and go elsewhere.

The fishing ground off Pass Island was about 8 miles southwest and southwest-by-west from the island, in 100 fathoms. It was only a small "spot," not more than 2 or 3 miles in extent each way, if so large. After two seasons this also was worthless as a halibut fishing ground; though frequently visited since, I have never heard of a large catch being made there.

I will return to the Grand Bank and show what I think was, in a measure, the accidental discovery of new fishing grounds. From the first it had been the general way for the halibut fishermen to run direct for the Eastern Shoal Water, never dreaming that they were passing over much better grounds than any they had ever yet fished on. In March of 1870 the schooner C. B. Manning, Capt. Charles Nute, the schooner N. H. Phillips, Capt. William McDonald, and the schooner John Corliss, Capt. George Brown, all left Gloucester at or about the same time. I have positive information that the two former were in company. These vessels had a fine run down as far as the western edge of the Grand Bank, striking it north of 44° N. latitude. About the time they reached the western edge of the Bank the wind sprang up easterly and blew heavy. Captain McDonald, whose vessel was new and the cable stiff and wiry, thought he would anchor and get the kinks out of it, so that it would be in working order when there was a return of fine weather. He was in 60 fathoms, and had not the remotest idea, it is said, of finding halibut in that depth of water, but after the vessel was anchored, and while some of the men were straddling the cable, &c., one of the crew threw out a hand-line and caught a pair of halibut. The rough weather lasted two days, but after it was over a fare was soon caught. Captain Brown, in the Corliss, anchored in about 50 fathoms on the western edge of the Bank to hold on until the easterly was over. After the gale moderated, the trawls were set to get some bait and "try the ground." On the first set only 4,000 pounds of halibut were caught, which was then thought to be poor fishing, but the skipper determined to set again, although some of the crew opposed it. On the second set between 45,000 and 50,000 pounds of fish were taken, and it was nearly two days' work to haul the trawls and dress the halibut caught on them. On the third set the majority of the fish were gone, so that not more than 3,000 pounds were taken. Captain Brown then started for home, realizing about $4,000 from the sale of the fish. The facts of the catch were obtained from Captain Brown, who is now dead. The schooners N. H. Phillips and John Corliss both got in about the same time and stocked nearly the same amount. The C. B. Manning, instead of anchoring as the other vessels did, kept on and carried sail to get to the eastward. She tried over the old grounds, but when she had been from home three weeks she had only 5,000 pounds of halibut, and taking a heavy gale about this time her dories were stove, and the prospect for a successful trip looked discouraging. However, the dories having been repaired as well as the circumstances permitted, the vessel worked to the westward and struck halibut on the western part of the Bank in about 51° 20′ W. longitude and 44° 10′ N. latitude (my informant, one of her crew that spring, thinks the above is the right position, and probably he is correct), and soon made up a fare of 86,000 pounds. After the first two seasons fishing for halibut on the western part of the Bank, these fish, though plenty in the winter and spring, grew scarce in summer, but in the fall good trips were got for several years on the Eastern Shoal Water. The scarcity of halibut on the Grand Bank in summer obliged the fishermen to look elsewhere, and as they knew very well that these fish were more or less migratory, but did not know that the species went into deep water, many places were visited where, in former years, halibut had been reported plenty by people who had caught them while in pursuit of other fish. In this manner the west coast of

Newfoundland, the southern coast of Labrador, island of Anticosti, Magdalen Islands, Virgin Rocks on the Grand Bank, and other localities heretofore mentioned, were visited. More or less halibut were found at all these places. Captain Johnson, in the schooner Ocean Belle (now in the Augusta H. Johnson), caught a fare in the bay of Saint George, and another of 70,000 pounds at Red Island, on the west coast of Newfoundland. Only a few fares have been caught at the Magdalen Islands, and those were mostly taken on the shoal between the Bird Rocks and Byron Island. Captain Markuson, in the schooner Notice, got the best fare there that I have heard of; he had about 40,000 pounds. The date of this trip was about 1869. The halibut were pursued with more or less success on the shores of Newfoundland, Labrador, and Anticosti in summer, until 1875, when the deep-water fisheries being discovered, and several vessels making unsuccessful trips on the northern coasts, the fishermen became convinced that the schools were broken up, and those fisheries were abandoned until last year, 1878, when the schooner Chester R. Lawrence got two good fares, 80,000 pounds the first and 60,000 pounds the second, and the schooner G. P. Whitman, one trip of 80,000 pounds, at Green Point, about 10 miles northerly from Bonne Bay, northwest coast of Newfoundland. In the spring of 1861, while on a "salt trip" to Cape North, Cape Breton Island, we found halibut plenty 10 miles northerly from the Cape in 75 to 90 fathoms, but since then the catch in that region has been small, and recently it is a rare occurrence to get halibut there. I have never known of a full fare of fresh halibut being taken there, though it is possible such may have been the case. My brother, Capt. D. E. Collins, was there codfishing in the spring of 1877 and 1878, and he tells me that he got very few halibut. Meanwhile, as early as 1869 or 1870, if not earlier, some of the halibut catchers resorted to the Gully between Banquereau and Sable Island, generally about the first of April, and many good fares were taken there. But as the fishermen seldom, if ever, ventured beyond a depth of 70 fathoms, they generally "lost the run of the fish" after May.

Captain Nute, in the C. B. Manning, was probably the first to visit the Virgin Rocks on a "fresh trip," going there about the 1st of July, 1870. He caught a fare of 83,000 pounds in a week on the westerly side of the "main shoal." These fish, as well as those which visit Miquelon Beach, Newfoundland, and other northern coasts, were in pursuit of capelin, which at that season are abundant about the Virgin Rocks, and which is a favorite food for both halibut and cod. The schooners Frank Butler, N. H. Phillips, and Eastern Queen all obtained good fares there after the Manning left for home. The Manning got another fare of 46,000 pounds at the Rocks in August; but when the Eastern Queen went there on her return to the Bank, about the last of August, the fish had left, or were broken up, and she was obliged to go farther south, and then secured only a small fare. In 1871 I was in the Alice G. Wonson, and about the 20th of June we baited in Fortune Bay, after which we tried off Pass Island, in company with the schooner Lizzie A. Tarr, at Miquelon Beach, with a fleet of six or seven other vessels, and also on the northern part of Saint Peter's Bank. At all of these places we found halibut very scarce, notwithstanding that they had been abundant in these localities one or two years earlier. Failing to catch fish enough to warrant our going home, we returned to Fortune Bay, and baited the second time on July 4. As soon as we got our bait we proceeded direct to the Virgin Rocks, arriving there about the 6th or 7th of July. The schooners Mary G. Dennis, Capt. Randall McDonald, and Varuna, Capt. B. A. Williams, arrived there one or two days previous. They caught a few halibut on their first sets, but the school was soon broken up, and by the time we arrived at the Rocks fish were so scarce that, after making a thorough trial, all of the vessels left and proceeded farther south. Thus ended the halibut fishing at the Virgin Rocks, for none of any amount have been taken there since.

For several years that part of the Grand Bank between 44° and 44° 40′ N. latitude, and 51° and 51° 30′ W. longitude, was a favorite resort for halibut catchers. At first, as has been stated, the halibut were found abundant all the season, but after a few years they could be caught in large numbers only in winter and spring, when migrating across the Bank from east to west. On this ground Capt. William Thompson, in the Mary Carlisle, in March of 1871, caught the trip which gave the largest share to each one of the crew that has ever been made in the fresh-halibut business. The schooner White Fawn caught a fare of 44,000 pounds a few days later (starting from home March 31) in 43° 30′ N. latitude and 50° 30′ W. longitude.

The vessels continued to fish on the Western Bank and Grand Bank in winter and spring, changing to Saint Peter's Bank and the inshore ground about Newfoundland, Labrador, and Anticosti in summer, and back to the Grand Bank in autumn, until 1875, when the deep-water fisheries along the borders of the outer banks became for the first time generally understood by the fishermen. In April of 1874 the schooner G. G. Kidder caught a good fare in 90 fathoms, about 44° 30′ N. latitude, on the western edge of the Grand Bank. The schooner Sarah H. Cressy was fishing near her on a flitching trip, and found halibut very plenty for a few days; but when they grew scarce, the vessels were not prepared with sufficient cable to follow the fish into deeper water, even had it been known they were there, which may be doubted, for it was generally believed then that when halibut passed beyond a certain depth they left the Bank.

I went on a fresh-halibut trip to the Grand Bank in the schooner Ocean Belle in March, 1864, while the Howard was building. On that occasion we caught our trip of 55,000 pounds from 44° 08′ to 44° 16′ N. latitude and from 51° 10′ to 51° 20′ W. longitude. We were absent from home four weeks, and each man shared within a few cents of $100.

In the latter part of January, 1875, while in the Howard, I caught a good fare, for the season, on the same ground. The weather was very boisterous while we were on the Bank and on our passage home. A large part of our fare was caught by setting and hauling trawls at night. We were seventeen days on the home passage, which was the longest, hardest, and most fatiguing I ever made. We encountered on our way home a succession of westerly gales, which, with the severe cold of that winter, made it extremely difficult to get to the westward. As an instance of the great severity of the weather, it is only necessary to say that a first-class Beverly vessel, the schooner Sarah H. Putnam, which went to the Grand Bank that winter on a "fresh trip," was forty-two days making the passage home. That is the only instance of a Beverly vessel being engaged in the fresh-halibut fishery of which I have any knowledge, and she made only one trip. We were detained from sailing on our second cruise that winter by easterly winds for two weeks or more, and when we reached the Grand Bank, about the 15th of March, the whole of it to the northward of 44° 25′ N. latitude was covered with heavy masses of field-ice.

Two or three weeks previous to our arrival on the Bank halibut were very plenty in latitude 44° 20′ to 44° 25′, in 50 to 55 fathoms on the western part of the Bank. They were moving quite fast to the westward, but nevertheless a number of the vessels got large fares in a very few days. When we arrived in this locality the fish had left, probably being driven by the ice-floes which slowly drifted to the southward, reaching at one time as far south as latitude 43° 40′, in the middle of the Bank, and causing the fishermen much anxiety and more or less loss of gear by unexpectedly drifting on their vessels in the night. On one occasion a number of vessels tried to skirt the ice and get around it so as to reach the northwest part of the Bank, but toward night of the day on which the attempt was made a northeast gale and heavy snow-storm came on, and we all lay to under the lee of the ice, which made the sea very smooth. The next day we found the floe had been driven so far south by the gale that we did not again attempt to get by to the northwest of

it, but a little fleet of eight vessels having met together at the southern edge of the ice, all of the skippers went on board of the schooner Augusta H. Johnson to talk over the situation. After deliberating a while, each returned to his own vessel, and while some of us ran to the southward others lay by waiting for the ice to recede to the northward. Just after this, the schooner Noonday, which was one of the fleet referred to, caught 30,000 pounds of halibut in 60 fathoms of water on the western edge of the Bank in latitude 43° 40′. The ice did not drift so far south on the western edge as in the middle of the Bank, and she was not troubled by it. After the consultation referred to above, we ran down to latitude 43° 30′ N. and longitude 50° 30′ W., but could find no fish. We were there some days before the weather permitted us to try, and after we hauled our gear and found no fish on it we got under way, with a southerly wind, and ran for the western edge of the Bank, intending to strike it north of latitude 44° N. A careful lookout for ice was kept. That evening we spoke the schooner Edwin C. Dolliver, at anchor in 70 fathoms, and lay by her for the night. The next morning we made sail, spoke the Dolliver again, and also the schooners Chester R. Lawrence and Restless. The first two were lying at anchor in 60 to 70 fathoms of water and the Restless lay in 49 fathoms. Neither of them caught any halibut.

The ice, driven by the southerly wind, had at this time drifted back to about 45° N. latitude, and we worked to the westward, in company with several other schooners, among which were the Restless, Edwin C. Dolliver, Alfred Walen, N. H. Phillips, and John S. Presson, all of them setting trawls under sail in the day and anchoring and setting their gear at night. In this manner the fleet beat slowly to the westward against a moderate breeze for several days, trying for halibut in water varying from 48 to 70 fathoms in depth, but catching nothing. The water was so intensely cold that the frozen baits on the trawls would scarcely thaw when set in 50 fathoms of water, or less, and we were almost compelled to believe that the fish had been driven entirely off the Bank by the great ice-field and straggling icebergs. The latter were occasionally seen in the deep water off the edge of the Bank.

One day we passed by a large berg, about one-third of a mile distant from us. On one end of it a sharp pinnacle, resembling the spire of a church, ran up to a height of 75 or 80 feet; the middle was quite low, but the other end rose in a bunch or hummock about 20 feet above the water. The sunlight, playing on this huge mass of ice, throwing lights and shadows here and there, causing the peaks to glitter and gleam for a moment, then darken to a greenish tint, and its constantly changing aspect, as we sailed by it, made it an interesting and impressive sight. But the thought that it or some of its fellows might drive down on us some foggy and windy night, when we were at anchor, caused us to look upon it with a sense of dread and apprehension instead of the admiration we might have felt in watching such an object under different circumstances.

On the last day of March we all set our trawls as usual—some of the vessels being at anchor and others under sail—but no fish were caught by any of the fleet, and before dark all of the schooners which had been at anchor got under way. The wind was north-northeast, blowing a fresh breeze, and knowing the ice was not far off in a northerly direction no one would have cared to remain anchored, even had there been greater inducement to do so. We were then on nearly the extreme northwest peak of the Grand Bank, and the question was where to go next, for I do not think it occurred to any one then to try in deeper water than we had previously set in. The schooner Edwin C. Dolliver went back to the eastward again, but others of the fleet lay by speaking with each other, the skippers evidently uncertain in what direction to steer.

Having spoken the schooner Carrie P. Morton, which came driving along from the eastward just at dark, and learned that no fish had been caught by the vessels farther east, I decided to "hold our ground" till morning. We accordingly hove to alongside of the Alfred Walen, which

was also lying to. As day broke on the following morning we saw a schooner at anchor and ran down to her in company with the Walen. Finding the anchored vessel was the Restless, we hove to, and Captain Thompson (from the Walen) and I, each of us accompanied by three or four men of our respective crews, went aboard of the Restless for a chat with the skipper and crew. She was anchored in 83 fathoms of water, and her crew were just setting their trawls when we ran down to her. The skipper of the Restless said he broke out his anchor the evening before and let his vessel drift until the latter part of the night, when, finding deep water, he let it go again. We stayed on board of the Restless until some of her dories returned from hauling, about 10 a. m., when, seeing that they were getting fair fishing on the gear that was in the deepest water, we both returned to our own vessels and set under sail outside of the Restless.

We were in 115 fathoms, which was then thought to be a great depth to fish in, but the Walen went still farther out, in 135 fathoms. We caught about 4,000 pounds of halibut on a short set, and anchored; and the Walen, as I afterward learned, got 8,000 pounds or more, and also came to anchor. In the mean time the schooners John S. Presson, William T. Merchant, Lizzie K. Clark, of Gloucester, and the George Peabody, of Salem, made their appearance on the scene of action, and anchored at no great distance to the northwest and southeast of us. The Lizzie K. Clark anchored a fair berth, about 2 miles, to the north-northwest. The afternoon was fine, with a moderate and decreasing northeast wind, and current setting to the northwest or north-northwest. Knowing full well that the first vessel arriving home with a fare of halibut would be likely to strike a "high market," and, of course, wishing to be first, we set twenty skates of trawl, the whole string, in the evening, not for a moment suspecting that there was any ice in a southerly direction from us.

The next morning was fine and calm, but cool. We had our breakfast before daylight, and just as day was breaking an "ice glim" was noticed in the southern board; and when it grew lighter an immense field of ice could be seen drifting toward us with the current, which still ran north-northwest. Of course, the first thing to be thought of was to get our gear, if possible, or, at least, as much of it as we could. We hoisted the dories out and started at once. One of the crew, who had a fainting fit the evening before, was very ill, and I was therefore obliged to go in a dory in his stead. Before leaving the vessel I gave the men orders to get all the gear they could, and if the ice came on them to cut and go aboard. The trawl that we went to haul was off the starboard quarter, four points abaft the beam. We pulled for the outer end, and on reaching it began to haul as though our lives depended on our efforts.

We succeeded in getting a skate and a half of our trawl, about 500 fathoms, in the boat, when we saw the flag in the rigging of our schooner, which we knew to be a signal for us to return to the vessel, as the ice was nearing her fast. We instantly cut the trawl, put out our oars, and pulled with all our might to reach the vessel before the ice did. Another dory, which was near us, started about the same time, and we both met the ice about 600 feet astern of our schooner. When the ice passed the vessel the men on board had the presence of mind to throw a buoy, to which a line was fastened, on one of the leeward cakes of the floe. This buoy we got hold of and made it fast to the bow of the dory, securing the bow of the other boat close to the stern of the front one. The current was running at least 2 knots, and the buoy line being under the ice near the buoy, we had a hard struggle for some time to make any progress toward the vessel and to get the line on top of the ice. The men on the vessel held the line as taut as they dared to, not to risk parting it, while we jumped out of the head dory upon the ice, sometimes hauling the boats over the large cakes and again shoving the smaller pieces clear of the dories and line. The ice was broken into sections of all sizes, from a piece of a few pounds weight to one of 50 feet in

diameter and 6 to 10 feet thick. In this manner we worked, tugged, and pulled, never resting for a moment, until at last we had the line clear and above the ice, when it became a comparatively easy matter to reach the vessel.

After getting on deck we found one of the George Peabody's and one of the William T. Merchant's dories aboard of our vessel, while one of our own boats, which had held on to her trawl too long, had to seek a refuge on board of the Lizzie K. Clark. After our dories were taken in, we had a better chance to view the scene, which certainly had a decidedly arctic appearance. As far as the eye could extend from aloft, in a southern and eastern direction, an almost unbroken mass of drifting field ice was all that could be seen. Here and there, however, a small streak or pond of water added a little diversity to the otherwise monotonous appearance of the frozen ocean.

All of the forenoon and the first hours of the afternoon the ice kept drifting by us, being carried along with the current. But our anchor held fast, though the strain was great on our cable as the heavy masses of ice came up against the bows and went grinding, gritting, and groaning along the vessel's side. After a while a moderately sized open space was seen ahead, and as it approached us the men belonging to the Peabody and Merchant anxiously watched it, being very desirous to reach their respective vessels, which were not far off; in this they succeeded.

A moderate breeze sprang up in the afternoon and the Lizzie K. Clark, getting into one of the clear streaks, got underway and worked up abreast of us, when she forced her way through the ice, passing close alongside, dropping our dory, which came aboard.

Meanwhile we had hove short on our cable, and seeing an open place to windward, were all ready to break out our anchor as soon as the opening came near enough to us. We waited only a short time before we got under way, after which we stood back and forth along the weather edge of the ice, watching for the trawl buoys to make their appearance, and as fast as they did, sent a dory to haul the trawl.

This area of clear water was of considerable extent, and, since the current did not run so swiftly as before, we had a very good chance to work. However, the ice was down on us again before we got all the gear, but the men stuck to their work without flinching, and since there was a fine sailing breeze the vessel could force her way through the floe very well. It was nine o'clock in the evening when the last dory came aboard; the others had finished hauling their gear before dark. The ice was all around this boat during the evening, but we kept near her, though it required close calculation to keep track of her in the darkness. The men in her got the whole of their gear, and, notwithstanding the unfavorable appearance of things in the morning, we lost only one skate of trawl. When, at last, all hands were safe on board and we were seated at the supper table, the incidents and anxieties of the day became the subject of an animated conversation, and each one had a yarn to spin in relation to his experience during the day.

In the mean time the crews of the other vessels had not been idle; for, taking advantage of any favorable circumstances, they had endeavored, like ourselves, to haul their trawls. Three of the Alfred Walen's crew had a narrow escape from what promised much suffering if not death. The work was so difficult that the three men went in one boat. When the area of clear water, which I have before alluded to, came along they started out to get their trawl, the vessel still remaining at anchor. They were caught in the ice, and although they held on to the trawl, which was the only thing they could do, the floe carried them adrift, and their chances to reach their vessel again were looking slim, when, late in the afternoon, the Lizzie K. Clark spoke the Walen, and the skipper of the latter requested Captain Murphy, as his (Murphy's) vessel was under sail, to go to their assistance. The Clark immediately kept off, but as she had to force her way through the ice, it was just growing dark when she reached the drifting boat, and past 9 o'clock when she got

back to the Walen. The dory was nearly three miles from the Walen when picked up, and such a timely rescue must have been gratefully appreciated by men fatigued, hungry, and chilled to the marrow.

After the Clark reached the Walen she made fast to the stern of the latter with a long warp for the night; the only instance of one vessel lying fast to another on the Grand Bank I ever knew of, and I think the only one on record.

We kept under sail during the night succeeding the day of which I have been writing, and held our position by observing the riding lights of the other vessels. The following morning we anchored. We had foggy weather after this for the three days we staid there, which made trawling somewhat dangerous; for, although the main floe had passed by, detached pieces and long narrow streaks of ice kept coming along, and, oftentimes, when the dories were caught to leeward of these the men had great difficulty in working their way through or over them. Frequently the boats had to be hauled over the ice for a distance of one or two hundred yards. This trouble was increased by the denseness of the fog, which shut out from view all but the nearest objects, and the fisherman leaving the side of his vessel felt that the thick mist, which hung like a pall over the face of the sea, rendered his task more perilous and uncertain than ever before, hiding as it might a vast floe of ice which would carry him away with it to drift helplessly until he succumbed to cold and hunger. Fortunately, however, no more serious adventure occurred than that already mentioned, though the men comprising the crews of the entire fleet did not hesitate to brave the perils incident to the occasion.

All of the vessels secured good fares of halibut and some made large stocks. The rough experience of some of the fleet in the ice was apparent on their return home, when it could be seen that the planking at the water's edge was badly chafed and cut, in some cases necessitating repairs. The ground-lines of our trawls, being only 24 pounds to the dozen, were too small to stand the severe strain of this deep-water fishing, especially where so many vessels were lying close together, and setting their gear afoul of each other. We lost so much of our gear that, after fishing four days, we could not muster enough for a set, and, all things considered, I thought best to start for home with a fare of 22,000 pounds of halibut. As I had anticipated, few halibut had arrived in Gloucester for the two weeks previous, and for ours we got 8 and 14½ cents per pound for gray and white. The "hawkers" were so anxious to obtain our halibut that they came aboard while we were sailing into the harbor, and after our anchor was down they bid on the fish, the highest bidder taking the trip. We shared between $79 and $80 to each man.

We did not go after halibut any more that year; but the trip of which I have given such a long account may be said to have been the beginning of deep-water fishing for halibut, for it was the first time, to my knowledge, that fresh-halibut vessels tried in more than 90 fathoms, on the Banks. All of the spring and summer of 1875 halibut were found very plenty along the edge of the ground between Grand Bank and Green Bank in 60 to 200 fathoms. Capt. Nathaniel Greenleaf got 18,000 pounds from one set as late as October, but the fish were evidently moving fast, for when he set again they had left.

In January, 1876, I was again engaged in fresh-halibut fishing on the Grand Bank, and tried from 51° 35′ to 51° 5′ W. longitude and in about 44° 10′ to 44° 15′ N. latitude for the first week on the Bank; made several sets, but found few halibut, and finally started in company with the schooner Edwin C. Dolliver, Capt. Nathaniel Greenleaf, and worked southward to 43° 41′ N. latitude and 50° 52′ W. longitude. The wind was southeast and breezing up smart when we anchored and set our trawls, and the weather was so rough that they were out four days before we had a chance to get them. We lost two trawls and set again in hopes to recover them, but another gale

came on in a few hours and the gear was out that time three days before we could haul. In the mean time halibut struck, and were very abundant in the vicinity of the vessel. The afternoon before we hauled the trawls the second time, we caught 16 halibut on a "bull-tow"—a short section of trawl-line with a dozen to twenty hooks, which is set from the vessel's stern, left out for an hour or two and then hauled. There were few fish on the trawls, however, when we hauled them, for they had been out before the halibut came along, but on our next set we got 10,000 pounds and soon completed our fare, and went home.

We reached the Grand Bank on our second trip some time in the latter part of February, running on in latitude 44° 25′, where we found a number of halibut vessels that had been doing fairly well in 55 fathoms on the western edge. We made a set under sail when we first got on the Bank, in 55 fathoms of water, quite near some of the anchored vessels. When we set I saw a large floe of field ice to the north of us which was drifting to the southward, and before we hauled our gear was quite close. We did well on this set, and, as the wind had in the mean time changed to the southward, and the ice began to drift northerly, we anchored where the best fishing was, and set our gear out again. But when we hauled the lines, some three hours later, we got only 2 halibut, proving that the ice, or some other agency, made the fish move very suddenly. We now had several days of heavy weather, during which we shifted out into 90 fathoms of water. The next day after doing this it blew strong north-northeast so that we could not set any gear, but we ascertained by setting a "bull-tow" that there were plenty of halibut where we lay. The second day we lay there the wind was not so heavy, but the ice came down on us early in the morning. We lay still, however, and getting into a clear place, set four skates of trawl in four strings, but got no fish of any kind. By the time we had the trawls on board, the wind had changed and begun to breeze up from southeast. We got under way and beat down to about 44° 6′ N. latitude, where we anchored in 70 fathoms, and rode out the southeast gale, as well as one that followed it from the northwest. After the northwest wind began to moderate we got under way and worked to the southwest about two miles, where the schooner Chester R. Lawrence lay at anchor in 110 fathoms. Her men had just gone out to haul their trawls when we spoke her, so we lay by, jogging around, until I saw that her crew were getting good fishing on the deep-water side of the vessel. We gave her a berth on that side, anchoring in 142 fathoms, just at dark, and set our gear that night. We fished there four days, and got enough to make us up a fare of nearly 60,000 pounds of halibut. As there was a fleet of 8 or 10 vessels fishing in company with us I decided not to wait to catch a full fare, since we were liable to obtain more money for 60,000 pounds of halibut, if we arrived home first, than for a much larger amount if we reached port with the fleet. We therefore got under way for home in the night, notwithstanding it was nearly calm at the time. It was fortunate that we started when we did, for a gale that sprang up a day or two later drove many of the vessels adrift, and interfered with the successful issue of their voyages.

On our passage home we fell in with ice while running in a northeast gale, and our vessel was "sprawled out" by heavy seas twice in one day, being knocked down so that her sails were in the water, and the leeside completely buried. The night preceding the day on which we were knocked down we had a tussle with the ice, immense floes of which, in the spring of 1876, were driven by a succession of northerly winds nearly to the edge of the Gulf Stream. We were running under a double-reefed mainsail, whole foresail, and jib with the bonnet out—all the sail we could stagger under—when, a little after midnight, the watch shouted down the companion-way: "Hear the news there below! rouse out; here's ice close aboard!" It needed no second call to bring us out, for all realized the danger of meeting with ice while running at such a rate; for if the vessel should strike a heavy piece her bows would be crushed in like an egg shell. As for myself I hurried on deck in my

shirt-sleeves, and jumping into the rigging, climbed far enough above deck to get a good view, and clung there for nearly two hours, directing the wheelsman how to steer to avoid coming in contact either with the floe or straggling pieces of ice. The latter, which were of various sizes, were really the most dangerous, since they could not be seen so quickly. It was bright moonlight, however, which was much in our favor, and by taking in the foresail we reduced the speed of the vessel, so that we passed safely by hundreds of isolated pieces of ice, any one of which would have knocked in our vessel's bow had she struck it. With the wind blowing a northeast gale and sweeping down from such a vast body of ice as lay to windward, the air was keen and biting, as may be easily surmised, and when at last we had cleared all of the fine "lolly-ice," which strung out to leeward of the main floe, and the increasing motion of the vessel gave evidence of open water to windward, I crawled down out of the rigging, but was so thoroughly chilled that I could scarcely stand.

Since there was still possible danger of meeting more ice, and the wind had increased somewhat, I concluded not to set the foresail before daylight. When we cleared the ice we were nearly a hundred miles south of the latitude of Sable Island, and were therefore obliged to steer west-northwest, which brought us almost in the trough of the sea. Having warmed myself and ordered the watch to call me if there were any indications of ice or increase of wind, I turned in. The sea increased very much toward morning, and a little after daybreak we were tripped and knocked down. The mainboom went under nearly to the mast, parting the boom-tackle; one man in the forecastle was thrown from a weather into a lee bunk, and another, who was lying in a berth on the lee side, was scalded by the contents of the coffee-pot, which came tumbling on top of him from the stove on the opposite side. Altogether there was quite a mixing up of things; but almost before we had a chance to realize the situation, the vessel was back on her bottom and tearing along on her course again. Not caring, however, to repeat the performance if we could avoid it, we set a double-reefed foresail, took in the mainsail, and bent the riding-sail in its stead. Under this canvas we kept along on our course, though such was the danger of being knocked down again that I staid on deck all day directing the man at the wheel how to steer to escape the ugly cross-seas that very frequently came along. It was anything but pleasant, to be sure, to run a vessel under such circumstances, but nevertheless we kept her going, swinging off almost before it sometimes, and hauling to on our course again, or a little to windward of it, when a chance offered. In this way we went along safely until about sundown, when, being very hungry, I went below for a lunch, first giving the man at the wheel the order to "watch her sharp; swing her off quick if you see a bad one coming, and let her take it stern-to." I had scarcely seated myself on the weather side of the forecastle table, with a piece of bread in one hand and a mug of tea in the other, when the vessel was thrown completely on her beam ends. Dropping whatever I held, I sprang for the companion-way the instant I felt her going over. But the water, rushing over the top of the companion doors, met me as I gained the top of the steps, and as the vessel was at that time lying flat on her side, the prospect of her righting again before she filled looked rather dubious. There was a strong probability, too, that the man at the wheel had been washed overboard or injured, and if such was the case the vessel, should she right, would be in danger of broaching-to and having another sea sweep over her. Fortunately, as in the morning, she soon straightened up again, and I jumped out on deck and ran for the wheel. By the time I reached the main hatch, though it took scarcely an instant, the wind struck into the sails, and the vessel, starting ahead with a rush, drew herself out from beneath the water under which she was buried from the mainmast aft, and which went dashing and splashing out over the stern and both rails as she once more rose buoyant on top of the waves. So far under water had she been that the wheelsman (a six-footer) was entirely submerged when the vessel righted, though he stood on his feet, still retaining his grip of the wheel. The men

in the cabin were nearly smothered by the steam and gas which was driven from the cabin stove by a stream of water that ran down the stovepipe upon the burning coal. Barefooted, bareheaded, and panting for breath, they were glad to get out on top of the house where they could breathe the fresh air.

Although we had met with little or no damage from being "sprawled" out twice, it was, nevertheless, too unpleasant an experience for us to encounter again, so we hove to for a few hours until the moon rose, when, the sea having gone down somewhat, we started again on our course.

We struck the Grand Bank on our third trip that year in 44° 23′ N. latitude, where we found several vessels at anchor in 70 and 80 fathoms. They had been getting good fishing, but the halibut were growing scarcer when we arrived there. We had a couple of sets, but not meeting with much success ran to the northwest, near where we were the spring before. We made two sets in that locality, but did not strike halibut. We therefore ran back to the southeast one night to learn if the vessels were catching any fish along the western edge of the bank. The following morning we spoke two or three schooners lying at anchor, after which we had a set under sail. We caught only a few halibut, and when the dories were all aboard from hauling, the wind was blowing smart from the southward; we kept off and ran 60 or 70 miles northwesterly again, in company with several other vessels, to latitude 44° 56′, where we anchored in 80 fathoms at 9 o'clock in the evening. It was blowing a smart breeze, when we anchored, with a sharp choppy sea. Nevertheless, we hoisted out the top dories and set four skates of trawl, in two strings, to try the ground, although I did not expect to get any halibut, for I thought the bottom was too muddy.

The next morning it blew too hard to go out, but at 11 a. m. the wind moderated and the men went to haul their gear. Before the men in either one of the dories had hauled a skate of trawl they stuck up an oar for some one to come and take their fish.

We now had a busy time; some of us going to assist those who were hauling and others starting off to set the trawls which were baited. We had but five dories then, and could set only six more skates of gear, and on the ten skates of trawl, the four which we set at night and six in the day, we got 20,000 pounds of halibut. We were hauling and setting gear all the afternoon and evening. The last dory to come aboard arrived alongside with a load at 10 p. m., and it was several hours after midnight before we got the fish dressed and iced.

The halibut were moving slowly to the northward and westward, and we had to shift our position twice before we completed our fare.

We fished five days in that vicinity and got enough, with the 12,000 pounds we had before, to weigh off 92,000 pounds, besides 4,000 pounds of "logy," or thin halibut. The schooners Polar Wave, Carrie P. Morton, Davy Crockett, and Elisha Crowell, fresh fishermen, were in company, and the schooners Mary E., Ocean Belle, and Wachusett, on salt or flitching trips. All of them did remarkably well.

On our fourth trip we went to Green Bank, about 25 miles farther to the westward, where we got the last fish on the previous cruise, of which an account has been given. The fog was very dense for several days after we arrived on the Bank, which undoubtedly was the reason that we missed getting a good fare. We found few halibut, and I thought perhaps that they had not worked so far to the westward, but had staid where they did the year before. I also heard the sound of a vessel's cannon, fired as a signal for her dories, which I thought was to the eastward, but in that I was mistaken. There was no indication of the fog clearing, so we got under way and kept shifting to the eastward, trying the ground as we went.

When we were between Green Bank and Grand Bank, the schooner Hereward came along one

evening from the westward, and Nathaniel Greenleaf said that he had been farther in that direction than we had, between Saint Peter's and Green Bank, but got no fish, neither did he see any vessels. But as the weather had not at any time been clear enough to see more than three or four miles, he, like myself, missed seeing the vessels which, as I afterwards learned, were on a large school of halibut only a few miles farther to the westward than we had been. He ran to the south-southeast down to 44° 20′ north latitude, and in about 48 fathoms. We went the same way the following day, and cruised up and down the Bank, seeing several vessels in the same predicament as we were, seeking for halibut and getting few or none. Finding halibut very scarce, and intending to go after codfish on the next trip, I concluded to go home and not lose any time looking for them. We made a short trip and obtained only a small fare of 17,000 pounds. Some of the halibut catchers found good fishing that winter and spring (1876) on almost the extreme southern part of the Grand Bank, from about latitude 43° N. and longitude 50° 40′ W. up to latitude 43° 30′ N. and longitude 51° 52′ W. The best fishing in that region was during March and the first of April.

Late in the spring or early in the summer of the same year, Capt. Thomas F. Hodgdon, in the Lizzie K. Clark, got becalmed on the Southwest Prong of Banquereau. He sounded, and having got bottom in less than 100 fathoms, determined to anchor and have a set. He found halibut very abundant in that locality all summer and autumn, and continued to fish at or near the same place with uninterrupted success. After he had made a couple of successful cruises, however, other skippers found out where he got the halibut, and the remainder of the year that ground was the most generally resorted to of any. Excellent halibut fishing was also found that summer by Capt. Thomas Goodwin, in the schooner Polar Wave, to the southward of Sable Island, in 150 fathoms, and near the longitude of 60° W. Captain Anderson, in the schooner William T. Merchant (and who was lost in the great gale of December 9 and 10, 1876), caught some very fair trips to the eastward of Sable Island, in latitude 44° 4′ and longitude 59° 6′, on the fall-off of the Western Bank, in about 150 fathoms. Halibut were also found in deep water on the northeast part of George's Bank, and many of the hand-liners brought in good fares from that locality. One, I think, got 60,000 pounds. There were also a few good fares of halibut taken on the eastern part of Banquereau.

Previous to this, in 1875, and possibly the year before, Capt. Edward Morris, in the schooner Gertie Foster, got one or more good fares on some small ridges or "spots" off Liscomb, Nova Scotia. These grounds, which are about 20 or 25 miles from the land, are so small that they have never been generally resorted to for halibut, and, with the exception of two years at the most, the species has not been found abundant there.

After I returned from cod fishing, in the autumn of 1876, I went on a fresh-halibut trip. We tried at first in company with the schooners Augusta H. Johnson and Chester R. Lawrence, on the Western Bank, to the southward of Sable Island, in about longitude 60° 20′ W. We did not find enough fish to induce us to stay, and as soon as the weather, which was very rough, permitted us to do so, we ran to the eastward; the Johnson went with us as far as the Southwest Prong of Banquereau. We afterwards learned that the Chester R. Lawrence shifted a few miles farther to the eastward on the Western Bank, and found excellent fishing—much better than was obtained on Banquereau. We found the schooner Edward Grover on the prong when we got there, and before the weather was fine enough to fish, the schooners Andrew Leighton and Daniel A. Burnham came also. The weather was exceedingly bad and fish scarce; besides, we did not have cable enough to ride out a gale in the depth of water where halibut could be taken, and consequently had to work at a disadvantage, setting almost wholly under sail, being able to fish only in the

day-time. While there we had the heaviest gale that I have ever encountered, and as an account of it may possibly prove interesting, I will insert it here as an incident of the halibut fishery. We set under sail at noon of December 8, in 150 fathoms, in latitude 44° and longitude 58° 30′ by dead reckoning. We had eight skates of trawl out, set in four strings, three men going in a dory. As the weather looked threatening, we left the gear out only about two hours before we began to haul. The wind blew so strong, just as the men finished hauling, that the vessel could not carry her three lower sails, and I had to heave her to under mainsail and foresail. The dories came aboard safely, however, bringing a good catch of fish (about 5,000 pounds), but it blew so hard that I knew it would be of no use to attempt to anchor in deep water. We therefore took in the mainsail and jib, and lay to for the night close by the Andrew Leighton, which was at anchor. The schooners Augusta H. Johnson and Edward Grover, each of which had secured small fares of about 20,000 to 30,000 pounds of halibut, started for home that evening.

The wind, which was westerly in the evening, died out during the night, and on the morning of the 9th began to breeze up from the southeast. We made sail (that is, set mainsail and jib) before daylight, and got all ready to set our trawls, but before it was light it blew up smart from the southeast and began to snow. We lay by for awhile around the Andrew Leighton and her dories, some of which were out. After an hour or two, finding the wind increasing fast, we ran in on the Bank until we reached a depth of 60 fathoms, where we anchored and got all ready for a gale. The southeaster blew heavy, but was of short duration, being about what many winter southeasters generally are.

The night of the 9th the wind jumped into WNW., and toward morning of the 10th blew very heavy; so hard, indeed, that, fearing the riding-sail would go to pieces, we hauled it down. The riding-sail, which belonged to another vessel, and which we had taken temporarily, was a new one which had no reef in it, as did our own. The latter had been left ashore, as it was too old for a winter trip.

The gale increased in fury, and after daylight blew extremely hard, while, to make matters worse, the tide set out to run to the southward, hawsing the vessel up in such a manner that she lay almost in the trough of the waves. There was a heavy sea going, too, I think the worst I ever saw, but we did not ship any heavy water before 8 o'clock a. m. Just before that hour I went up in the companion-way and spoke to the man who had the watch, and who was busy aft by the wheel-box clearing the log-line, or some other small gear which had been fouled by the water washing it about. He was standing with his back to the sea, totally unmindful of his danger. As I went below I said to him, "Keep a good lookout for yourself, George; keep your eye to wind'ard, for there are some nasty seas coming along." "All right, skipper, I'll look out for myself," he replied in a cheerful tone. His watch was just out, and the man who succeeded him was nearly ready to go on deck as I went below.

I had not been in the cabin more than a minute, when a tremendous wave broke on board, abaft, or about the main rigging, swept aft with resistless force, knocking the companion-way slide to as though it was struck with a trip-hammer, ripping two boards off of it; also the bait planks off the house; and last, and most appalling of all, sweeping the unsuspecting man, George Miller, into the foaming and seething waters astern, so far away as to be beyond the reach of all human aid. A feeling of horror, like an electric shock, passed through me as I heard the roar of the breaking wave and the peculiar swishing sound of the waters rushing across the deck, and I exclaimed to the man who was standing by the steps ready to go on deck, "My God! Silas, I'm afraid that sea has washed George overboard." Reaching up, he shoved the slide back, and we both sprang on deck. But what a sight met our eyes! More than a hundred feet astern and drifting

with the current, every moment still farther away, we saw the poor fellow rise to the surface, struggle for a few seconds, and then, buried beneath a huge wave, disappear forever from mortal sight. Sad, indeed, were the faces of our crew when it became known that we had lost a man.

However, we had but little time to indulge in regrets or sorrow, for the gale, which had then increased to a furious hurricane, compelled us to make extra endeavors for the safety of the vessel and our own lives. She hawsed up so badly soon after the event just described that we were compelled to set the riding-sail to keep her more nearly head to the sea. We reduced the size of the sail as much as was practicable, by making a "bag reef" in it. This was done by tying up the clew and lashing the bottom hoops together, which being done we hoisted it up a little before 9 o'clock a. m.

Shortly after the riding-sail was set we had a succession of tremendously heavy snow squalls, which blew with a fury I never before saw equaled or even approached during an experience of thirty years' battling with the Atlantic storms, while the snow was so dense that, when we were in the hollow of a sea, the top of it could scarcely be seen. The vessel quivered and trembled like a stricken dolphin, as she struggled with great apparent effort up the steep sides of the mountainous waves, which threatened to bury her beneath their curling crests. Even with the small sail which we had set, a mere rag in size, and lying almost head to the wind, she buried her lee side nearly to the hatches. To walk against the blast was out of the question, and all one could do was to haul himself along by the life-lines or cling to the rigging for safety. She plunged so heavily into the waves that the jib was soon washed loose from the bowsprit. While I was in the cabin after a rope to secure the jib, a second heavy sea boarded us, breaking over the port bow, covering our little vessel nearly out of sight beneath a deluge of rushing water and flying spray. When the men on deck saw it coming they sprang for the rigging. Two of them, who got upon the fore-gaff, held on to the peak halyards, clinging to the ropes with their hands and legs. The sea broke so high that both of these men were nearly washed clear of their hold, although they were eight or ten feet above the deck, which was filled with water nearly to the top of the rails, compelling us to knock off some waist boards so that the vessel would clear herself.

Between the squalls we managed to secure the jib, though it was extremely hazardous going out on a bowsprit in such a gale. The squalls had the most terrifying appearance that I ever witnessed, as they came tearing down from to windward. Black as night and driving a line of white foam before them, they were an awful sight, and enough to strike terror to the hearts of those who never before had felt a sense of fear, and who, even then, when death was imminent, bravely faced the storm, disdaining to flinch from the peril which duty and self-preservation called them to meet.

Fearing the cable would part, and feeling sure that the vessel would be knocked down on her beam ends if she fell off with the least bit of sail set, I stationed myself at the mainmast, whenever the squalls came along, ready to let the riding-sail run down if necessary. When the fourth squall was coming I took my usual position, standing on the bitt-head of the fife-rail with my right foot, and grasping the riding-sail halyards with my right hand. While I was standing in this position, and in the midst of a flurry of flying snow, a lightning bolt burst between the masts. I was struck by it and knocked insensible to the deck. Others of the crew were slightly shocked. As soon as they could, the men who were on deck picked me up, thinking I was dead, and carried me below.

I would not speak of the intense suffering which I endured for four hours—hours of dreadful agony—while I was being resuscitated, were it not to mention the conduct of my men, all of whom showed great devotion and nobleness of spirit. Though in almost momentary expectation of death

themselves, they continued their efforts for my relief with extraordinary zeal and coolness. Fortunately I could speak soon after being taken into the cabin, and was thus able to direct what should be done both for myself and for the safety of the vessel.

We had only three more squalls after I was struck by lightning; those were not so heavy as the previous ones, and after they were past, the wind soon subsided to an ordinary gale.

After recovering sufficiently to examine my injuries, I found that the lightning had plowed along my right arm from the wrist to above the elbow, scorching it severely, while five smaller burns were on my right leg below the knee, and mostly about the ankle. My right side was paralyzed, and I could not stand on my feet for several days.

We started for home as soon as the gale was over, but had a long, hard passage. My burns were so painful that when we got as far as Liverpool, Nova Scotia, we went in there for medical assistance, and arrived home on the 23d of December. The Augusta H. Johnson got in the same day. We had only 17,000 pounds of halibut, but as we obtained a high price for them we made a fair trip.

The Daniel A. Burnham was lost in this gale, being knocked down and dismasted. She was abandoned after the gale, her crew being taken to St. John's, Newfoundland. The Andrew Leighton was knocked on her beam ends and came near foundering, and the William T. Merchant was lost. This alludes only to the vessels in our immediate vicinity when the gale came on. Several other Gloucester vessels were lost or abandoned; the total loss of life reached 100.

One of the men who had been with me for nearly two years now took charge of the Howard for a trip, while I remained at home to recruit from the effects of the lightning-stroke.

Halibut were found extremely abundant in the winter of 1877, between the parallels of 43° and 44° north latitude, in 60 to 90 fathoms, on the western edge of the Grand Bank. They were taken from the middle of January until nearly the last of March, 1877, but were most numerous during the last days of February and first half of March.

I took charge of the Howard again on her return, and went to the Grand Bank. We got a trip of 70,000 pounds of halibut to the northward of latitude 44°, in 55 to 90 fathoms, on the western edge of the Grand Bank. In latitude 44° 23′ and longitude 52° 30′, in 55 fathoms, we caught more than 20,000 pounds of fish at one set with 15 skates of trawl. The next set we got only 5,000 pounds, which indicated that the fish were moving fast. This was the trip before I began my daily journal, in which it is recorded that the following winter very few, if any, halibut were caught in less than 140 fathoms on the Grand Bank.

Large quantities of halibut were found all along the southern edge of the Western Bank, La Have Ridges, and Brown's Bank, and, in fact, as far west as George's, in the deep water, when first resorted to by the fishermen; but in a short time the fish appeared to be considerably reduced in abundance, and in the summer of 1879 I do not know of any vessel finding halibut plenty on La Have Ridges or vicinity.

Ever since deep-water fisheries have been pursued, halibut have been found, just previous to and during their spawning season, in July, August, and September, in large numbers on rough or rocky bottom, most generally on rocky spots or patches of small extent which occur along the slopes of the outer banks. From my own observations, I believe that bottom where the rocks are supplemented with a growth of corals is peculiarly attractive to halibut. The fish which frequent these localities are generally large gravid halibut, called "mother fish," but among them are always found more or less male halibut, invariably smaller, averaging about one-third the size of the females. The males are called the "little bulls" by fishermen.

Halibut have a remarkable habit of remaining on the spot which they have selected for their spawning ground, and the natural result is that, when once a breeding-school is found, fare after fare is caught at the same place, until the fish are so much reduced in numbers as to no longer offer sufficient inducement to the fishermen to visit the locality. Sometimes, however, the fishermen lose so much gear on these spots, on account of the roughness of the bottom and other causes, that after a few trips are made the area becomes so completely covered with old lines that it is almost useless to set trawls, since there is small chance of getting them back. This liability to loss, especially after the fish have been broken up and no longer can be caught in large quantities, compels the fishermen to resort to other localities.

Where so many trawls are lost, of course the halibut that are on the hooks finally die and decay, thus being destroyed without benefiting any one, but instead, it is believed that they become, temporarily, an injury to the fishing grounds.

As previously mentioned, these spots are almost always small, and the boundaries of the schools of fish found in such places are so sharply defined that, although sometimes, as the fishermen express it, "the fish are four tier deep on the spot," 100 fathoms either side of it few if any halibut can be caught.

It does not follow, as a matter of course, that halibut are found abundant in the same place two seasons in succession, but the reverse is, perhaps, the rule, especially if many trips are caught in any given locality the first season that it is resorted to.

The following is a brief account of the results obtained on a few of these small areas, and which will serve to illustrate what has been written above:

In the summer of 1876, Captain Markuson, in the schooner Notice, found one of these places on the Southwest Prong of Banquereau. It was so small that he could get only two trawls on it, and those had to be set very close to each other.

But the halibut were so abundant, according to two men who were with him at the time and have sailed with me since, that on each of the two trawls which were on the right spot they used to get six and seven dory-loads of fish (about 1,500 pounds to a load) every time the gear was hauled, while on the other lines not more than two or three halibut, at most, were taken. After making a few sets they marked the spot by anchoring buoys, thereafter running only two or three trawls, instead of six (the full complement), and in this manner they caught a full fare.

About July 22, in the summer of 1877, the schooners Sultana and Fitz J. Babson struck a large school of halibut on the Southwest Prong of Banquereau, in latitude 43° 55′ and longitude 58° 45′. The captain of the Sultana told me that the area covered by these fish was not more than three-fourths of a mile in diameter, either way. Each of the above-named vessels caught a fare of 80,000 pounds of halibut at that place, and when they left their positions were taken by other vessels—the Chester R. Lawrence, Augusta H. Johnson, and another, the name of which I cannot now recall. There were probably more than 300,000 pounds of halibut taken from this place.

In the summer of 1878 halibut were found very plenty on the western side of the Southwest Prong of Banquereau, in latitude from 43° 56′ to 43° 57′, and longitude 58° 55′, dead reckoning. The schooner Magic got a trip of 50,000 pounds there in July; returned again in August, but failed to secure a full fare on account of her windlass breaking, which compelled her to go home. She also got 45,000 or 50,000 pounds there in September. We caught part of a trip (18,000 pounds) there in July. The schooner William Thompson got 98,000 pounds there in August, and the schooner Lizzie also caught part of a fare, about 40,000 pounds. On the same spot, and nearly at the same time, the Davy Crockett got part of a trip there also, and several other vessels took more or less halibut at the same place; but at last there was so much lost gear on the bottom that it did not pay to set trawls

there. Probably there was as much as 400,000 pounds of halibut taken from this ground, besides large numbers that remained on the lost trawls.

In the summer of 1879 there were comparatively very few halibut found at the above locality, though the ground was very thoroughly tried over on several occasions. However, another breeding-ground was found on the eastern part of the middle prong of Banquereau, in latitude, by observation, 44° 14′ N., longitude, by dead reckoning, 58° 04′ W., in from 230 to 380 fathoms, on pebbly, rocky, and coral bottom. It was of small extent, not much more than a mile in diameter either way, when we were there.

The following vessels all got good fares on this small piece of ground. From the best information obtainable, I think the fish were first found about the 10th of July:

The Andrew Leighton had 80,000 pounds; the Herbert M. Rogers, 50,000 pounds; the Bessie W. Somes, 60,000 pounds; the David A. Story, 70,000 pounds; the Conductor, 55,000 pounds; the Bellerophon, 55,000 pounds. We also caught about 55,000 pounds on my last halibut trip, and when we left for home two vessels, the Addison Center and Thresher, took our berth and each of them secured fair catches.*

Thus it will be seen that more than 400,000 pounds of halibut had already been caught at this point, which, added to those retained on the lost gear, which must at least equal 100,000 pounds more, makes a total of more than 500,000 pounds. That so many fish should be taken from such a small area of sea-bottom seems almost incredible, but the facts admit of so much proof that they are indisputable.

Only one result can be obtained by this system of fishing, and that is this: The halibut must soon become reduced to scarcity, even if they were "four tier deep" at the beginning. But, notwithstanding all this, the men feel obliged to catch as many fish as possible when they go after them, and whatever the result may be on the abundance of halibut in future years, the present time must be improved to the best advantage.

The schooner David A. Story arrived in Gloucester July, 1881, with a trip of 25,000 pounds of halibut, which were caught off the southeast point of Anticosti Island in the month of June. Nearly all of the fish were taken in two days, after which little or nothing could be done, owing to the lack of the proper kind of bait. The trawls were set three or four times a day, being run along parallel with the shore in depths of water varying from 5 to 10 fathoms.

Other vessels which were at Anticosti at the same time found halibut quite plenty for a few days, but failed to secure full fares on account of having only a small supply of good bait.

In June and July, 1881, the best fares of fresh halibut that were brought into Gloucester were caught on the southern part of the Grand Bank in 150 to 250 fathoms of water. The best locality was in about latitude 43° 12′ N., though good catches were obtained a few miles north and south of that point. The fish were two-thirds white and of a superior quality. The Alice G. Wonson, the only vessel fishing off the eastern part of George's Bank, found halibut in considerable abundance. On all the other "deep-water" grounds, namely, the southern edge of La Have Ridges, and the Western Bank, along the south and east borders of Banquereau, and also off Saint Peter's Bank, the catch of halibut was very small, and over a large portion of these grounds, once so prolific, very few halibut can now be caught. The Josie M. Calderwood, while fishing for cod in 50 to 60 fathoms, in the northwest part of the Gully, during the month of June, 1881, caught 17,000 pounds of halibut, which were brought in fresh. Captain White, who commanded her, states that the halibut were fairly plentiful and evidently many were lost from the trawls, owing

* The quantity of fish taken by each of the various vessels is given in round numbers, but in no instance will it vary much from exactness.

to the gear being too small to hold them. The Mystic also found fair halibut fishing near the same place, but in shoal water. The fish were of excellent quality, but evidently their occurrence there was accidental, or at least very temporary. Had their presence in this locality been permanent in the least degree, the region would have soon been covered by the trawl-lines of the halibut fleet.

Two events of a remarkable character, and which seem worthy of particular mention, occurred during the seasons of 1881–'82. These were (1) the discovery of a new fishing ground, and (2) the occurrence, at a season when it was least to be expected, of halibut in almost unequaled numbers in a well-known and long-frequented region.

During most of the season of 1881, and particularly in the fall, halibut were scarce on most of the fishing grounds along the edge of the outer banks. Consequently, the inducement was great for the skippers to seek new and untried fields, where perhaps fish might be found in undisturbed abundance. With this end in view, Capt. George A. Johnson, of the schooner Augusta H. Johnson, in the autumn of 1881, crossed the Grand Bank and fished in the deep water on its eastern slope, where, so far as I know, no systematic research had previously been made. I was told by an acquaintance several years ago that a vessel had sought for halibut along the eastern edge of the Grand Bank as early as 1877, but had failed to find any, the skipper reporting that the bottom declined so suddenly that it was useless to attempt to anchor or set trawls. The recent researches in this region have shown that the statement was entirely wrong, and give reason to doubt the probability of the vessel having visited the deep water on the east side of the Bank. Anchoring in 110 fathoms, latitude 43° 55′ N., longitude 49° 8′ W., Capt. Johnson found halibut plenty, and made large catches on trawls set to the eastward of his vessel and in somewhat deeper water. In six days' fishing he secured a fare of between 50,000 and 60,000 pounds of halibut, most of which were large "gray" fish. It is somewhat remarkable that when halibut are found on grounds not previously fished on a large percentage of the catch are generally "gray" fish, and with rare exceptions these are above the average size. Instances are somewhat uncommon where medium-sized "white" halibut have predominated on newly-tried fields, but occasionally such cases have occurred. After several years' fishing in one locality the quality of the halibut generally improves, the fish being of smaller size and in finer condition.

The same schooner on her next trip—this time commanded by another man—revisited the new ground, but the winter season had then so far advanced that there was a constant succession of furious gales. The prevalence of strong northerly winds caused an unusually rapid flow of the polar current, which often sweeps down by the eastern side of the Grand Bank with such velocity as to render fishing nearly impracticable, and in consequence of this combination of unfavorable circumstances very little was accomplished. In the spring of 1882 Captain Johnson went to this place again and had remarkable success. His good fortune was soon noised abroad, whereupon many of the other halibut schooners made similar ventures, the result being that the eastern side of the Grand Bank was pretty thoroughly tried over from latitude 43° 15′ to 44° 30′ north, in depths varying from 100 to 300 fathoms. At many points along this stretch halibut were abundant, but a strong polar current caused the fishermen much loss of gear, while the prevalence of dense fogs, together with the proximity of numerous icebergs, rendered fishing in that locality so hazardous that the majority of the skippers were glad to resort to other grounds, even where, perhaps, the prospect of finding large numbers of fish was not so good. Several of the vessels lost most of their trawls before they had secured a full fare, and few that fished on the eastern side of the Bank returned to port without having met with some damage to their gear. Where strong currents prevail in deep water the buoys which mark the position of the trawl-lines are dragged

beneath the surface of the water by the great strain on the buoy-line. These buoys, being generally soft-wood kegs, are broken by the pressure of the water when they have been submerged to any considerable depth, and the result is that there being nothing to support the buoy-line, the only means by which the trawl can be recovered, the apparatus is lost.

The icebergs sweeping down from the north, borne along by the swiftly-running currents, were a source of great danger to the vessels lying at anchor. Huge mountains of ice would often appear suddenly out of a dense fog, so close to the schooners that the startled crews were frequently almost compelled to cut their cables to prevent collision. Captain Johnson told me that on one occasion he counted twenty-eight bergs within sight of his vessel, and one of the number lay grounded for nearly a week—all the time he remained at anchor—not more than a mile distant, in water probably not less than 125 fathoms deep. It is scarcely necessary to say that in a rough sea one blow from such a monster would crush a fishing schooner as though it were an egg-shell.*

The fact, however, of halibut having been found in abundance off the eastern, or rather, perhaps, the southeastern side of the Grand Bank, is a matter of more interest than would appear at first glance, since it permits us to form a better idea of the winter habitat of certain schools of this species, and also to judge more intelligently concerning the spring and fall migrations, about which heretofore only indefinite and uncertain ideas could be formed. For several years previous to the discovery of the deep-water fishing grounds it was noticed by the fishermen that during the winter and early spring—from about the middle of January to the last of April—the schools of halibut met with on the body of the Grand Bank, between 43° 30′ and 45° north latitude, appeared to come from the east or southeast side of the Bank, and almost invariably moved steadily, but slowly, across the ground in a westerly or northwesterly direction. A vessel might obtain remarkably good fishing for two or three days, perhaps for a shorter time, but the halibut would suddenly disappear, and none could be taken. It frequently happened that on such occasions a change of position—the schooner moving 5 or 6 miles in the direction which the fish were known to be going—might result in the school being overtaken again and the capture of a full fare. In some instances a skipper might be able to "keep run" of the fish for several days, and while they were passing over a distance of 20 to 30 miles, and many statements could be cited of a character to verify this assertion. As it may be a source of wonder to many how any intelligent idea could be formed by the fishermen of the direction in which the halibut were moving, the following explanation should be offered. The custom is for the Grand Bank halibut schooners to fish with trawls, each about 2 miles long. As has been explained elsewhere, these are set out from the vessel, from which as a center they radiate in the form of a star. A school of halibut approaching from the east would first be caught in great abundance on the lines set in that direction, while the trawls on the west side of the vessel would get comparatively few fish. On the next set the catch might be pretty equally divided, while succeeding hauls would show that the fish had moved so far that only the "tail end" of the school could be reached by the farthest ends of the western trawls. As soon as this occurred any intelligent skipper, understanding the habits of the species, could form a tolerably definite theory as to how fast the halibut were moving, and also the course they were pursuing.

Notwithstanding it was apparently well known that the halibut were migrating at such times, only the most vague and indefinite ideas were formed as to the place from which they came or whither they went. No one seems to have entertained the thought that they "hung around" the edges of the Bank, in deep water, after leaving the body or shoaler portions of the ground. That

* During the summer of 1885, while this is being printed, the majority of the Gloucester halibut vessels are fishing on the eastern side of the Grand Bank.

the halibut came from some undiscovered bank to the eastward and passed across the Grand Bank on their way north and west toward Newfoundland, the Gulf of Saint Lawrence, Labrador, &c., was, I think, the general belief of the fishermen, at least of such as took the trouble to formulate any theory. The discovery of halibut along the east side of the Grand Bank seemingly settles this question, and it is undoubtedly a fact that the great schools of this species which for many years have been known to migrate northwesterly in the spring make their winter residence on the eastern slope, in depths varying from 100 to probably 400 fathoms.

Fortunately, halibut were discovered in remarkable abundance in the early summer of 1882 on another and well-known fishing ground, thus rendering it unnecessary for the fishermen to be longer exposed to so many losses and perils as they had experienced on the east side of the Grand Bank.

On the deeply-submerged plateau which extends in a northwesterly direction from the northwest prong of the Grand Bank to Saint Peter's Bank, forming a sort of border to the southern end of Green Bank—by which name this area of bottom is usually called by the fishermen—in depths varying from 112 to 250 fathoms, halibut of the finest quality and in extraordinary numbers were found. This locality has been famous for the abundance of halibut in the spring of the year since the discovery of the deep-water fishery in 1875. Since then, however, notwithstanding the fact that large schools of this species have been found off Green Bank almost every spring, it has appeared from the movements of the fish that they were migrating to more northern regions, and that they were only passing over these grounds, pausing slightly, perhaps, in their course, or, at least, moving slowly. On several occasions the movements of these fish have been pretty definitely traced along the southwestern side of Saint Peter's Bank, and into the deep water between this Bank and the shores of Newfoundland.

For a period of four to six weeks, generally in March and April, large fares were obtained between the northwest prong of the Grand Bank and Saint Peter's Bank. After that interval, however, the fish became scarce, and rarely did it happen that they were sufficiently plenty during the summer for vessels to obtain good fares there. In this connection it may be well to mention that in the summer of 1878 the schooner Gwendolen found a new fishing ground some twenty miles to the southwest of Saint Peter's Bank in a depth of about 200 fathoms, where no soundings are laid down on the charts. She succeeded in taking several large fares, but other schooners learning of her good fortune resorted in such numbers to the same grounds that in September of that year the school had been broken up, nor was any large catch of halibut made on that ground afterward. Allusion is made to this fact because the locality is not far from that region off Green Bank now under discussion, and also because, with this exception, halibut were rarely found abundant in the summer in its immediate vicinity from 1875 until 1882. That year was, however, a marked exception to the general rule, and the fact of halibut being abundant at that point is all the more remarkable, inasmuch as when the schools have been broken up on other fishing grounds, or the fish forced to leave their favorite resorts during a portion of the year, they rarely return to stay in such plentifulness. From early in June until late in October of 1882 the species occurred in almost unprecedented numbers off the southern part of Green Bank in depths ranging from 100 to 250 fathoms; whereas, in former years, even when halibut have been most plentiful, a dearth has usually occurred on all the fishing grounds in the latter part of September and in October and November. During those months, however, of 1882, wonderful catches were made, several fares of from 40,000 to 75,000 pounds having arrived at Gloucester. The following are a few of the many instances of large captures made on Green Bank during that season. One of the first fares to arrive from that locality—possibly the first—was brought in by the schooner Isaac A. Chapman,

which reached Gloucester on June 25, 1882. She had on board above 80,000 pounds, four-fifths of which were "white." The following detailed account of the amount and value of her fare appeared in the Cape Ann Advertiser of June 30, 1882:

"Schooner Isaac A. Chapman, Capt. Augustus G. Hall, arrived from a Grand Bank trip on Sunday, bringing in 81,000 pounds of halibut and 5,000 pounds of codfish, stocking $4,303.66, the crew sharing $145.30. She was absent nineteen days, of which time two days were spent in Nova Scotia ports waiting for bait."

Captain Hall told me that these fish were caught at a depth of 112 fathoms in latitude 45° 04′ N., longitude 54° 59′ W. He fished for eight days altogether, during the first two of which he was in shoaler water and caught only 4,500 pounds of halibut, so that 76,000 pounds were taken in six days.

September 11 the schooner Gertie E. Foster arrived home from Green Bank, bringing in a fare of 78,625 pounds of halibut. Captain Olsen, who commanded her, told me that he had made several unsuccessful attempts to catch halibut on the Western Bank and Banquereau during that summer.

On the 4th of October the schooner Willie M. Stevens arrived with about 80,000 pounds of halibut caught near Green Bank at a depth of 250 fathoms. The vessel, however, lay anchored in 220 fathoms, her position, according to Captain McInnis, being latitude 44° 58′ N., longitude 54° 33′ W.

A few days later the schooner Grace L. Fears arrived with a "big trip" caught near the same locality, the following notice of which was published in the Cape Ann Advertiser of October 13, 1882: "Schooner Grace L. Fears arrived from a Bank trip on Monday, October 9, with 70,220 pounds of fresh halibut, which were sold to the Atlantic Halibut Company for $3,606.61, her crew sharing $119.39."

On October 28 the Augusta H. Johnson arrived in Gloucester from Green Bank with a fare reported to be between 50,000 and 60,000 pounds of fresh halibut.

In conversation with the captains of several halibut schooners, I learned that many attempts were made during that summer and fall to catch halibut along the southern edge of the Western Bank and the Southwest Prong and eastern edge of Banquereau, but these were rarely successful. The captains of these schooners were induced to make these trials because the greater portion of the fleet had resorted to the vicinity of Green Bank, where the vessels lay close together, fishing on a small area of sea-bottom. As a result of this crowding, there was much loss of gear, which rendered the trips far less profitable than they otherwise would have been. With scarcely an exception, however, so far as I have been able to learn, the vessels, after making the attempts already alluded to, were obliged to go to Green Bank in order to complete their fares. It may be interesting to note that, whereas in former years the halibut taken in the region under discussion were nearly always of large size, the "gray" predominating, this year the reverse is the case, for the fish caught there have nearly all been of medium size and of much finer quality, averaging from two-thirds to seven-eighths "white."

Mention should be made here of the capture of halibut along the southwest part of the Grand Bank during the first part of 1882. Several fine fares were obtained on the western slope of that Bank, in depths ranging from 150 to 300 fathoms, between the extreme southern point of the Bank and 44° north latitude. Much difficulty was experienced in fishing off the southern peak, as well as on the eastern side of the Bank, from the strong polar current, though this is not generally a source of trouble on the western side of the Bank north of latitude 43° 20′. It appears, however, that halibut were scarce along the southwest slope of the Bank during the summer months, though

occasional fares were possibly taken in that locality. From information derived from the most reliable sources, however, it appears that nearly all the vessels engaged in halibut fishing resorted to Green Bank after July. It is undoubtedly true that the small number of vessels engaged in this fishery was favorable to their obtaining large fares throughout the season. Had the fleet, as in 1878 and 1879, been composed of forty or forty-five instead of only fourteen or fifteen sail, there is no doubt but that the school of halibut on Green Bank would have been broken up after two or three months' fishing; and if not, it is certain that the accumulation of lost gear on the fishing grounds would have rendered profitable fishing in that locality a practical impossibility.

12. JOURNAL OF FRESH-HALIBUT TRIPS TO THE GRAND BANK IN 1878 AND 1879, IN THE SCHOONER MARION, OF GLOUCESTER, MASS.*

By J. W. Collins, *Master*.

Friday, February 15, 1878.—There was a moderate breeze N. by W. in the morning and during the forenoon. This was a fair wind to start with. We had completed our preparations for the trip on the previous day; everything was ready with the exception of a supply of frozen herring for bait. As soon as the crew mustered in the morning—between 8 and 9 o'clock—two men were sent off to the "baiter," a vessel loaded with frozen herring lying in the harbor, with her flag flying, and they returned with some 5,000 stiffly frozen herring, which were hastily packed in one of the ice-house pens, under straw to prevent their thawing. This having been done, and some other minor matters attended to, we hoisted our sails, and as the city clock rang out the hour of ten we cast off our lines and once more filled away for the Banks.

After passing Eastern Point, and getting the light sails set and sheets trimmed to the best advantage, the ordinary routine of setting the watch, lashing dories, cables, securing hatches, putting out the log, &c., was gone through with.

The wind died away in the afternoon, and finally fell calm in the latter part of the day. At 7 p. m., however, a breeze sprang up from the southwest. With this wind we could run along on an E. by S. course—which we were steering—with all sails drawing on the starboard tack, and sheets well off.

Saturday, February 16, 1878.—The morning was fine and clear, with a light westerly breeze, which continued with very little change throughout the day. As soon as breakfast had been eaten, about 7 a. m., the hatches were taken off, the gear was passed on deck, and all hands were soon busily engaged in preparing their trawls, buoy-lines, buoys, dories, and the various other apparatus which they may need for use as soon as we arrive on the fishing ground. Moderate, pleasant days are the exception in these latitudes in winter, and every one is eager to improve to the utmost the opportunity thus afforded of doing work which must otherwise be carried on under much less favorable conditions.

Longitude, by observation at 9 a. m., 69° 25′ W. Latitude at noon by meridian observation of the sun, 42° 42′ N.

Sunday, February 17, 1878.—There was a very light northwest wind and clear weather in the early morning. It was calm for a while in the forenoon, but at 10 o'clock it breezed up again.

*The accounts of halibut trips given here are selected from a series contained in a journal from April, 1877, to August, 1879, during which time the writer was constantly engaged in the fresh halibut fishery. In other chapters are given the arrangement of the vessel, incidents connected with sailing, obtaining bait at home or in other ports, and many other matters which give an insight into the daily life of the fishermen, and the manner in which this fishery is prosecuted. The notes referred to may, at some future time, be published together.

Latitude at noon 42° 45′ N., longitude 68° 05′ W. At 3 p. m. there was a light southwest breeze. We saw a fisherman bound to the westward. It began to snow in the evening.

Monday, February 18, 1878.—The snow fell thick during the past night. The wind, however, continued moderate, but veered around until at 8 a. m. it was NNE. The weather began to clear at this time. Barometer 29.65. The wind steadily increased during the day until it blew heavy in the afternoon. At 10 a. m. the main-staysail sheet parted and we hauled the sail down and did not set it again. At 2.30 p. m. we clewed up the gaff-topsail. At 4 p. m. double-reefed mainsail and took the bonnet out of the jib, and at 5 o'clock we double-reefed the foresail. We saw a vessel at anchor at 4.30 p. m. The air grew cold in the afternoon, and the sky had a wild wintry look. At 7 p. m. it blew a strong gale and there was a very sharp sea running. We took the mainsail in, and furled it, and let the vessel run under her reefed foresail and jib. At 8 p. m. shipped a sea which stove one of the dories.

Tuesday, February 19, 1878.—At 1 o'clock a. m. we took in the jib and furled it, and ran under a double-reefed foresail. It was blowing a smart gale at this time. The cold had increased and the vessel was making considerable ice. At 8 a. m. the wind had moderated, but still the temperature was lower than it had been during the night. I think it was colder than I have seen it before this winter. We set the jib and riding-sail at 8.30 a. m. At 2.30 p. m. the wind and sea had decreased very considerably, though it still blew hard and was so cold that where any spray struck it froze. We began beating the ice off the foresail at this time, and at 3 o'clock we shook the reef out. After we got the foresail up, we pounded some of the ice off the rigging, sails, &c. At 9 p. m. we set the mainsail, shot to, and sounded in 56 fathoms on the Western Bank.

Wednesday, February 20, 1878.—This morning there was a fine northerly breeze. We began to beat off the ice at daylight, and at 8 a. m. set the light sails. Our latitude at noon was 42° 13′ N., longitude 60° 14′ W. Longitude, by observation at 4 p. m., 59° 34′ W. The wind in the afternoon and evening backed to NW. and, toward midnight, was light and puffy.

Thursday, February 21, 1878.—There was a light WSW. breeze during the first half of this day, and the air was much warmer than it had been, so that the ice began to melt and fall off the rigging and rails. The wind kept backing gradually until at 6 p. m. it was south. It began to snow soon after noon and was quite thick all the rest of the day. We took in the gaff-topsail and furled it at 5 p. m. The wind still continued to back against the sun, until 11 p. m. when it was NNE., fresh and puffy.

Friday, February 22, 1878.—The wind in the first of the morning backed to north and blew up heavy. We took in the mainsail and furled it at 4, and reefed the foresail at 5 a. m. At 8.30 a. m it blew a strong gale. We took in the jib and furled it and hove to. The barometer at this time was on 30.15, which is higher than I ever saw it before when it blew a gale like this. At 3.30 p. m. the gale moderated some and veered to NNE. We loosed the jib and set it, and bent the riding-sail, so that we could keep on our course. The barometer at this time had risen to 30.40. The wind blew very heavy, and there was a bad sea, in the latter part of this p. m.

Saturday, February 23, 1878.—At 6 a. m. it was still blowing a strong breeze, though considerably less than during last night. The Marion behaved splendidly under her short sail, and made an average of 4 knots, which is very good in such a gale, considering that we had to keep close to the wind. At noon we shook the reef out of the foresail. At 3 p. m. we came to anchor in 100 fathoms on the western edge of the Grand Bank. It was rough, and still blowing strong, and the weather was hazy and drizzly when we anchored. We repaired the dory which was stove on the passage. I noticed that we came into white water 25 or 30 miles westward of the Bank, which is

rather unusual; I think this discoloration so far from shallow water must somehow have been caused by the late gale.

Sunday, February 24, 1878.—There was a light southeast breeze in the morning. We hove in "slack cable," but did not set any gear, as I do not feel disposed to begin a trip on Sunday. I got an observation in the forenoon and one at noon. Our latitude is 43° 32′ N., longitude 51° 57′ W. I saw a vessel at anchor to the SE. At noon I saw a schooner working up from to leeward, which proved to be the Ada K. Damon, which vessel sails from the same firm that we do. The skipper came aboard, and we exchanged our budgets of news. He reports halibut very scarce on the Bank. It is ten days since he anchored on the Bank and he has taken only 2,000 pounds of fish. He went adrift in the last breeze,* and has not anchored since. He says it blew nearly a hurricane where he was. After he returned to his vessel he kept off and ran to the NW. We set four trawls this afternoon, chiefly to catch some fish for bait. At 5.30 p. m. the Andrew Leighton spoke us. She was working to the SE., and kept on in that direction. The wind blew up strong from the south east in the evening, and we had to stick out some more cable.

Monday, February 25, 1878.—It was moderate, and very thick fog this morning and forenoon, with indications of a sudden change of wind. We hove in our cable to a short scope. After dinner the weather cleared up and our men went to haul the gear. They got only two of the trawls; the other two I expect the tide, which runs very strong, has carried adrift. We spent all the afternoon looking after them. The wind breezed up NW., and I concluded to wait till morning and have a hunt for the missing gear in the vessel.

Tuesday, February 26, 1878.—The morning was dark and gloomy-looking, and there was a light northerly breeze. The barometer was low and falling slowly. We began to heave up the anchor before daylight. After the vessel was under way we made short tacks to windward in the direction I thought the trawls had drifted, and, fortunately, we soon found them. There were only a few codfish on them, and no halibut, so we kept off and ran to the SE., spoke the Andrew Leighton, and still continued our course for about 18 miles farther, when we anchored in 70 fathoms and set 12 skates of trawl. Last year at this time halibut were very plenty in this vicinity. Although the barometer is down to 29, the weather still continues fine, with a light WNW. breeze in the afternoon.

Wednesday, February 27, 1878.—This morning the clouds had a wild, unsettled look, and as the barometer was on 29.10, I expected it would blow before night. We hauled our gear, and as we got no halibut on the trawls we hove up the anchor, set all sail, and stood to the NNE. The wind was about NW. by N., a smart staysail breeze.† The Leighton, which was anchored about 5 miles from us, got under way at the same time, and was on our weather bow, standing the same course. Latitude at noon, 43° 31′ N. We tacked in the afternoon and stood to the westward a while, and at 5 p. m. we anchored in 47 fathoms and set 12 skates of trawl. The Andrew Leighton anchored at the same time about 5 miles WSW. of us. Weather still fine and barometer rising—now on 29.30.

Thursday, February 28, 1878.—In the morning there was a fresh northwest breeze and cloudy sky. We got nothing on our gear, hove up the anchor, set all sail, and began to beat to windward. The Leighton hove up at the same time. We beat to windward all day until 3 p. m., when we fell in with the Alice M. Williams and I went on board. Captain Murphy reports having found halibut very scarce. He has been on the Banks about five weeks, and has about 30,000

*Gloucester fishermen generally speak of a gale as a "breeze." The average fisherman seldom dignifies the most furious tempest or storm by any other name than a breeze. "Were you out in the breeze?" is equivalent to asking if you were exposed to some unusually heavy gale.

†This means all the wind a fishing schooner could carry a staysail with, close hauled. This method of ganging the force of the wind is very much in use. For instance, a "double-reefed breeze" signifies that a vessel can carry only double-reefed sails, while a "whole sail breeze" is one in which the three lower sails can be carried, and no more.

pounds; nearly all of these fish he has caught quite recently. He said that the City of Gloucester, which lays a berth south of him, has got a fair trip, and will probably go home to-morrow. We gave the Williams a dory-load of ice, then we went a berth northward of her and anchored in 56 fathoms, and set twelve tubs of trawl after dark. The barometer has risen to 29.90, and the weather is fine; wind W. by N.

Friday, March 1, 1878.—It was calm in the first part of the day. We got 3,000 pounds of halibut on the morning haul, and a large part of them were white. We baited up our trawls, and as it still remained calm we set them again at 10 a. m. The Mary F. Chisholm lays a berth WSW. and the Bessie W. Somes a berth to the NW. of us. The City of Gloucester got underway at noon and shifted to the westward into deeper water. At 2 p. m. there was a moderate breeze from the westward. The Williams was under way at this time, standing to the northward under whole sail. While our men were out hauling this afternoon we had a smart and very sudden squall. Some of our dories were to leeward, and for a while I was afraid they would not get aboard; but fortunately the tide set strong to windward, which assisted them very much, and after a hard pull they all succeeded in reaching the vessel. The Williams was under whole sail when the squall struck, and I think she went down pretty low before her crew lowered the mainsail. She was not far from us at the time, and Captain Murphy, seeing that some of our men were to leeward, ran down and kindly offered to assist them. In his quiet way he said to them, "Well, boys, do you think you can pull up?" "Yes, I guess so," they replied. "I'll keep watch of you, and if you need it will give you a tow," he shouted out as he passed by the dories. We got all our trawls but one. That one parted on the outside end, and just as the men began to haul the inside end the squall struck. We got only 1,000 pounds of halibut. The Williams kept on for home. Our position is latitude 43° 52′ N., longitude 52° 25′ W.

Saturday, March 2, 1878.—This day began with a fresh and cold northerly gale, so that some ice was making on deck. We set the dories amidships and cleared the decks, putting the gear below and securing everything which was liable to be washed overboard. We had a smart gale all day, with frequent heavy snow squalls. The barometer was on 30.10 at 8 p. m.

Sunday, March 3, 1878.—There was not more than a moderate whole sail breeze at daylight this morning, so, while one dory went to haul the trawl that was out, the rest of us hove short and beat the ice off the deck, rigging, and sails. We lost one trawl-anchor, buoy, buoy-line, and two lines of trawl, and got about 500 pounds of halibut. The northwest wind died away in the forenoon, and in the afternoon the wind breezed up from the southward. We hove up our anchor and ran to the NNW., where we fell in with and I went aboard of the Ada K. Damon. Afterwards we ran 4 or 5 miles NNW. of her and anchored in 65 fathoms, and set eighteen skates of trawl. The Damon broke her anchor out and ran this way, and anchored a short berth ESE. of us. The Bessie W. Somes spoke us at 4 p. m., and ran to the NNW. a long berth,* where she anchored.

Monday, March 4, 1878.—At 2 p. m. I began to write the record of this day, which has been a rather eventful and exciting one for us, and which came very near having a tragical ending for two of our crew, James Abbott and George Mathews. The day began with a strong SSW. breeze, and the sky had a "smurry," windy look. I did not intend to send our dories out, but as we soon saw the Ada K. Damon's boats out our men thought it was rather daring them, and they declared that they could go if the Damon's crowd could. The competition in this busi-

*A "long berth" in halibut trawl-line fishing is between 3 and 4 miles. The distance between two vessels is generally spoken of as a "short berth," which may be anywhere from three-fourths of a mile to double that distance; a "fair berth," generally 2 to 2½ miles, and a "long berth," 3 to 4 miles. The position where a vessel lies fishing is called a berth, and though she may drift some distance, as in mackereling, she is said to be in her berth. Also if a vessel moves from one place to another it is called "making a berth."

ness—and especially between vessels from the same firm—is so sharp that skippers and men both dare all dangers rather than be outdone. Our men were soon ready, and we hoisted out our dories, and, jumping into them, away the men pulled for their trawls. Abbott and Mathews had to pull nearly at right angles to the sea and wind, and when they were about half way to their outer buoy a sea cockled up, and, catching the dory on the broadside, nearly threw her bottom-up. All that saved her was that both men jumped, and threw themselves on the weather gunwale. As it was, the dory was almost filled with water, and oars, thwarts, and kid-boards were washed out of her. It fortunately happened that there was another dory near enough to the scene of the accident for the men in her to notice the mishap and see the signals for help. The crew of this boat pulled up to those who had so nearly capsized, picked up their oars for them and placed them in a situation once more to battle with the elements. But for this timely aid they must have drifted helplessly to leeward, and doubtless to death. After they got their dory bailed out they started for their outer buoy again, reaching which they began to haul the trawl, but, unluckily, it soon parted, and, as a result, they had a very hard pull to reach the vessel. All of the dories were several times nearly filled by breaking waves, and, since the wind kept increasing while they were out, it was certainly rough enough before they got aboard again. We had two dories astern, riding on long painters, while we were waiting for the others to come on board, and a sea hove one of them across the other's bow, so that the weather one had a hole knocked through her side. When this occurred the order was, "Hurry up, boys, and let's get the dories in before they fill." This was successfully accomplished. We hauled four and a half trawls—fourteen skates—and got about 2,500 pounds of halibut. The dories were all aboard at 11 a. m., by which time it blew so hard that we had to pay out some more cable. After that we got our dinner and then dressed the fish. At 5 p. m. the wind had increased to a heavy gale. We cleared the deck, reefed the foresail and ridingsail, and set the dories amidships before dark. When a gale is coming on, the foresail is carefully reefed (though it is afterwards furled), so that it may be ready for any emergency which may arise, such as going adrift or having to cut the cable to escape collision with a drifting vessel, which may drive down on one at anchor. The dories are moved amidships, so that they may be less liable to injury from a sea breaking over the vessel's side. Since the successful issue of the trip depends on keeping them whole, much care is taken of them.

Tuesday, March 5, 1878.—At 1 a. m. an "unwelcome visitor," in the shape of two or three barrels of water—the top of a comber—came into the cabin. There was a general scramble to snatch up the boots that lay on the floor, to keep them from being filled with water. Some of the men were not quick enough, and their boots got wet, causing considerable growling, as a matter of course. I said to the watch, "Haul that slide over when you see a bad one coming." Everything was soon quiet again, and the men who were turned in all hauled the quilts over themselves and rolled over and once more went to sleep, indifferent alike to the roar of the gale and the swish-swash of the water on deck. At 5 a. m. the wind had moderated, so we turned out and hove in the cable to a short scope. After breakfast—which we always have at daylight or before—we began baiting up our trawls, but the wind, which was light at this time, increased so rapidly that in less than half an hour it blew a gale and was raining and thick. We had to stick out cable again, and thus our hopes of improving this day were utterly foiled. At noon it blew a heavy gale SSW., but at 6 p. m. there was less wind, and it was veering to the westward. The weather was still thick and raining. At 9 p. m. we hove in some cable.

Wednesday, March 6, 1878.—There was a smart northerly breeze this morning. The sky was overcast and the scud was flying fast to leeward, as though it might blow hard again. We set 8 skates of trawl in the morning, but the weather looked so threatening that we did not attempt to

get those we had out. The wind blew strong all day, so we did not put our dories out again. I never before have seen such a succession of strong winds and gales with the barometer so high. It has not been below 29.70, in the open air, in any of the late gales.

Thursday, March 7, 1878.—Blow! Blow! At daylight it was still blowing strong, and I felt utterly disgusted with the state of things in general, and the weather in particular. At 8 a. m. the wind moderated a little, and we put out our dories, and the men went to haul the trawls. We got 3,000 pounds of halibut, baited up and set again. Capt. Peter Mathewson, of the Solomon Poole, came aboard in the afternoon; he has been on the Bank but a few days. He said that while he was at home the Howard came in from the Western Bank with a good trip. She was gone only thirteen days from home. The Ada K. Damon hove up this afternoon and stood to the northward. We got no halibut on our trawls in the afternoon, so we hove up and stood to the NNE. 4 or 5 miles, and anchored in 58 fathoms, and set eighteen tubs of trawl at 10 p. m.

Friday, March 8, 1878.—There was a moderate southerly breeze in the morning. We got 5,000 pounds of halibut on the morning haul; baited up, and set again. Three of the dories caught nearly all of the halibut, so all of them set at 10 a. m. in the direction where the fish appeared to be most abundant. The sun was out to-day, so that I got observations—latitude 44° 4′ N., longitude 52° 30′ W. Capt. Peter Dolliver, of the Lizzie, came aboard in the afternoon. He has not been long out from Halifax, where he has been to refit, having lost cable, anchor, &c., in the heavy gale that swept the Grand Bank the 4th, 5th, and 6th ultimo. He said he had himself tried, and had spoken several others who had been fishing 18 miles northward of us, and the halibut were very scarce in that region. We got only 2,000 pounds of halibut in the afternoon haul. Just as our dories were getting aboard, the Ada K. Damon spoke us. She was running to the northward, towing her anchor. It was then 5 p. m. We took in our dories, broke out the anchor, and shifted a long berth, after dark, towing the anchor. We baited 12 skates of trawl and set them after we anchored again.

Saturday, March 9, 1878.—There was a fresh whole sail southerly breeze in the morning, and it looked like rain. We got very few halibut on the morning haul, and as soon as the dories were aboard we began to heave up the anchor. The Carl Schurz spoke us at 7 a. m. She was running to the NNW. While we were heaving up, the wind died away calm. We set only bank sail at first, but at 2 p. m. the wind began to breeze up NW., and we hoisted the mainsail, and beat to windward about 7 miles, where we anchored in 57 fathoms at 5.30 p. m., and set several skates of trawl. It was foggy for a while at midday, but cleared in the afternoon and there was a fine NNW. breeze, sky dark and overcast. Barometer 30 at 6 p. m. Every vessel in sight but one was under way, so I conclude that they all find fish scarce, as we do.

Sunday, March 10, 1878.—This morning there was a light NNW. breeze, falling barometer, and dark and cloudy sky. At 7 a. m., while our men were hauling, the barometer stood on 29.70.

Capt. Daniel McKinnon, of the Mary F. Chisholm, came aboard. He had set, under sail, a berth WSW. of us. He staid till our dories came alongside, and then he went back to his own vessel. He thinks he will start for home to-day.

We got only 3,000 pounds of halibut. We hove up the anchor and worked to the NNW. under whole mainsail and jib. The wind had been breezing up since morning, and at this time, 2 p. m., it blew too strong for two men to pull a dory to windward. Therefore, after we got 3 or 4 miles from our last berth, we hoisted the dories out and set 18 skates of trawl to leeward; I ran to leeward in the vessel, and having picked up the boats we anchored at the lee ends of the trawls. After McKinnon got his gear he started for home. There was a strong breeze and frequent snow squalls in the latter part of this p. m. The barometer remains steady. I turned in at 8 p. m., after

giving the watch the usual order for the night: "Pass the word along to fleet the cable at 12 o'clock, and if the wind blows any harder, give me a call."

Monday, March 11, 1878.—At 2 a. m. the watch called me and said that "Old Boreas was tuning his harp again." We called all hands and paid out some more cable, set the dories amidships, &c. There were frequent heavy snow squalls from the NNW. and rapidly falling barometer at this time. At 7 a. m. it blew a gale. Barometer 29.30. At 2 p. m. it blew a heavy gale. Barometer 29.15. The gale continued without abatement during the remainder of this p. m.

Tuesday, March 12, 1878.—At 7 a. m. the gale still continued. Barometer 29.70. At noon barometer 29.90, and no change in the gale. We hove in the strad, and shifted it. Saw a topsail schooner to windward lying to. I cannot help feeling disgusted and dissatisfied at the way things have worked with us this trip. The wind has blown a gale most of the time, and when we have had good weather we have found fish scarce. At 5 p. m. the wind had lulled a little, though it still blew heavy and was as rough as ever. Later, the wind increased, and the latter part of this p. m. blew a heavy gale, with a very bad sea running.

Wednesday, March 13, 1878.—At 2 a. m. our vessel shipped a sea over the bow that broke some of the checker-planks and washed aft what cable we had on deck. At 6 a. m. there was less wind. Barometer 30.25. We hove in some cable and repaired the checker-planks in the forenoon, and hauled the trawls in the afternoon. We got only eight or ten small halibut, and I felt so disheartened, so tired and disgusted with constantly trying and getting next to nothing, that I determined to start to the westward, and if we have a chance we will try on the Western Bank, and if not we will go home with what few fish we have caught, rub out the old score, and begin again. It will be better for us than to stay here any longer as the prospect now is. We hove up and set all sail. At 7 p. m. it was nearly calm, but at 10 o'clock a light air sprang up from the southward and we set the stay-sail and headed on our course W. by N. half N.

Thursday, March 14, 1878.—In the early part of this a. m. the wind backed to SE., and at 3 o'clock a. m. was blowing fresh and puffy. Called all hands and took in the stay-sail, turned the dories over, and lashed them securely. We got through at 4 o'clock and all of the men went below but the watch. I staid on deck myself, for these winter southeasters cannot be safely trusted, though, at the same time, sail must be carried to the last extremity. It was raining lightly, and the night, which was moonless and starless, was one of the blackest I have ever seen. All that could be seen was the sparkle of the spray as it flew from the bow, and the luminous phosphorescent wake of the vessel, as, with the sheets well off, she rushed through the water and darkness like a wild horse flying from a pursuer. Every sheet and halyard fairly hummed with the strain upon them. I called all hands. "Get on your oil-clothes and stand by the halyards," was the order. Hardly had I begun to pace the deck again, when a squall struck into our sails with a force which strained every thread of the bellying canvas, and threatened to carry away the spars or drive our little schooner beneath the sea. Feeling the vessel settling I shouted to the man at the wheel, "Let her come to!" and to his watch-mate, who was standing by the weather dories, looking out, "Let go the mainpeak halyards, Jerry!" At the same time I sprang to the main throat-halyards and tried to get them clear, but they were made fast in some unusual way, and in the darkness I could not tell how. In the mean time our little craft came near going to the bottom. She was under water from her cat-head to her taffrail on the lee side. The man at the wheel had to get upon the wheel-box, the water was so high where he stood. When he first heard my order he put the wheel down, but finding the vessel was going so low he became frightened, and kept her off before it again, thinking that the safest thing to do. The man I sent to the peak-halyards, though he was floated off his feet by the rush of water on the lee side of the mainmast,

managed to get the halyards clear and let them go by the run. This reduced the sail considerably, and the first fury of the squall being past the schooner shook some of the water off her deck, and though she was still running at an appalling rate she kept afloat until we could shorten sail still more.

While all this was happening, which took but a few moments, finding I could not clear the throat-halyards and, execrating the "peddler" who had made them fast, I jumped to the companion-way and sung out to the men below, "Jump up here, boys! Jump for your lives, and let's get the sail off of her!" Up they rushed, and we soon had the mainsail and jib down, and, under her foresail, the Marion once more rose buoyantly over the waves. We double reefed the mainsail and took the bonnet out of the jib and put them on her again, determined, of course, to make all we could out of the fair wind. It was foggy at 8 a. m. At 10 o'clock the wind had hauled so far to the westward that we could not head our course. At 11.30 a. m. the fog cleared off and the sun came out, so that I got a meridian observation. Our latitude was 44° 13′ N. At 12.30 p. m. there *was a moderate breeze W. and we turned out the reefs and set all sail. At 5 p. m. the wind was* backing to the SW., and the barometer, which had been falling slowly since morning, then stood on 29.50. At 6 p. m. there was a smart southerly breeze. At 8 o'clock the wind changed very suddenly to W., and blew so heavily that we reefed fore and aft. Feeling very much fatigued I turned in after everything was set in proper shape, having first told the watch to pass along the word for the men who came on watch later to keep their eyes peeled and if there was any change in the wind, either in force or direction, or if it looked squally, to give me a call. "Ay, ay, sir," was the answer down the companion-way; and taking off my oil-clothes but leaving my boots on and my sou'wester within reach of my hand, ready for a quick jump on deck, I crawled wearily into my bunk to get the rest I so much stood in need of, as I had got only one hour's sleep in the previous thirty-nine.

Friday, March 15, 1878.—"Say, skip! it looks wild and squally, too, to wind'ard," was the call that awoke me at 1 a. m. I sprang out, all standing, and grabbing my sou'wester in one hand as I went, I started for the companion-way to take a look at the weather. The watch had already gone on deck, and was standing on the quarter, waiting for my decision. To windward were heavy masses of dark, inky clouds, that appeared to be driven and whirled around by the wind. "Rouse 'em out forward; and then stand by the foresheet!" I shouted to the watch, while I dodged below to call the after crowd, and to get my oil-clothes on. The squall was not so bad as it looked, but it blew strong, though we took in no sail, since the men were stationed at the sheets and halyards ready to let them run if necessary. The wind at this time was W. by N., blowing heavy, but towards morning it backed to W. and moderated some. At daylight we shook the reefs out of the mainsail and foresail. During the forenoon the wind was quite moderate, and we set the staysail. At noon the sky was overcast, as it had been all the first part of the day, precluding the possibility of getting any observations. Our position at noon by dead reckoning was 45° north latitude and 57° west longitude. We tacked at noon and stood to the southwest. The wind at this time still continued moderate, notwithstanding the barometer was down to 29.55. At 2.30 p. m. the wind hauled to about north. It was moderate at first, but later it blew up fresh. We sounded on the eastern part of Banquereau at 7 p. m. We took in the staysail at 8, and reefed the mainsail at 11.30 p. m. The air at this time was growing cold, and the wind backing westerly, blowing heavy with strong puffs. In the squalls the Marion had all she could do to stand up under her canvas and she went surging along, through the choppy head sea, with her lee side buried, and showers of spray flying over her bow almost to the top of her reefed mainsail.

***Saturday, March* 16, 1878.—At 5 a. m. the puffs came so heavy that we double reefed the**

foresail and took the bonnet out of the jib. We sounded at this hour on the southwest part of Banquereau in 70 fathoms. After the jib and reefed foresail were set, we steered W. by S., and at 9 a. m. sounded on the Western Bank in 52 fathoms. It has been cold during the past night and this morning, and the vessel has made considerable ice. At 10 o'clock a. m. we saw two vessels at anchor to leeward. At noon we shook the reef out of the foresail. At 2.30 p. m. turned the reef out of the mainsail and put the bonnet in the jib. The sky at this time was dark and overcast; barometer 30. At 5 p. m. I sent a man aloft to lash the backstay outriggers to the after cross trees, and then we set the staysail. An hour later we sprung the topmast, at the mast-hole below the cap, and took the stay-sail in. At 7.30 it was moderate and we set the gaff-topsail. It still continued cold. If I had thought, when we passed those vessels, that it would have moderated so soon, I should have stopped and had a try for halibut; it is now too late to repent.

Sunday, March 17, 1878.—This morning was fine and clear, with a moderate breeze, which was gradually backing to the westward, and with some indications of a southerly wind. At 9 a. m. we tacked to the northwest, and having previously put a lashing around our topmast, where it was sprung, we set the staysail. Our position at noon by observation was 42° 40′ north latitude, and 61° 39′ west longitude. Longitude at 4 p. m., 62° 05′ W. There was a light breeze WSW. in the afternoon, and St. Patrick's day has been the only fine one that we have seen since March came in.

Monday, March 18, 1878.—At 4 a. m. the wind was SE. by E., breezing up fast and accompanied by rain. We took in the light sails. At 7 a. m. the wind was ESE., blowing heavy in the rain-squalls. We took in the mainsail, reefed and furled it. At 11.30 a. m. there was less wind, and we set the whole mainsail. At noon the wind veered some to the southward, but soon died away almost calm, leaving the sea all up in heaps. All we could do was to keep right before the sea. Fortunately we could do this and still be on our course. After 2 o'clock the sun came out bright and clear. I got a set of altitudes of the sun and worked them out by "Sumner's method." At 4 p. m. latitude 42° 42′ N., longitude 65° 22′ W. In the last part of this p. m. there was a brisk southwest breeze.

Tuesday, March 19, 1878.—At 3.30 a m. the wind came from the northward and there were indications of a strong breeze. We clewed up the gaff-topsail. There was a good whole sail breeze all the forenoon, but about noon it moderated and began to back to the westward. We set the gaff-topsail at noon. Latitude by meridian observation, 42° 56′ N. At 2 p. m. the wind was W. and we tacked and stood to the northward. At 2.30 p. m. there was a moderate breeze W. by S., and we set the staysail. Barometer at this time 29.70. At 4 p. m. I got an observation and found our longitude to be 68° 12′ W. During the latter part of this p. m. the wind was light and variable.

Wednesday, March 20, 1878.—At 3 a. m. we made Matinicus Rock lights, and a few minutes later we saw Monhegan light. At 6.40 we tacked between Matinicus and Monhegan. There was a fresh breeze NW. by W. at this time, and I noticed that the barometer had fallen considerably since last night. At 9 a. m. we passed to the northward of Monhegan. There was a strong whole sail breeze from NW. at this time. From Monhegan to Cape Elizabeth, which we passed 12 miles to leeward of, the Marion had all she could "smother to," as some of our men remarked. Sometimes in the flaws we had to "light her up," for a minute or two, to shake off the water, and then we would give it to her again. At 3.30 p. m. we could carry it no longer, so we hauled down the mainsail and double-reefed it, and at 4 o'clock, when just to the westward of Cape Elizabeth, we had a very heavy white squall. There was a large coasting schooner to windward, and seeing her douse her canvas gave us a good warning. From the top of the house I saw it coming over the water, rolling up a feather white sheet of foam and spray before it. "Haul down the foresail and put a double reef in it," I shouted out to the men who were waiting for the order. We had,

besides the reefed mainsail, the whole jib set, and I thought it would burst when the squall struck into it. So I sang out at the top of my voice, "Leave the foresail and man the jib-downhaul, and let's get the jib down before it goes to pieces." All being ready, the halyards were let go, but it was a hard job to haul the sail down. The force of wind striking in the sail would send it surging up and down the stay, as though it would tear itself clear off the hanks. After it was down we took both bonnets out, and setting that and the reefed foresail, we let the vessel go to the westward again under her double reefs, which were quite enough, for she frequently buried her lee rail and filled the lee side with water. We passed Thatcher's Island at 9.30 p. m. Just before midnight we came to anchor off the steamboat wharf, in Gloucester harbor, and having furled the sails, &c., we hoisted out a dory, and all the married men went home.

Thursday, March 21, 1878.—After breakfast, I went down to the fresh-halibut establishments and tried to sell our fish. Halibut were very low, and the gentlemen who composed the halibut firms did not seem inclined to make any offer, so I determined to go to Boston for a market. The Howard, which got in this a. m., was going with us, but when the "hawkers" found we were about to start, they came down and made us a more liberal offer, and we sold to the Atlantic Company for 3½ cents per pound right through for white and gray. We hove up our anchor and dropped into the halibut wharf, but did not take any fish out to-day.

Friday, March 22, 1878.—We took our fish out this forenoon and hauled to our own wharf at noon. We weighed out 20,000 pounds. Our net stock was $334.40, and share $11.44. It is quite needless to make any comments on these two last trips. Let it suffice to say that we are not the only ones who have made poor fares; even moderately good trips, being an exception rather than a rule this winter. Even with large fares of fish, as we had on our last trip before this, little could be made owing to the low price.*

Friday, January 24, 1879.—It being understood that we should sail to-day, the boys all put in an appearance at the wharf between 8 and 9 a. m., many of them bringing under their arms a small calico bag containing a supply of clean clothes for the trip, and nearly all getting a quantity of tobacco and pipes at the store; the order to the clerk generally being as follows: "Say, Archie, give us two pound terbaccer and a half dozen T. D.'s" (the common clay pipes with "T. D." marked on the bowl.)

A noticeable absence of shore clothes, the hasty running for this and that article forgotten until the last moment, and the pulling here and hauling there, gave evidence that a "start" was contemplated.

In the mean time the cook built a fire in his cooking stove and began making preparations for dinner.

All were ready at last, and just before noon the sails were hoisted and we filled away from the wharf. As the city clock struck twelve we passed the "fort," beating out of the harbor with a moderate southwest breeze.

After passing Eastern Point, at the harbor's mouth, we set the staysail and shaped our course E. by S. for the Banks, and so as to pass several miles to the southward of Cape Sable, Nova Scotia.

In the mean time the ropes were coiled, dories turned bottom up and securely lashed, and the vessel pumped out; while our ears, as we turned the "Point," were pleasantly greeted by the

*The two trips made in the beginning of 1878, the second of which has been described in the foregoing pages, were the most unremunerative I ever made. The one alluded to above will serve as an example of the extreme of poor fares, not so much in the quantity of fish taken (for profitable voyages have often been made with no more) but as showing both a limited catch and a low price. On the previous trip, though a large quantity of halibut was taken, the financial results were even worse than those given above, the men sharing only a little more than $8 apiece.

clang of the cook's dinner bell, calling us away from "straightening up things on deck." The crew is divided into two gangs for meals, the table in the forecastle not being large enough to accommodate all. One of the second gang now came aft saying, "I'll keep her along, skipper, while you get dinner;" whereupon I gave up the wheel, which I had held since starting, and went with the first gang down to dinner. For dinner we had the usual first meal at sea, which, hastily prepared, generally consists of boiled salt beef and potatoes, with biscuits, pilot-bread and butter, strong tea, and fried beefsteak. This bill of fare is very much changed as soon as the "doctor" (cook) has time to prepare a greater variety, and, though beefsteak or other fresh meat is rarely seen after the first few days out, the table is well provided with plenty of good raised bread, cakes, pies, duff, &c., and last, though not least, the finest fish are served up in a manner rarely equaled elsewhere.

After dinner the patent log was put out, a note made of the bearing and distance of the land, and then everybody was called aft to "thumb the hat," in order that the watch might be set. All hands stand around an inverted hat, taking hold of it so that their thumbs are on top of the rim. The skipper then turns away his head, and, reaching over, touches one of the thumbs, and then counts around from left to right any number previously decided upon. The first one that the count reaches has the first watch. The counting then begins at the next thumb with "one," and so on until each man knows his watch, and with the injunction, "Remember now, whom you call," the performance ends, and the one having the first watch takes the wheel.

On board of trawling vessels it is very common for dorymates to stand watch together on a passage, and in this case only half of the crew "thumb the hat," they choosing their mates to stand with them. After the watch was set most of the men turned in and took a nap, while one or two busied themselves ganging hooks, &c.

At 3 p. m., the wind having increased to a smart breeze, we took in the staysail and gaff-topsail. At 5 p. m., barometer 30.15; smurry-looking under the sun. The wind increased some after 5, and the sea made up sharp.

A little before 7 o'clock p. m. our vessel took a heavy lurch to leeward, sending her lee rail so far under that, when she straightened up, the deck was nearly full, and several bucketsful came down the companion-way over the lower cabin door, which sets about 18 inches above the deck, wetting the bed-clothes in the lee-bunks, and also the boots lying on the floor. This episode called forth exclamations more forcible than polite from the occupants of the lee bunks, and shouts of laughter from their companions who could see only the ludicrous side of the accident. The sea by this time had risen sharp and choppy, and so frequent were the lurches—the main-boom often going under to the slings—that we soon after double reefed the mainsail. This done, I went below for the night, giving the usual order to "call me if there is any change in the force or direction of the wind."

After the reefed mainsail was set we hauled the log and found that we had made an average of 10 knots since we passed Thatcher's Island. Barometer at 8 p. m., 30.05. Strong breeze all the latter part of this p. m.

Saturday, January 25, 1879.—The wind had moderated some at 7 a. m., and hauled to WSW. Barometer at this hour, 29.70; sky overcast. We shook the reef out of the mainsail and set the light sails.

Soon after breakfast the hatches were taken off and the men took the trawls on deck and began rigging them up by bending the gangings, that had been unbent on the last passage home, into the beckets on the ground line. Each hook before being attached to the trawl undergoes a critical examination, and if dull must be touched up with a file, if crooked, straightened into

proper shape, or, if the hook cannot be fixed so that it will serve all purposes, it is condemned and thrown aside; if a ganging is poor, the hook attached to it is also thrown aside to be reganged. The trawls are marked in various ways with the number of the boat they belong to, and as they are passed on deck each dory's crew stand by to select or claim their own gear. When the marks happen to be indistinct on a good trawl, considerable discussion about the ownership frequently takes place; as all who have to rig new trawls or have some that are nearly worn out are eager to get it, and several will declare it is theirs and point out some peculiarity in the rig which they claim no one else has but themselves. Some put in a claim, just for fun, to make the other claimants talk more earnestly; and considerable amusement is occasioned in this way, the non-contestants always urging on the others and laughing.

At last, all differences being satisfactorily settled, the men take up their stations on different parts of the deck, and the work of "fixing up" the trawls goes briskly on, many of the workers singing some ballad of the sea or telling their chums long stories of experiences which they met with while last on shore.

At 9 a. m. the wind hauled so far to the westward that we took in the staysail and winged the foresail. At 10 o'clock we jibed the mainsail, bringing the main-boom on the starboard side. The wind was quite light after 10, and weather hazy. At 2 p. m. we made Seal Island, Nova Scotia, bearing NE. by N., 8 miles distant. The work on the gear was completed at 4 p. m., and the trawls were stowed below. At 7 p. m. barometer 29.40; wind WSW., and breezing up; sky overcast. The barometer continued to fall, and at 8.30 stood on 29.30 and vibrating very much. The night was intensely dark, with "spitting" snow in the air. I considered the danger of being struck with a squall so imminent that, notwithstanding the wind was light, we took in the gaff-topsail and mainsail at 9 p. m. and furled them up.

Sunday, January 26, 1879.—This day began with a strong breeze WNW., and the barometer, which was on 29.15, indicated still more wind. The night or early morning was exceedingly dark, and having previously taken in and furled the mainsail and gaff-topsail, we double-reefed the foresail at 1.20 a. m., and took the bonnet out of the jib. At this time the wind was increasing rapidly, blowing in sharp puffs, and hauling to NNE., while it grew cold very fast, causing the flying spray to soon congeal into ice on the rigging and such portions of the hull as were not under water when the vessel lurched. At 4.30 a. m. the wind had freshened to a gale, and the sea ran sharp and high, causing our vessel, which was running with the wind abeam, to occasionally take a heavy lurch to leeward. Fearing the dories might be injured if we continued on our course, we furled the jib and hove to under the reefed foresail until 7 o'clock in the morning, at which time we kept off again, the wind in the interim having changed to NNW., which was fair for us, though it was blowing hard.* It was bitterly cold all the morning and ice made rapidly on deck and about the rigging. Nevertheless, we set the jib and riding-sail soon after breakfast, and a half hour later saw a vessel at anchor ahead, which, as we approached nearer, we knew was the Everett Steele. There was no one to be seen on her deck, and as we passed close to her stern our men, most of whom had gathered aft on the quarter, joined in a general shout. This had the desired effect of frightening her crew, and four or five of the Steele's men rushed up, bareheaded and stockingfooted, to be greeted by the laughter and shouts of our fellows as we went dashing by. At 10 o'clock a. m. we passed a brig which was lying to under main-staysail. She was badly iced up, and appeared to be laboring heavily, rolling her lee yard-arms nearly to the surface of the water.

* The schooner Howard, of Gloucester, in which I had formerly sailed, was knocked down and came near being lost in this gale; the Thresher, of the same port, also had her deck swept, and it is believed by many that the Gwendolen, which was also bound to the Banks, went down the same day, since she was never seen afterwards.

To one standing upon the deck of our little schooner at this time, the scene, though grand and impressive, had a decidedly wintry and dreary look. The ice-covered hull and rigging, the dark masses of snow-laden clouds driven to leeward by the gale, which shrieked and whistled through the ropes and lashed into the wildest fury the foam-flecked waters, piling them into huge waves, was a sight that, once seen, could never be forgotten. But on we went, now plunging down the side of a great wave, again lurching heavily, filling the deck with water, which, as the vessel straightened up again, went dashing over to the weather-side, often out over the rail, and some of it finding its way, through the binnacle, into the cabin.

The remark of one of our boys that "any one who can't swim had better take a back seat" was certainly very apt, but the gravity of the situation, and the dangers incident to running in such a gale, with the sea on the quarter, were better expressed by the order, frequently shouted to the man at the wheel, "Watch her sharp, now! Keep your eye to wind'ard, and if you see a big one coming, swing her off and let her take it stern-to."

During the afternoon there was a nasty and dangerous cross-sea running, rendering it extremely unsafe to continue on our course during the night. We therefore took in the jib and furled it before dark, and at 5 o'clock p. m. hove to under double-reefed foresail and riding-sail. At 7 p. m. the gale still continued with undiminished force, but, like a gull with its head under its wing, our little vessel rises and falls, safely breasting the foam-crested waves as they go seething by, leaving behind them a phosphorescent track, which lights up the surrounding darkness, in a peculiarly weird manner. Thus closes this day, the events of which I now sit down to write before turning in for the night.

Monday, January 27, 1879.—We kept off again at 6 a. m. At this time the wind still blew a gale. The sky was overcast with heavy leaden-looking clouds, varied occasionally by a wild-looking black and scurrying snow squall, driving along to leeward. The barometer had risen to 30.00. It still remained as cold as yesterday. We set the jib at 7, and shook the reef out of the foresail at 7.30 a. m. The wind had lulled some at this time, though it still blew heavy in the squalls. When these struck in the sails, the Marion would tremble and quiver like a leaf, and, settling down to her work, roll up the white water under her bows, sending sheets of foam and spray hissing off to leeward. At 10 a. m. we passed about half a mile to windward of a large brig rigged steamship. She was heading to the westward and had fore and main trysails and close-reefed fore and main topsails set; was badly iced up and going slow. As a general thing we go along first-rate. Sometimes, however, our schooner takes a heavy lurch to leeward, sending the lee rail under out of sight. When she straightens up again the water rushes to windward, often going over the weather rail, but more frequently filling the binnacle, and thereby finding its way into the lee bunks, and calling forth emphatic exclamations from those who are thus unfortunate enough to have wet boots and bed-clothes. The clouds were broken at noon. I got a meridian observation and found our latitude to be 42° 39′ N. We made an average of ten knots this forenoon. The wind decreased a little in the afternoon, and there was a decided change in the temperature, so much so that the ice on deck grew softer. At 4 p. m. a "flopper" broke over the quarter, some of which came into the cabin and wet the book in which I am writing my journal. This is a bad time for writing, but I shall not soon get a better chance, and this one must therefore be improved. The wind veered gradually to the westward in the afternoon, and at 6 p. m. was WNW.; barometer, 29.95. At 8.30 p. m. there was somewhat less wind and smoother sea.

Tuesday, January 28, 1879.—The wind moderated gradually after midnight, and at 2.30 a. m. called all hands, unbent the riding-sail, and set the mainsail and staysail. Light baffling airs and calms at 6 a. m., with indications of an easterly wind. Barometer, 30.10. At 7.30 a. m. a light breeze sprang up from SE. by E. We tacked, and headed to the eastward on the starboard tack;

set the light sails. All hands busy this morning clearing the ice off the deck and rigging. The sky overcast all day. There was a moderate breeze all day from SE. to SSE., and the barometer remained steady. Our position at 4 p. m. by dead reckoning was 42° 32′ north latitude and 57° 2′ west longitude. At 7 p. m. the wind had increased to such a smart breeze that we took in the light sails. The latter part of this p. m. there was a strong whole sail breeze, as much wind as our vessel could swing her three lower sails to.

Wednesday, January 29, 1879.—There was a good whole sail breeze the first of this a. m. The morning broke red in the east, but overcast elsewhere. Barometer falling; on 29.85 at 6.30 a. m. The wind at this time was SE. and freshening, and our schooner had all she could stagger under. We double reefed the mainsail and took the bonnet out of the jib at 7.30 a. m. The wind blew steady and strong all the forenoon, but lulled some at noon and backed a trifle to the eastward; rain and hail showers. At 3.30 p. m. we changed the color of the water from dark blue to a whitish green. We shot to in the wind and sounded, but got no bottom with 150 fathoms out. The wind freshened again at 1 p. m., and all the afternoon it blew steady and strong, accompanied with rain and hail. We tacked at 4.45 p. m. and headed to the southward, with our port tacks aboard. Barometer at 8.30 p. m., 29.60. At 11 p. m., the wind having veered some to the southward, we tacked again, and headed to the eastward on the starboard tack.

Thursday, January 30, 1879.—The first part of this a. m. there was little or no wind, but as the barometer was down to 29.50 I expected a change to the westward; therefore I concluded to leave the reef in the mainsail until after breakfast, when, a light breeze having sprung up from the SW., we set the whole mainsail and staysail. At 8 a. m. saw a four-masted steamer going to the westward. Our position at noon was 44° 17′ north latitude and 54° 30′ west longitude. Barometer at noon, 29.40. When the men learned the position they began sharpening their bait knives and fixing other things preparatory to setting the trawls. Longitude at 3.20 p. m., 53° 46′ W. Barometer at 7.30 p. m., 29.55, at which time there was a fine southwest breeze, but later the wind moderated. We sounded at 10 p. m. in 110 fathoms, but as there were no vessels in sight we hauled to nearly by the wind and steered SSE., along the western edge of the Grand Bank.

Friday, January 31, 1879.—The early part of this a. m. it was calm. At 6 a. m. light WNW. breeze. Barometer, 29.40. We sounded at 6 o'clock in 65 fathoms, and soon after we saw two fishing vessels (one under sail and the other at anchor) to the SW. of us. We hauled aft our sheets and steered for the one at anchor, which proved to be the Magic. I spoke her. The skipper reported halibut very scarce on all parts of the Bank where he had tried or had heard from. He told me that the schooner under sail was the William Thompson. We saw two more vessels at anchor to the NNW., just in sight. We set the staysail and worked up to them; they were the Addison Center and A. M. Williams. I went aboard of the Center. She lay in 160 fathoms. The skipper told me that he got 7,000 pounds of halibut yesterday, but only 500 pounds to-day, and he was going to get under way and shift his position. He says that there has been plenty of fish here, and their present scarcity proves that they are on the move, as they usually are at this season. He also said that all the fleet had left the southern part of the Bank, and thinks many of them have gone farther to the northward. I had previously formed the same opinions in regard to the movements of the vessels and fish. So after a brief stay I returned to our vessel, filled away, and stood to the northward again. At noon we spoke the Alice M. Williams at anchor in 170 fathoms, and soon after the Gatherer in 160 fathoms. Both of them had done very poorly and were heaving up their anchors. These vessels were anchored from latitude 44° (where the Magic lay) to about 44° 8′ (where the Gatherer lay). We spoke the George W. Stetson at 1.50 p. m. in 80 fathoms, and about 44° 17′ latitude. She was heaving up, too, not having taken any fish

to-day. We saw the Laura Nelson under "bank sail" standing to the northward, but did not speak her. We worked to windward all day until we got up to about 44° 25′ north latitude. At 5 p. m. we passed astern of the Polar Wave, but as it was getting late in the afternoon I concluded not to speak with her. The wind, which had been increasing since noon, and was now NW., blew a stiff breeze at this time, as much as we could carry the three lower sails to, and it looked wild and squally. The barometer was down to 29.25, which, with the appearance of the sky, made me apprehensive of a considerable increase of wind, therefore I thought best to anchor in shoal water. We anchored a berth NNE. of the Polar Wave, in 90 fathoms. We also saw two more vessels at anchor just in sight to windward. The A. M. Williams spoke us this evening, and later she anchored a berth NNE. from us.

Saturday, February 1, 1879.—This day begins with strong west-northwest wind; sky overcast with dark heavy clouds; barometer at 6 a. m. on 29.15. The clouds were broken at noon, which enabled me to get an observation of the sun; latitude 44° 25′ N. By an afternoon "sight" I found our longitude to be 52° 58′ W. I have a different chronometer this trip from that I had before, and I think it is a better one.

The wind blew steady and strong all day; not heavy, but still too much to send dories out. There were some snow squalls in the forenoon, but at noon and during the afternoon the clouds looked broken and fine, although the barometer still keeps low, as in the morning. The Gatherer passed across our stern this afternoon, and later she anchored a berth to the westward of us. We caught a halibut this afternoon on a "bull-tow."* Two of our men are on the sick list with very bad colds, and as I have to be both nurse and doctor, I am busy most of the time.

Sunday, February 2, 1879.—The first part of this a. m. it was calm, but as the barometer was falling instead of rising, we waited until daylight before we put our dories out. At daylight there was a light southwest air and the weather looked clear and fine. Barometer 29.05. We set 8 skates of trawl, baited with herring, in order to get some codfish, &c., for bait. Went to haul at 10.30 a. m. The wind at this time was breezing up SSW., and it looked wild and threatening in the west and northwest, and as the glass was so low I had some anxiety lest some of the dories would get caught out in a squall. We got about 1,000 pounds of small halibut. About the time that the dories got aboard the wind blew up smart, so we took them in on deck. Baited 12 skates of trawl at 1 p. m. I saw the Gatherer's flag in the rigging for her dories to go aboard. It was blowing strong at that time and looked very wild, but at 2.30 p. m. it was calm; such are some of the changes and uncertainties of the winds and weather here. When the wind died away we hoisted our dories out and set the 12 skates of trawl we had baited. The barometer has been down on 29.00 nearly all day.

The latter part of this p. m. the sky was cloudless. Since it was calm, and a bright moon shining, it justified the remark of one of the men, who asked, "What in thunder ails that old barometer? A finer night than this never shone out of the heavens." There is a heavy ground-swell, however, which tells quite plainly that a gale is blowing at a distance.

Monday, February 3, 1879.—We had a rain-squall before daylight. At 6 a. m. there was a brisk breeze SW. by S. The weather to windward looked dirty, and the barometer was down to 28.90. The sick man was quite comfortable in the morning. He said he felt "first rate." I think with care, he will come out all right in a few days, but he has had a narrow escape from a fever. Of course, on account of his sickness, I had to go in a dory myself this morning, and my parting injunction to

* "Bull-tow" or "boulter" is the Newfoundland vernacular for trawl-line. Bull-tow with American fishermen is a short piece of trawl (15 or 20 hooks) set from the vessel, with one end allowed to swing free with the tide; the other made fast to an anchor. The bull-tow is lowered carefully down to prevent the hooks from fouling the buoy-line. After it is on bottom the buoy-line is made fast somewhere on the after part of the vessel, and it is generally allowed to remain out from two to four hours before it is hauled.

all hands, as we left the side, was: "Now, boys, you all know that the glass is low, and you must make your own almanacs. If you see a squall coming, or find that it is breezing up, you'd better strike for the vessel." Our trawl was to windward of the beam. We pulled for the outer buoy, but before we got out to it a wild-looking snow squall was coming down on us like a race horse from the WSW. I thought by the looks of it that it would "make things hum" when it struck, and said *to Phil. Merchant, my dorymate, "I think we'd better slew around and scatter for the vessel. We're* to windward, and are all right ourselves, but if the squall strikes as heavy as it looks, those fellows to leeward can never pull up in the world, and the best thing we can do is to get aboard as soon as we can and pay our dory down to them." Accordingly we kept off and pulled for the vessel, but before we got far the squall was upon us. It blew smart for awhile, but there was not as *much wind and snow as I had expected there would be. Three of the dories reached the side just* after we did, but there were two others out, one which was dead to leeward and one to windward, the crews of which held on. The trawl which the men in the lee dory was hauling parted just as the squall struck, and they tried to pull up. At first they could not gain any, but after it lulled a little they made out to reach the dory which we had paid down to them and hauled up by the buoy-line. *The dory which was to windward got about a skate and a half of trawl, but as it began to* blow hard again after a little while, the wind also veering westerly, the men cut the trawl and came aboard. One of the dories got a hole knocked in her side alongside of the vessel, which we repaired after they were all in. We bent the ridingsail after all hands got aboard and hoisted it up. At 8.30 a. m. wind W., blowing a smart breeze. One of the men is catching some kittywake gulls for a "pot-pie." At 10 a. m. strong and very dense snow squalls. At 11 it was blowing heavy; we stuck out 100 fathoms more cable. At 1.45 p. m. it blew a gale W. by N., with a bad *sea running. We stuck out some more cable; put all the gear below; set the dories amidships;* reefed the foresail and ridingsail, and made all ready for a heavy gale.

A sea-hen (great skua gull) came quite close to the vessel to-day, but, although I was anxious to obtain so rare a bird, it blew so hard that it would have been only useless cruelty to shoot it, for it would be impossible to get it if I succeeded in killing it.

The wind gradually veered toward the NW., and at 5 p. m. was NW. by W., still blowing a gale; barometer 29.10. At 9 p. m. wind W. by N.; barometer 29.30.

Tuesday, February 4, 1879.—At 6.30 a. m. a fishing schooner passed across our bow under double-reefed foresail, ridingsail, and jib, with both bonnets out. At this time the wind was W. and not blowing so hard as it blew yesterday. Sky overcast; barometer 29.35.

After breakfast we began to heave in cable. It was a slow, hard job, but we managed to get 100 fathoms of it in at 10 a. m. There were frequent snow and hail squalls and some breaking seas in the forenoon. After dinner the weather looked a little better and we went out and hauled our gear. We lost one skate of trawl and got 2,000 pounds of halibut. We began to heave up at 3 p. m. I saw several vessels under way this afternoon. At 5 p. m. wind WSW.; sky overcast; barometer 29.55.

We got our anchor up at 6.30 p. m., set bank-sail and staysail, and stood to the NW. on the wind. We dressed our fish and baited twelve skates of trawl. Our sick man was much better this afternoon. He helped us heave up the anchor and baited his trawl. The wind was light in the evening and in the last part of this p. m. nearly calm.

Wednesday, February 5, 1879.—Calm in the first part of this a. m., but at 2 o'clock it began to breeze up, and at 6 a. m. there was a fresh northwest breeze and windy looking sky; barometer 29.85. We kept under way, working to the NW. all of the past night. At 7 a. m. we saw two

vessels at anchor to windward, which were just in sight. At 8 o'clock there was a smart whole sail breeze, with snow and hail squalls, sun-dogs, and rainbows.

At 10 a. m., having worked up to the vessels we sighted in the morning, I went aboard of the N. H. Phillips, Capt. Jerome McDonald. He was lying in 140 fathoms and was getting good fishing; had 8,000 pounds of halibut, or thereabouts, on deck, and one-third of his gear yet to haul. I made only a brief stay. The Alice M. Williams lay a berth to the northward of the Phillips. We worked up and passed across the bow of the Williams and anchored a berth W. by S. from her in 130 fathoms. We were then about a mile and a half from the Phillips. We set our gear at 1.30 p. m. The tide ran to windward, so we put three men in a dory and set the trawls in four strings, three skates in each, in that direction. By "doubling up" in this manner we had in each dory two men to pull—that number being required—and one to throw the trawl. I went out in one of the dories. By the time the trawl was all out it blew a strong breeze, and there were some very sharp combing seas, which were bad for a dory. We all got aboard safe, but our dory came near swamping, or upsetting, while we were pulling before the wind for the vessel. A combing sea caught her on its crest and broke over and around her. For a moment she seemed like an egg-shell amidst the great mass of snowy foam which seethed and whirled around us. Fortunately she shipped but little water, and, thanks to steady, cool hands at the oars, she came out of it all right. Two of the Alice M. Williams's crew were aboard of our vessel while we were out setting the trawls. They had set their trawl about the time we put ours out, and, as their outer buoy was very near our vessel, they came aboard of us and staid a few minutes. They said that they got about 4,000 pounds of halibut to-day, but I think they are in too shallow water to catch many fish.

Our position by dead reckoning is 44° 31′ north latitude and 63° 41′ west longitude. At 8 p. m., no change in wind or weather; barometer, 29.55.

Thursday, February 6, 1879.—This morning was dark and gloomy looking, with a fresh west-northwest breeze and rough sea; barometer, 29.60.

As soon as it was light we put the dories out. Five of them went to haul the trawls, while the sixth one set three skates of trawl, which we baited yesterday afternoon after we had set the others. Our sick man had so far recovered this morning that he was able to take his place in his dory again. The wind died away soon after the men went out, and in the afternoon it was almost calm, though the sea still kept up. The Williams got under way at noon, and anchored a berth NW. from us at 5 p. m. We lost two skates of trawl, and another, which is afoul of the cable, I do not expect is any better than lost. On the remaining twelve skates we got about 12,000 pounds of very fine halibut, both as regards size and color. I think about half of them are white. Their weight varies from about 30 to 80 pounds each; very few go over 100 pounds. We set eighteen skates of trawl this p. m. After the men returned from setting, we hove in 100 fathoms of cable, and then dressed and iced the fish.

At 5 p. m. the wind breezed up NE., and later it hauled to ENE. We had light showers of hail in the evening. At 8 p. m., wind light; barometer, 29.55. We got through work at 9.20 p. m.

Friday, February 7, 1879.—This morning broke dark and cloudy, but, as there was only a moderate northerly breeze and a fair prospect of getting our gear without any danger, I did not feel like complaining (a rarity for a fisherman). Barometer at 6 a. m., 29.65. We got only 6,000 pounds of fish to-day. Nearly all of those were on the western ends of the trawls, which leads me to think that the halibut are working that way. We therefore began to heave up the anchor as soon as we had eaten dinner (11.30 a. m.), and had it on the bow at 2.15 p. m. There were frequent snow showers while we were doing this. The wind backed to NW., but still continued moderate. Under bank-

sail and staysail, we worked to windward of the Williams, and at 5 p. m. anchored a berth NNW. of her in 130 fathoms. I spoke one of her dories while we were beating up to our new berth. The men told me that they got 15,000 pounds of halibut to-day. After anchoring, we set eighteen skates of trawl. It was snowing when the men went out to set. Barometer at 5 p. m., 29.60.

I saw five vessels under way to-day; one under whole sail beat up from to leeward, and now (5.30 p. m.) is up to the Williams; one to leeward 6 or 7 miles made a short berth; one to windward about the same distance made a short berth. I saw two others just in sight to windward, and I think they are running this way, but am not certain. The one I saw under whole sail proved to be the Laura Nelson. She spoke us at 7 p. m., and said there were twenty-five sail of vessels to the southward "doing nothing," which, in fishermen's vernacular, means getting no fish. She anchored a berth NW. of us this evening.

Saturday, February 8, 1879.—The first of this a. m. we had frequent snow-squalls. The day began dark and cloudy, with a strong north-northwest wind. Barometer at 6 a. m., 29.55. The wind gradually increased, until at eleven it blew heavy and there were frequent smart snow-squalls. We stuck out some more cable. The wind blew strong all the afternoon, and there was a rough breaking sea. It is nothing unusual while sitting in the cabin for one to look out of the companion-way and see the water dripping off the end of the main-boom; for when the vessel's stern falls in the hollow of a sharp sea the end of the boom is frequently immersed to a depth of two or three feet. The cook set a short "bull-tow" (18 hooks) this afternoon and caught 6 fine halibut. Barometer at 8.30 p. m., 29.70.

Sunday, February 9, 1879.—The wind blew a gale all of the past night, and at daylight this morning it had abated very little. The wind was northwest, with a bad cross-sea heaving from the westward. Barometer at 7 a. m., 29.95.

I feel very anxious about the gear we have out. It is exceedingly trying to one's patience to know that there are plenty of halibut here and to have no chance to catch them. Since a few fine days would, in all probability, enable us to get a good fare, we indulge the hope of soon having better weather. It was colder to-day than I have seen it since we have been on the Bank. There was little or no change in the wind until late in the afternoon, when it lulled a bit and hauled to NNW. Barometer at 6 p. m., 30.15; at 8.30 p. m., 30.20.

The cook caught four halibut on his bull-tow this afternoon. At 7.30 p. m., though it still blew a strong breeze, we began to heave in cable, and hove as short as we dare to do, since if we got too short a scope the vessel might go adrift.

Monday, February 10, 1879.—At daylight this morning a southeast snow-storm was prevailing—a most undesirable condition of the weather. The wind began to breeze up at 2.30 a. m. and freshened very fast, while the barometer fell rapidly, and at 6 a. m. was on 29.85.

With the wind in this direction, all of our trawls were dead to leeward; and as it was blowing smart and rapidly increasing in strength, it was out of the question to try to get them. It is nevertheless very discouraging to have trawls, which are worth hundreds of dollars (and in all probability as many hundred dollars' worth of fish on them), setting so long, with no chance to get them. The longer they remain out the smaller the probability becomes of ever getting them at all. It is difficult under such circumstances for one to muster philosophy enough to endure it with patience.

At 7.30 a. m. it blew a gale. We gave her nearly the whole string of cable (about 375 fathoms we have out), reefed foresail and ridingsail; set dories amidships, &c. Barometer at 8.30 a. m., 29.60. Ten a. m., smart SSE. gale and thick snow. At 10.35 the watch sang out, "Here's a feller drifting down close to us." We were all on deck in a minute, but the first glance showed

that the vessel was drifting clear of us, and with the remark, "Oh, he's all right; he'll go clear of us," the crew went below again, all except the watch and myself. I tried to make out what vessel it was, but was unable to. The weather was so thick that, although she drifted by us not more than 150 fathoms distant, I could only see the blur of her hull and spars showing indistinctly through the snow and flying spray. I thought at first it was the N. H. Phillips, but afterwards, when the snow lit up, I saw that it was the A. M. Williams, and one, which probably was the Phillips, was also adrift about 2 miles to the eastward of us.

Barometer at noon 29.45, and indications of a sudden change of wind. At 12.30 p. m. the wind struck in a squall from the westward, but it did not last long. As soon as it moderated we manned the windlass and began to heave in cable. We had in 100 fathoms of cable at 3 p. m., at which time the wind began to breeze up again and the sky looked wild and squally. The Nelson must have gone adrift, too, for when the weather cleared she could not be seen.

A little land bird (a snow bunting) came aboard this afternoon. As an evidence of the strength of wing possessed by these little creatures it is only necessary to mention that the nearest land is Cape Freels, Newfoundland, 128 miles distant.

The southeaster and westerly squall left the sea all up in heaps, which, with the squally appearance of the weather, made it extremely hazardous, if not foolhardy, to attempt to get any of our trawls. After we got the cable stradded up, &c., at 4 p. m. we hoisted out a dory to go and look for the inner buoys. Three men went in her, who were told to see how many inner buoys they could find, and to lift them out of the water and see if the buoy-lines were chafed, &c. Strict orders were also given to them not to go far from the vessel if they valued their lives, for it was liable to blow a gale in fifteen minutes. They saw only two of the inner buoys, which were near the vessel. They also saw some of the other buoys, and disregarding orders, as well as their own safety, pulled out towards them and went quite close to them. They got back again just before dark in the midst of a thick snow squall. Fortunately the wind did not blow very heavy, or in all probability these men would have had a narrow chance to save their lives. It was taking too much risk for nothing, and it can be said of them that they are of that class whose courage can be more commended than their judgment.

At 6 p. m. it was nearly calm, and we hove in to a short scope, for I feared our cable might chafe on the bottom. Just as we got through heaving a puff struck NNE., but lasted only a short time. Barometer at 6 p. m., 29.25. The Williams spoke us at 7.15, and we ran down to where she was this morning and anchored. I saw her riding light at 7.45. At 8 p. m. the wind struck in a very heavy squall N. by W. This was what I had been expecting. We mustered on deck in a hurry, and stuck out nearly the whole string of cable. By the time we had the cable out, the wind, which was gaining in force, began to screech, and all the latter part of this p. m. it blew a hurricane N. by E., with dense snow. We had two men in a watch, one stationed on the fore-gaff and the other on the main, so as to be out of the way if the vessel shipped a sea. In this way the men kept the best lookout they could. But looking to windward is hardly possible in such a gale, with the snow, sleet, and spray driving furiously to leeward and nearly blinding whoever turns his face to windward. But the attempt must be made, for in such a gale there is imminent danger of some other vessels driving down across our hawse, and if these should not be seen in time for us to cut the cable, and thus prevent a collision, both would sink. One or the other of the watch occasionally comes below to look at the clock and ascertain how the time is passing, and also to get his breath. As they brush the snow and frozen spray from their eyes, hair, and beard, they often remark, "I tell yer what 'tis, this is a tough one. If this haint a regular old-fashioned screamer I never saw one." They are, however, confident of the ability of the vessel to ride

the gale out in safety, and to the question of "How does she ride?" they reply, "Ride? Why, she shames the gulls! But there's some wild seas going; some regular old tearers that give her all she can do to climb over them." *Barometer at 10 p. m., 29.45.*

Tuesday, February 11, 1879.—This morning at 7 o'clock the wind still blew a heavy gale, but its fury did not compare with that of last night. There was a high combing sea, but our vessel rose bravely over the sharp waves. The air was as it has been, quite cold, and there was some ice on deck. All the damage the vessel has sustained, so far, is one broken checker plank and the cleats knocked off two others; a damage so trifling as to be hardly worth mentioning. The barometer, at 7 a. m., stood at 30.05. There were no vessels in sight this morning, so it is evident that the Williams and Phillips both went adrift again last night. The sky was generally overcast in the morning, though here and there a patch of blue showed through the rifts in the clouds. It was a wild scene around us, but one which has so often been described that a repetition would be words wasted.

The little white gulls sit hovering on the water near the stern of the vessel, occasionally rising on a wing to clear a breaking wave, or to pick up any fish offal that may be washed from the scuppers.

At 3 p. m. a brig-rigged steamship passed across our stern, going to the westward, and a half hour later another of the same rig passed, going to the eastward. The wind blew a smart gale until the latter part of the afternoon, when it began to moderate some. At 6 p. m., barometer 30.25.

The men have been variously employed to-day, each to his own taste; some have been making mats out of buoy-line; others patching oil-clothes, reading, &c.; while one poor fellow with a penchant for card playing has been coaxing some one to play a game with him. "Anything you like," he says; "state your game, only say you'll play."

At supper time I ordered the cook to get on his boilers and heat some water, so that we can thaw the strad, and get the ice off the windlass, and later the order was given to the watch to pass along the word to give me a call if it moderated any more. I was called at 10.30 p. m., and we began to heave in cable. The wind at this time had backed to W. by N. and still blew a fresh breeze, making it slow, hard work heaving in cable.

Wednesday, February 12, 1879.—At 1 a. m. we got the "slack" cable (100 fathoms) hove in, went below, and all except the watch turned in again. At this time (1 a. m.) the air was milder, and the ice began to soften up and drop off the rigging and rails in some places. Before going below I ordered the watch to fix up the checker planks, and to tell the next watch to clear the ice off the dories.

The morning broke fine and clear, with a moderate westerly breeze. Barometer at 6 a. m., 30.30. Having had breakfast, our fellows were off to look for their trawls as soon as it was fairly light.

At 7 a. m. two vessels were in sight to the northward of us, under whole sail, heading this way, but as they frequently changed their course it was apparent that they were looking for gear. After awhile they both steered straight for us. They proved to be the Alice M. Williams and N. H. Phillips. Both skippers came aboard to find out if we had drifted any in the gale, for they knew if we still held on they could find their gear by the bearings and distance from our vessel, which they had observed before the gale came on. After shaking hands and the usual inquiries about each others' welfare, one said to me, "Did you ride it out?" I replied in the affirmative, when he continued, "What kind of a vessel have you got? I don't believe there's another vessel on the Bank that rode it out, and I didn't think any could—not in deep water. We've come thirty miles up the edge of the Bank, and there's not a vessel at anchor." I inquired of the skipper of

the Williams when he went adrift, and he replied that his vessel held on only about fifteen or twenty minutes after the squall struck. The two captains made a brief stay, but soon returned to their own vessels, and went in search of their gear.

I got good observations to-day, by which I found our position to be 44° 33′ north latitude, and 53° 46′ west longitude.

The skipper of the Andrew Leighton came aboard at 2.30 p. m. His vessel went adrift in the late gale, and in consequence he lost 18 skates of trawl, which were out, and these, together with previous losses, make 27 skates he has lost this trip, besides 75 fathoms of cable and two anchors. He told me that every vessel that was near where he was went adrift. He reports his trip as 20,000 pounds of halibut, but as he could see no probability of finding his gear, he said he should go home, which, under the circumstances, was about all he could do. The wind at this time (3 p. m.) was SSW., blowing a fresh breeze. After he returned to his own vessel he put the bonnet in the jib and started for home under three lower sails.

We got about 9,000 or 10,000 pounds of halibut to-day. Set twelve skates of trawl at 3.30 p. m. While the men were out setting the gear the Edwin C. Dolliver spoke us and then ran a short berth to the NNW., where she anchored. Soon afterwards the Phillips also spoke us and ran to the northward, how far I don't know, as it came on dark a short time after she passed us. The wind blew up smart at dark. We stuck out more cable and took our dories in before we began to dress the fish. After the dories were in we shoved them up forward as far as we could, so that they would be out of the way of our work. It was 9 p. m. when we got the fish dressed and the dories placed in their proper positions. At this time it was blowing strong and there were indications of a gale. Barometer 30, and falling quite fast. Thinking it best to get everything prepared for a gale before we turned in, I did not take off my oil-clothes, but sat down on the cabin floor to wait until the men in the ice-house got the fish iced. Feeling somewhat fatigued after the work and anxieties of the day, I soon fell asleep, but was awakened at 10.30 p. m., when the ice-house crowd came into the cabin. By this time the barometer had fallen to 29.80, and it was blowing heavily and storming. We manned the windlass, hove in the strad, and then stuck out some more cable and set the dories amidships.

Thursday, February 13, 1879.—At 7 a. m. wind SW., blowing heavily, with rough sea, thick fog, and drizzly rain. Barometer 29.60. At 9 o'clock the wind struck in a heavy westerly squall, and, thinking it would continue to blow a gale, I turned in and went to sleep. I waked at 10 a. m., but not hearing the familiar roar of breaking waves, and howling of the wind, I knew at once that it had moderated. I immediately turned out and inquired of the watch how long it had been since the wind died away. "Only about half an hour or less," he replied. "Why did you not call me before? You knew I wanted to be called if it died away," I said. "Well, I didn't know but it'd blow agin soon; it looks nuff like it," he answered in a dogged sort of manner. It could not be denied that it did look "nuff like it," nevertheless I told him to call the men forward and we would heave in some cable, at the same time rousing out the after crowd. We had hove in only about 30 fathoms before I knew by the bearings of the Dolliver that we were adrift. After the cable was in we found that it was chafed off square as an ax would cut it, and that we had lost 120 fathoms. It is probable that the cable was not on the bottom more than half an hour, and it must have come in contact with a very sharp rock to cut it off so quickly. Although the loss of cable is not an uncommon occurrence, I have generally been fortunate in that respect, never having lost so much before in the eighteen years I have been master of a fishing vessel. This is a special misfortune to us, too, at this par-

ticular time, for the good prospects which we had for obtaining a fine fare of halibut are thus ruined in an hour, since we have not cable enough left to ride in deep water. After we got the cable in, we set bank-sail and worked back to our gear. There was not more than a whole sail breeze at this time, but the sea still ran very high and sharp. As it was too late to haul the trawls before dark (with such a rough sea the gear would be liable to part, even if the dories did not upset), I concluded to keep under short sail through the night and "jog" around the Dolliver and Williams, the latter of which lay a berth to the northward of the Dolliver. I did not dare anchor for fear it might blow up; in which case we should certainly go adrift and thus lose all chance of getting our gear. By keeping under sail we can, if it blows up, run on the Bank into shallow water, only a short distance from our gear, and anchor. When it moderates we can then heave up and run back to it.

I went aboard of the Dolliver at 4 p. m. The skipper said he left home the 1st instant, was in Halifax the 3d, where he saw the Howard, which was in there for repairs. She had been knocked down in the gale of the 26th and 27th of January, had her deck swept, losing anchor and 80 fathoms of cable, also some of her dories. The Dolliver went adrift in the late gale. I returned to the Marion at 5 p. m. Barometer at 5.30, 29.90. Hazy looking in the WSW., but clear elsewhere.

Since there was a fresh breeze at this time we double reefed the foresail and took the bonnet out of the jib, in order to have the vessel under easy sail for the night. At 8 p. m. it was very dark, and we came near getting afoul the Dolliver's bow. Special orders had been given the watch not to cross her bow unless it was at a long distance. They mistook the distance until it was too late to keep off; the wind moderated just then, and the tide setting to leeward came near drifting us afoul of her. As it was, we cleared her by about a vessel's length. We then set the whole foresail, and giving strict orders to the watch not to cross her bow at all, I went below and turned in.

Friday, February 14, 1879.—The first part of this a. m. it was very moderate, wind backing to the SW. The wind, which was very light in the morning, finally died away calm at 9 a. m. We had light showers of rain and hail in the morning; sky overcast, dull, and rainy looking.

At 5 a. m. called all hands, put the bonnet in the jib, and set the staysail. Barometer at this time, 29.95. As soon as it was fairly light we "hove" out the dories, and the men started for the trawls. We got all our trawls and two and a half skates that we had previously lost, on which were 4,000 pounds of halibut, besides what we reserved for bait. The object of saving some for bait was because if the weather looks favorable we shall make a set under sail to-morrow. The last dory was aboard at 1.30 p. m., at which time there was a light southwest air springing up, so we kept off to run to the northward, as it is my intention to go as far as Green Bank, if the wind is favorable. The Dolliver and Williams both got under way and ran in the same direction.

The last part of the afternoon we had light westerly airs and calms. Since there were some indications of an easterly wind, I was in doubt for a while what to do, whether to start for home at once or stop longer on the Bank. At last I concluded to have another trial, and we baited twelve skates of trawl for that purpose just before dark. Barometer, at 7 p. m., 30.00.

Saturday, February 15, 1879.—At 3 p. m. the wind, which had been out as far as E., backed to N. by E., snowing very thick. We hove to for awhile to await developments. The N. H. Phillips spoke us at 4.30 a. m. She was under bank-sail, heading to the NW. We stood along with her, and just before daylight sounded in 65 fathoms, muddy bottom. Barometer, at 5 a. m., 29.90. As soon as it was daylight the Phillips set her mainsail. We did the same, and headed to the westward on a wind. Soon after that I saw another vessel about 7 miles to windward, under whole

sail. The wind at this time had backed to N. by W. and began to freshen up. In the northwest the sky looked squally and unsettled. Under such circumstances I did not dare set our gear, for fear of losing it if the wind should blow up strong. Seeing the crew of the Phillips turning their dories over, I concluded to do the same and start with her for home. All hands were called and we swayed up the lower sails, and after having lashed the backstay out rigger to the after cross-tree, so that the backstay would support the topmast and prevent it from being carried away, we set the staysail. We were astern and a little to leeward of the Phillips when we set the staysail, but soon caught up with her and passed to leeward of her. At noon she was nearly hull down astern.

I have rarely ever started for home feeling so much dissatisfied as now. I was confident of getting a good fare of fish this time, and am quite sure we would have succeeded in doing so if we had not lost our cable. What influenced me to start for home to-day—aside from the loss of our cable—is because I think we will probably reach there about the first of Lent, and may possibly get a better price for our fish at that time than if we arrive later. The wind in the afternoon was puffy and extremely variable, with snow and hail showers. At 5.30 p. m., began to have strong snow squalls, so we took in the staysail. At 6 p. m. the wind changed very suddenly, in a puff, from WNW. to NNW. It struck our vessel a hard full (the sheets were flat aft), and before she came to the wind it made her show her mettle, for she had all she could stand up under. After this we made an average course W. for about two hours, when it knocked her off again. Barometer, at 8 p. m., 30.30.

Sunday, February 16, 1879.—We had strong puffs of wind all of last night, and at times the vessel had all she could stagger under. At 6 a. m. the wind was steadier and not quite so strong, so all hands were called to sway up the lower sails and set the staysail. Barometer, 30.40 at 6.

We could see the Phillips astern this morning. She was a little to leeward of our wake and probably about 8 or 9 miles distant. Two steamships and a sailing ship passed us this forenoon going east. During the forenoon the wind was extremely variable, and we headed all the way from SW. to NW. on the same tack. Latitude, at noon, 42° 45′ N. Longitude, 56° 54′ W. Barometer, 30.50. Longitude, at 3.15 p. m., 57° 04′ W. It was very moderate in the first part of the afternoon and calm and fine towards evening. At 9 p. m. a light easterly breeze sprang up and we squared our booms to make all the sails draw. At 11.30 p. m. the cry came down the gangway, "Hear the news there below. The main halyards have parted, and you'll have to turn out and fix 'em." All hands accordingly roused out and hauled down the mainsail. We then spliced the halyards and put a mat over the copper on the jaws of the gaff, which had worn through, and being "rucked up," cut the rope like a knife.

Monday, February 17, 1879.—At 1 a. m. we had the mainsail and gaff-topsail set again. At this time there was a light southeast breeze, which, at 7 a. m., had increased so that we ran along 5 or 6 knots. The sky was overcast with stormy looking clouds; barometer, 30.40. The wind gradually backed to the eastward, and from that northerly until 10.30 a. m., at which time it was NE., blowing a smart breeze, and snowing. The snow cleared off toward noon, and, though the sky was overcast, the weather was clear all the afternoon, with a fine, steady northeast breeze and smooth sea. The barometer remains steady at 30.40. It has been more like summer sailing to-day than anything else, but one may expect that these mild breezes will soon be succeeded by gales that will be anything but gentle in force or pleasant to encounter.

Tuesday, February 18, 1879.—At 2.30 a. m. the barometer had fallen to 30.25. The wind at this time was veering easterly, and blowing a strong breeze accompanied with snow. We took in the staysail and gaff-topsail. At 7.30 a. m. the wind had increased still more and was so far to the

eastward that we could not run our course (WNW.) without danger of jibing the foresail, which would be liable to carry away the foremast head. Not wishing to run winged out when it was blowing so heavy, we took in the mainsail, and having first double reefed it, furled it up and let her run under the whole foresail. Barometer, at 8 a. m., 30.10. We had a very heavy fall of snow this a. m., until 11 o'clock, when it stopped snowing and turned to sleet and misty rain. Wind at this time had increased considerably. Barometer, 30. At 2 p. m. the barometer stood on 29.90. There was not so much wind at this time as during the forenoon, but the sea had made up high and sharp. There was a fine, sleety snow falling. The wind was about east and, as we were running W., we were dead before it. At 3 p. m. we noticed that the fore throat-halyards were stranded. We set the jib, and having first shook the reef out of the mainsail, we hoisted it up in order that she would run fast enough to keep clear of the sea. As soon as the foresail was in we let the vessel come to, swayed up the mainsail, and then kept off again. We first furled the foresail and then repaired the halyards. The wind backed slowly to the northward, but still continued to snow. At 5 p. m., just after supper, a heavy northeast puff struck, and if I had not been ready to let the mainpeak run she would have repeated the performance of last winter, when she came so near going to the bottom in a squall. But this time we had daylight in our favor, which doubtless saved us from disaster. We hauled down the mainsail, set the foresail, hauled down the jib and took the bonnet out and furled it. At 5.30 the weather cleared so that we could see about half a mile, and before dark we could see 2 or 3 miles. Set the jib at 9 p. m.

Wednesday, February 19, 1879.—At 1 a. m. we set the mainsail. The barometer at this time had risen to 30.10. The wind still continued NE., decreasing slightly in force. There was a cold, sleety rain that had coated everything on deck and above deck with ice. I judged we were well up to Cape Sable, and hauled to W. by N., having previously been running W., to go well clear of the cape. At 5 a. m. set staysail and gaff-topsail. It was very cold at this time; barometer had risen to 30.20. At 10.30 a. m. there was a smart breeze NE. by N., and "spitting" snow. Barometer, 30.35. Our position at this time, by dead reckoning, was latitude 42° 55′ N., and longitude 66° 41′ W. There was a good leading breeze all the afternoon, and we went along very smartly. Barometer, 30.35 at 6 p. m.

Thursday, February 20, 1879.—At 12.15 a. m. (correct apparent time) we made Thatcher's Island Lights a point on the weather bow, and, as we headed, we would have just about struck Eastern Point. The wind at this time was veering easterly, with indications of snowing thick very soon, and shortly after snow began to fall, though it did not immediately get very thick. "Beautiful snow" may sound very pretty and poetical, but it certainly is not appreciated very much by one coming on the coast in winter. I was kept in a constant state of anxiety concerning the weather, as there was every appearance of a coming gale.* The lights kept disappearing and reappearing as we neared them, being hidden most of the time, keeping me in suspense between hope and fear; hoping that the snow would not shut down thick before we got in, and fearing it might be so dense as to preclude all possibility of making the land until daylight, before which time it might blow a gale, and compel us to haul off. At last Thatcher's Island Lights were entirely shut in and we saw no more of them; but as it was not so thick to the westward and we had got pretty well in, a glimpse of Eastern Point Light was obtained, and we steered straight for it. The wind in the mean time had hauled out to SE., and began to breeze up smart. As the snow grew thicker and thicker we barely kept sight of the Point Light, although, with every foot of canvas

* One of the most furious gales of the winter was then approaching the coast; the gale in which thirteen sail of George's cod fishermen were lost on the Bank, with their crews of one hundred and forty-three men.

spread, we were running toward it at least 9 or 10 knots an hour. We lost sight of it several times, and when passing by it I do not think we could see objects more than a half-mile distant. We anchored off Harbor Cove at 3 a. m., furled the sails and went ashore. At 9 o'clock this morning there were seven vessels, besides ours, in with fares of halibut, which, with the Polar Wave in Boston, makes nine cargoes on the market to-day. The Alice G. Wonson, Andrew Leighton, George W. Stetson, and Gatherer all left the Bank the 12th instant (three days before we did) and got in this morning. The Alice M. Williams arrived the same time we did, and the N. H. Phillips at 9 a. m. The Nathaniel Webster also got in from the "Gully" last night. So many arrivals at once causes a depression in the market, and as a natural consequence prices rule low. The Stetson went to Boston in the forenoon; all the rest, with the exception of the skipper of the Webster and myself, sold in the forenoon for 3 cents per pound right through for white and gray alike, to take out here. I was offered three cents, but would not sell. The dealers finally offered me 3¼ cents per pound right through, and thinking no better terms could be obtained I sold the trip at that price. We had previously let go our second anchor, and at this time (1 p. m.) it was blowing smart.

Friday, February 21, 1879.—It blew a heavy gale from the NE. last night; this morning there was still a smart breeze and some undertow heaving in the harbor, which is usually the case after an easterly gale. The "hawkers" wanted the halibut to send away, so we took a tug, which towed the vessel into the Atlantic Company's wharf. The undertow made it very difficult to lie at this wharf, the vessel surging back and forth considerably. She parted several lines, and we had much trouble to hold her. Toward noon it was smoother. We finished taking the halibut out in the afternoon, and towed down to our own wharf. We weighed off, heads and all, 36,855 pounds of halibut, all in splendid condition. Fourteen per cent. was deducted for the heads, for which we receive nothing. This deduction leaves the net weight 31,691 pounds. Net stock, $970.26; share of each man, $33.48.

Monday, February 24, 1879.—The William H. Oakes arrived to-day. She was from Green Bank, and had a good fare of halibut. She had a rough time of it in the late gale; she came very near sinking, and her crew had a thrilling experience. She was loaded so deep in the water that the sea made a clean breach over her; and to save her from going down, which they say there was imminent danger of, the crew broke through the cabin bulkhead, and in this way got into the hold and hauled out halibut and threw them overboard. They threw away several thousand pounds (variously estimated from ten to twenty thousand), until she lay better and shipped less water. The Bessie W. Somes also got into Massachusetts Bay during the gale. She ran to make the land, but the snow shut down so thick and the gale blew so heavy that it would have been madness to run longer. She hauled off, but as it blew too hard to carry sail enough to gain to windward, she finally anchored on Middle Bank.* It was blowing very heavy at this time, and there was a wild sea going. After riding awhile she pulled her anchor in two, breaking the shank, a result which proves what a fearful strain there must have been on the cable and anchor. Fortunately, the gale lulled shortly after this, and gave her crew a chance to set sail enough to hold off until the weather cleared. All late arrivals report the gale very heavy, and one must feel thankful to have got in clear of it.

* This is named Stellwagen's Bank on the charts, but is always called "Middle Bank" by the Cape Ann fishermen, the latter name having reference to the position of the Bank between Cape Ann and Cape Cod.

2.—THE SALT-HALIBUT FISHERY, WITH ESPECIAL REFERENCE TO THAT OF DAVIS' STRAITS.

By Newton P. Scudder.

I. GENERAL DISCUSSION OF THE FISHERY.

The demand for smoked halibut maintains a fishery of increasing importance, in which the vessels are employed exclusively in catching and salting these fish. The demand is at present greater than the supply, and it seems probable that in the future this fishery will grow much faster than it has in the past.

In order to understand this prospect of increase it is necessary to inquire from what fisheries the "smoke-houses" obtain their salt halibut for smoking. These are the salt-cod, the fresh-halibut, and the salt-halibut fisheries.

Halibut caught by the salt-cod fishermen are commonly salted and sold to the smoke-houses. In the fresh-halibut business, however, when the quantity taken is greater than the fishermen have ice for preserving and there is danger of the fish spoiling before reaching a market, sometimes part of the fish are salted for smoking, and when the market is overstocked with fresh halibut the surplus is often sold to the smokers and salted. Were either of these two fisheries, or both combined, able to meet the demand for smoked halibut, there would be no inducement to send out vessels on purpose to catch and salt these fish. It is, however, a fact that though halibut were formerly very abundant near the coast of New England and on the banks frequented by the cod-fishing vessels, they have been gradually disappearing from these places, until at the present day the fresh-halibut fleet finds greater and greater difficulty in supplying the market with fresh fish, and the cod fishermen cure less and less every year.

The scarcity of halibut near the coast would at first seem unfavorable to the development of a salt-halibut fishery, but in reality the contrary is true. The fresh-halibut fishery must ever be limited by distance, for only those fish caught comparatively near home can be sold in the market as fresh fish. All others must be salted. But this scarcity, by decreasing the amount of salted halibut furnished by the cod and fresh halibut fisheries, and thus making the demand greater than the supply, encourages vessels to engage in the salt-halibut fishery and to utilize distant fishing banks where the halibut are more abundant. These banks must be more numerous than is at present realized, for the halibut is a widespread species, and may be circumpolar in distribution. It occurs off the Orkneys and to the north of Norway, has been caught in the Arctic north of Siberia, is abundant off the coast of Alaska and British Columbia, supports an important fishery in Davis' Strait, and is a nuisance to the cod-fishermen about Iceland.

In the autumn of 1881 over 432,000 pounds of salt halibut were brought from Greenland, the principal source of supply, but by the following spring the supply had been exhausted, and smoked halibut was out of the market.

We see, then, that the demand for smoked halibut is sometimes in excess of the supply; that the salt-cod and fresh-halibut fisheries furnish less and less every year; and that the halibut, though decreasing near the coast of New England, are very plentiful in northern waters. When we consider that the fishermen, competent in all that pertains to their profession, are especially eager

when encouraged by prospects of making money, what other result can be predicted than a considerable growth of this branch of the fisheries.

OUTLINE HISTORY.—The salting of halibut was doubtless begun by the cod-fishermen as an experiment, and then continued for the winter food of their families. These fishermen, though finding the halibut so plentiful as to interfere considerably with the catching of cod, did not prize them much as a food-fish, and as there was no demand in the market for them, the quantity cured was at first very small. So gradual was the growth of the custom that it would hardly be possible to trace it back to its commencement or to state when salt halibut first came into the market, but from the practice of the fishermen of Marblehead and of other places of salting these fish for winter consumption no doubt arose the market value of salted halibut.

We find that about 1842, before the introduction of ice-houses on board the fishing vessels, it was customary to bring flitched halibut from George's Bank, and that from 1845 to 1850 the Grand Bank cod-fishing vessels from Beverly, Provincetown, and other places were in the habit of sending flitched halibut to the Boston market, to be there sold as "dried halibut." Since 1850, however, the demand for smoked halibut has been so great that all the salted halibut have been bought for smoking, and there has been no dried halibut in market.

From 1850 to 1863 or 1864 the halibut brought in by the cod-fishermen, and by the fresh-halibut fleet were sufficient to meet the demand of the smoked-halibut trade, and the fitting out of vessels for salting halibut was resorted to in only one or two instances.

Perhaps the first trip of this nature was made by Capt. Chester Marr, in the schooner Grace Darling. He says:

"I went on a flitching trip to the Canadian shore about 1858. I had heard from the mackerel fishermen that halibut were very plentiful about Magdalene River in the summer. I was in the Grace Darling, and I hauled the vessel into the river, moored, and fished in our dories, setting the trawls along the shore in the vicinity for six weeks. I was induced to stay so long by the native fishermen, who made exaggerated statements concerning the halibut. I got only about 100 quintals of salt halibut, and gave up the trip and went to the Bay and filled up with mackerel."

The following is on the authority of D. C. & H. Babson, of Gloucester:

"The first vessel that ever sailed from Gloucester on a flitching halibut voyage to the Grand Bank was the schooner A. J. Chapman, 105 tons, that sailed May 19, 1864, commanded by Capt. George W. Minor. Arrived home August 13, and stocked on the trip $4,933.05. Her crew was composed of eleven men, and they shared $223.59 each; captain's share and commission was $420.82."

The practice of sending out vessels to salt halibut, once commenced, has continued up to the present time, but the vessels engaged in this way have ever been few, and at no time, according to Mr. Wonson, of Gloucester, has the number for any year exceeded ten.

Though the practice has been continued, the banks to which the vessels are sent have become fewer and fewer, until for several years past the banks in Davis' Strait have been the only ones visited by these vessels.

THE GROWTH OF THE GREENLAND HALIBUT FISHERY.—Reports of the abundance of halibut off the west coast of Greenland were first brought to Massachusetts by Provincetown whalers. The first trip to Greenland after these fish was made in 1866, by the schooner John Atwood. She sailed June 29 and returned October 14, stocking $5,500. Capt. G. P. Pomeroy, of New London, went as navigator, and Capt. Averill L. York, of Gloucester, as fishing-master. Though she failed to fill her hold only because of her late arrival upon the fishing banks, no enthusiasm was excited in this fishery until Capt. John McQuinn, in 1870, brought from Greenland a trip of flitched halibut worth over $19,000. Each of the two or three succeeding years five or six vessels, with hopes of having

like success, were fitted out for the same place. But, for some reason or other, the fish were not caught in very extravagant quantities, and a fall in the price of the fish rendered such a long trip financially rather uncertain. Besides, as there was no reliable chart of Davis' Strait and the coast of Greenland, the fishermen hesitated considerably before undertaking a voyage to such a precipitous and barren coast, and no one can blame them. Once give them a good chart of the coast and harbors of Western Greenland, and their greatest difficulty will be removed. No reliable survey and chart of Greenland have been made.

Notwithstanding the need of large and accurate charts and the immense distance of two thousand miles, so great are the probabilities of making a profitable catch that thirty-one trips have been made from Gloucester to Davis' Strait after halibut. The following is a tabulated statement of the vessels and captains engaged in the Greenland fishery from its beginning to the present time, showing also the year and the weight of flitches for each trip. This gives a total of 3,283,765 pounds of salt halibut brought to Gloucester from Greenland, or an average of 113,233 pounds for the vessels that returned in safety:

Year.	Vessel.	Captain.	Pounds of fish.
1868	John Atwood	George Pomeroy	60,000
1869	Caleb Eaton	John McQuinn	134,400
1870	Caleb Eaton	John McQuinn	177,800
1871	Membrino Chief	John McQuinn	
1871	Caleb Eaton	Jeremiah Hopkins	429,200
1871	River Queen (lost)	George Robinson	
1871	Thorwaldsen	James Hamilton	
1871	William S. Baker	Albion Pearse	156,800
1871	Mary E	Rasmus Madsen	80,000
1872	Aaron Burnham	Charles J. Lawson	112,000
1872	Thorwaldsen	Henry Hamilton	145,600
1872	William S. Baker	Albion Pearse	145,600
1872	Membrino Chief	John McQuinn	134,400
1872	Carrie Jones	John Guskill	112,000
1872	Caleb Eaton	Jeremiah Hopkins	134,400
1873	Aaron Burnham	Charles J. Lawson	91,000
1873	William S. Baker	Albion Pearse	75,700
1873	Caleb Eaton	Jeremiah Hopkins	62,500
1873	Albert Clarence	John Guskill	51,000
1874	Nulli Secundus	Charles J. Lawson	163,000
1877	Henry Wilson	James Jamieson	91,000
1878	Grace L. Fears	Randall McDonald	60,000
1878	Cunard (lost)	Garrett Galvin	
1878	Bellerophon	Thomas Scott	60,000
1879	Herman Babson	Charles J. Lawson	140,000
1879	Bunker Hill	John McDonald	140,000
1879	Mary E	Rasmus Madsen	75,000
1880	Mary E	Rasmus Madsen	70,000
1881	Herman Babson	Charles J. Lawson	168,400
1881	Mary E	Rasmus Madsen	84,890
1881	Bunker Hill	John McDonald	179,575
	Total		3,283,765
	Average for vessels returning		113,233

Two vessels were lost; but one of these, the Cunard, after starting for home, went to the Grand Bank and was lost there, leaving only one lost in the Greenland fishery. The River Queen probably failed to reach home because too little care had been taken in properly arranging the salted fish, thus throwing the vessel considerably out of trim. The last seen of her she was rather low in the bow and sailing before a northeast gale, on her way home.

If we compare the Davis' Strait fishery with that of the Grand Bank we find much in its

favor. The water is not so deep, and fogs are not so frequent as on the Grand Bank. Good harbors are available in case of storms, which are not common. The climate is excellent, neither very cold nor very warm. The continual light permits fishing at all times of the day, and does away with much of the risk of the dories losing sight of the vessels. One great objection is the long distance from home, and lack of opportunities of hearing from the outside world. The fish, however, are plentiful, and, if the fishermen only had accurate charts of the banks of the west coast of Greenland, and of the harbors of Sukkertoppen and Holsteinborg, the long distance would be little thought of, as they would then be quite sure of a profitable catch. The harbor of Holsteinborg is usually open by the middle of May and perhaps fishing could be commenced by the 1st of June, but the ice, brought by the current down the east coast of Greenland, besides blocking up the more southern harbors, will probably render the passage north too dangerous before the middle of June. On this account and because of the change in the weather about the 20th of August, the fishing here will have to be done in July and August.

Besides the halibut, the Greenland cod is also caught on the trawls of the fishermen, but not in sufficient numbers to warrant their being salted. The proportion of cod to halibut is about 1 to 15. The Eskimo fish for both, in the bays and harbors, and the cod may be more plentiful there, but they are smaller.

The fine salmon of the coast might afford profitable fishing. This opinion is founded upon the quantity of these fish the natives catch with their rude appliances, and sell for $1 to $8 a barrel to the Danish trade agents. If the American fishermen were acquainted with the deep fiords, and should engage in this fishery with all the modern improvements for seine fishing, they would probably meet with great success. There is, however, this probable limit: the fish are caught mostly in June and July when they visit the mouths of the fresh-water creeks. After this they become scarce, but, if the fishermen do not succeed in securing a cargo of salmon, they have at least a month, after the salmon season is over, during which they can set their trawls for halibut.

The average of 113,233 pounds of salt halibut for a trip does not represent fully what the fishery may become in the future; for several of the trips were made the conclusion of cod-fishing trips to the Grand Bank, and the vessels were already partly filled with cod, leaving not enough room for a full cargo of halibut. Thus the Mary E., in 1871, '79, '80, and '81, fished first on Flemish Cap, and from there went to Greenland. In 1871 she did not reach the Davis' Strait fishing ground until August 20, and left off fishing August 28, but during these eight days she secured 30,000 pounds of halibut. In 1879 the Herman Babson had on board 60,000 pounds of codfish, which she brought from the Grand Bank. If we omit from our calculations the Mary E., which is comparatively a small vessel, the above average will be increased to nearly 121,000 pounds for each trip.

Again, since the fishermen first visited Davis' Strait, the methods of fishing in that region have altered considerably, principally because the first fishermen were unacquainted with the fishing banks, and were afraid to remain on them whenever the wind showed signs of increasing to a gale. Because of this, visits to the harbor were frequent, and much time was lost in regaining the banks after the blow was over. The custom now is to remain on the banks as much as possible, and to fish at every opportunity: had this method been employed from the start, the average catch would have been considerably larger. The success of the Bunker Hill, in 1881, proves this beyond a doubt. This vessel, though not arriving upon the banks until July 11, commenced fishing before going into the harbor, and by persistent effort, in spite of unfavorable weather, secured the largest fare of any vessel since the beginning of the fishery.

In the future, competition among the fishermen will become greater, knowledge of harbors and fishing banks more definite and widespread, improved methods of fishing will be introduced,

and, as the demand for the fish and the confidence of the fishermen increase, the Greenland halibut fishery will no doubt grow to be of considerable importance.

Where the halibut are caught on the Grand Bank they are flitched and salted; but as the fresh fish bring the higher price, the nearer the fishing grounds are to the market so much greater is the probability of the fish being brought in fresh. On the other hand, fishing grounds at a long distance from home present so many difficulties to the fresh fishermen that no attempt is made to carry home the halibut uncured.

Formerly, when the smoked fish were first coming into the market and the halibut were very abundant on nearly all the fishing banks, the supply was easily obtained near home, but now the halibut on George's, Grand, and other southern banks are no longer plentiful enough to encourage a fishery devoted to salting these fish. These banks, however, yield a few salt halibut, brought in by the cod-fishermen.

The reason the fresh-halibut fishery is still carried on with success where there is no encouragement for a salt fishery is that it takes only one-tenth the time to obtain a cargo of fish in the former that it does in the latter industry. In the fresh fishery the fish in the hold of the vessel occupy nearly as much space as when first caught, and they cannot be packed tightly together for fear of spoiling, whereas in the salt fishery a large part of the bulk of each fish is thrown overboard, *and the parts saved are packed away as solidly as possible, not occupying nearly as much* space as the same number of fresh fish would. Again, in the fresh fishery much space is occupied by the ice and ice-chest, which are not needed in the salt fishery. In this way it takes ten or more times as many fish to make a cargo of salted halibut as it does to make a cargo of fresh halibut.

Thus if a fresh fisherman fills his vessel in five days it would take a salt fisherman, with the same luck in fishing, fifty or more days to fill the same vessel. If the fishing were twice as good the fresh fisherman could secure a cargo in two and one-half days and the salt fisherman in twenty-five days. It is thus an inducement to the salt fisherman to spend part of these twenty-five days sailing to and from grounds where the fishing is much better than nearer home. In the north the scarcity of fish does not limit the fishery, but the slow discovery and utilization of banks where the halibut are probably very abundant. These fish, circumpolar in distribution and very abundant in the North Pacific and in Davis Strait, must abound in many places where we have no knowledge of their existence.

ICELAND.

In 1872 Capt. John McQuinn attempted to secure a "trip" of salt halibut from the fishing banks near Iceland, but did not catch a sufficient quantity to encourage a second attempt. Other circumstances, however, would indicate an abundance of these fish near Iceland. The French and other fishermen who catch cod in the vicinity of Iceland, but to whom the halibut are worthless as a food-fish, complain that the halibut are at times so very plentiful as to seriously interfere with the codfishing in these waters. A few years ago a Danish Government vessel returned to Denmark with a quantity of salted halibut, caught somewhere between Greenland and Iceland, but the crew refused to reveal the exact spot where the fish were taken, fearing lest England or some other foreign power might develop a fishery in that region.

Considering the difficulties a stranger has to encounter when attempting to fish in unfamiliar and distant waters, the failure of Captain McQuinn is not surprising, and is no indication of a scarcity of halibut near Iceland.*

* The United States Fish Commission having called the attention of the American fishermen to the abundance of halibut at Iceland, three Gloucester vessels went there in 1884 and secured good fares, and the present summer (1885) five Gloucester vessels are on a voyage there. A full report of the voyages in 1884 is published in Volume V, United States Fish Commission Bulletin.

2. FISHING GROUNDS.

DAVIS' STRAIT.

(*a*) LOCATION AND CHARACTER.—The fishing banks are 15 to 40 miles from the coast, and, if we can rely upon the Danish charts, extend from Disko Bay to within 3° of Cape Farewell; for these charts give soundings all along the coast between these two points. Extensive as the banks may be, only a small part of them, the part about Holsteinborg and Cape Amalia, has been tried by American fishermen. That the fish are to be found throughout their whole extent is more than probable, for the species is identical with that taken on the Grand Bank, and we would naturally infer it would be found in all favorable situations within the limits of its distribution. It is also reported that Capt. Rasmus Madsen, commonly known as "Captain Hamilton," who has been to Greenland several times, set his trawls for these fish farther to the south (probably off of Godthaab) and found them very abundant, but was unable to secure many on account of the numerous ground-sharks playing the mischief with his trawls.

At Cape Amalia are the favorite fishing grounds of the natives, and a few of the Gloucester vessels have visited them, but, as the fishing there is mostly by anchoring in the harbor and sending the dories a distance of 2 or 3 miles, this place does not offer many inducements to our fishermen. The best luck has attended the vessels fishing off and to the south of Holsteinborg.

Previous to 1872 the fishing grounds were 4 or 5 miles off Holsteinborg. That year, however, some of the fleet went 30 miles off this settlement, and since that time most of the fishing has been done on this latter ground.

In 1879 the fishing in July was on this ground, but in August better fishing was secured on a new ground 20 miles south of this. In 1881 the best fishing was found in the vicinity of Victori Island, some 15 miles from shore, in water from 14 to 28 fathoms deep.

Between the old ground off Holsteinborg and Victori ground there is a gully over 150 fathoms deep and 15 or 20 miles wide, and there is probably another gully south of Victori ground.

The depth of water on the banks is from 15 to 90 fathoms, and, on this account, the fishing is much easier than in the deep water of the Grand Bank. At the inner edge the banks have a sudden slope, leaving a long submarine valley, the depth of which I did not ascertain, between them and the mainland. The surface of the banks is varied, though generally rocky, with here and there sandy and clayey spots.

The character of the fauna varies considerably, and often abruptly, in places a little distance apart, as the following extract from my diary of the 25th of July will show: "The fish caught to-day and two preceding days have not been taken on all sides of the vessel, but in one particular spot, where the bottom is more attractive than elsewhere. This spot is covered by *tunicata*, called 'sea-lemons' and 'sea-pumpkins.' The moment the trawls strike the bottom covered by the stems of *hydrozoa*, by the crew called 'trees,' the fish are no longer found in any quantity."

It will readily be seen from the preceding remarks that a careful survey of the banks, with the view of determining their limits, character, and fauna, could not fail to be of great value to the fishing interest, to say nothing of its immense importance from a natural history and geological point of view.

(*b*) *Climate.*—The climate on the banks for July and August is, on the whole, very favorable for fishing. In the tables which follow I have omitted observations made in harbors, in order to avoid confusing the two climates together, for there is considerable difference. The climate on the banks is more constant in temperature and absence of rain, but more variable in respect to wind.

The temperature is very uniform. The lowest observed was 36° Fahr. and the highest 52° Fahr. The extremes of surface temperatures were 38¾° and 43¼° Fahr. There were no sudden changes, as the tables will show. The temperature was thus very favorable for work, though perhaps a little chilly in foggy weather, but nevertheless much better than the sweltering heat of summer in our own latitude. The men found, on sunny days, even a temperature of 48° Fahr. uncomfortably warm for work. On chilly days a fire was kept in the cabin, so that all could be comfortable when not working.

A reference to the tables of the condition of the sky will show that we had very little rain on the banks. Clouds were common and fogs not rare, but it only rained four or five times, and then mostly in the shape of fine misty rain, lasting at the longest only four or five hours.

The tables of the wind need explanation. The directions expressed are those of the compass, which here varies about 70°; for not knowing the exact variation, I thought this the best way of expressing them. The estimate of the velocity is much of it guess-work, founded on remembrance of former estimates and comparisons of the wind's velocity made by myself, and, on this account, not much reliance can be placed on them except for the relative velocities of the winds observed. The hardest blow was August 14, on which day I have put the velocity down as between 45 and 55 miles, and am well satisfied it could not have been any greater. Between this and a perfect calm I have used six numbers to designate as many different velocities: 2 for air just perceptible; 5 for a breeze of 3 to 10 miles an hour; 13 for a breeze of 10 to 15 miles an hour; 20 for a breeze of 15 to 25 miles an hour; 30 for a breeze of 25 to 35 miles an hour; 40 for a breeze of 35 to 45 miles an hour; and 50 for a breeze of 45 to 55 miles an hour.

The temperature, sky, and winds were quite different in the harbor. The land on all but the sea side of the harbor rises abruptly, and not only protects it from the winds, but also permits the sun to warm the surface of land and water more than in an exposed place. The thermometer is, therefore, more variable than in the strait, and the wind is seldom felt. The mountains, by causing the condensation of the vapors of the sea breezes, make fogs and showers frequent.

I have also given tables of the height of the barometer, made from an aneroid belonging to the captain. This was hung up in the cabin, and I noticed considerable variation in the instrument whenever a fire was built there. When this variation was very marked, I have indicated the same in the tables by an asterisk.

The season of 1879 was, however, uncommonly mild for Davis' Strait, and the weather that summer more favorable for fishing than it has been since. In 1880 the Herman Babson was started for Greenland, but was turned back in 52° north latitude by immense quantities of icebergs and field ice. The Mary E. succeeded in getting through by going farther to the eastward.

In 1881 the three vessels which went to Davis' Strait skirted the ice 200 to 300 miles before succeeding in getting through, and, even after reaching the fishing grounds, they were obliged several times during the summer to change their positions on account of drifting bergs.

This ice is carried by the currents down the east coast of Greenland, and thence across to the Straits of Belle Isle, and the fishermen will probably encounter more or less of it every year.

Table of the temperature for July and August.

JULY.

No observations made in harbor.

[Expressed by the Fahrenheit scale—all positive.]

	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
July 1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	.....	37½	37¾	38	37½	38	38½	39½	39	39	39	38½	38½	37½	.....	.....	.....	.....
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38½	39	.....	.....	.....	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38	38	38½	38	37	37	.....	.....	.....	.....	.....	.....
5	39	.....	.....	.....	.....	.....	.....	41	42	45	44	43	44	43½	42½	.....	.....	.....	41½	.....	40	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37½	.....	38	.....	.....	36½	36½	.....	.....	.....	.....
7	38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39	39½	39½	41½	41	40½	.....	39½	39½	.....	.....	.....	38½
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45½	41¾	.....	.....	41	40½	39½	38½	38½	38½	.....	.....	.....	.....
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38½	40	.....	.....	.....	41½	.....	40½	.....	.....	.....	.....	.....
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	.....	.....	.....	.....	.....	.....	.....	45	44	.....	.....	.....	.....	.....	46	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40½	.....	.....	.....	.....	.....	.....
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40	38½	48	40½	.....	44½	41	.....	39	38	.....	.....
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	42½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39¼	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39½	39¾	39	39½	.....	39	39	.....	38½	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40	.....	.....	.....	42	.....	.....	.....	.....
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19	.....	.....	.....	.....	.....	.....	40	40½	41	.....	41	.....	42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40	40½	.....	.....	40½	.....	.....	.....	48	.....	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	42½	42¾	42¼	44	44½	45½	.....	.....	.....	.....	.....	.....	.....	.....
25	.....	.....	.....	.....	.....	.....	.....	.....	45½	45	45	46	.....	46½	.....	44	44	42½	42	.....	41	.....	.....	.....
26	.....	.....	.....	.....	.....	.....	.....	.....	39½	40	.....	40	40	.....	41	41	41	40½	.....	.....	.....	.....	.....	.....
27	.....	.....	.....	.....	.....	.....	.....	40	40½	41½	42½	.....	.....	43	.....	.....	41½	.....	.....	.....	.....	.....	.....	.....
28	.....	.....	.....	.....	.....	.....	.....	41½	40½	42½	.....	43½	43½	44½	45½	.....	.....	.....	41½	.....	.....	.....	.....	.....
29	.....	.....	.....	.....	.....	.....	.....	42½	42¼	.....	42½	43	.....	.....	43	44	44	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40½	.....	43	.....	44	45	.....	44½	.....	.....	.....	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

AUGUST.

Aug. 1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	45	45	45	.....	45½	45½	45½	45½	45½	45½	44½	44	.....	.....	.....
3	.....	.....	.....	.....	.....	.....	.....	43	.....	44	44½	.....	46	46½	46½	45½	45	43½	44½	44½	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	44	44	44¼	45¾	46½	47½	.....	.....	.....	*50	*52	46	.....	.....	.....	.....	.....	.....
5	.....	.....	.....	.....	.....	.....	.....	46½	.....	.....	46½	46½	46½	46	46	46	.....	.....	46	.....	45	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	46	47	.....	47	*50	47½	47½	48¾	.....	.....	47	.....	47½	.....	.....	.....	.....	.....
7	.....	.....	.....	.....	.....	.....	45	.....	45½	.....	45¾	.....	47	.....	.....	*48½	.....	.....	.....	46	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	.....	.....	.....	45½	46½	46½	47	47	.....	.....	.....	.....	.....	45½	.....	.....	.....	.....	.....
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	46	46½	.....	46	.....	45½	.....	44½	.....	43	.....	.....	.....	.....	.....
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	44½	.....	.....	45	.....	.....	.....	.....	.....	44½	.....	.....	.....	.....	.....
11	.....	.....	.....	.....	.....	.....	.....	44	.....	.....	.....	.....	44½	.....	.....	.....	.....	.....	44	.....	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	.....	.....	45	.....	.....	.....	.....	47	.....	.....	.....	.....	.....	46	.....	.....	.....	.....	.....
13	.....	.....	.....	.....	.....	.....	.....	.....	42	.....	.....	.....	42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14	.....	.....	.....	.....	.....	.....	40	.....	.....	.....	.....	.....	41	.....	.....	.....	.....	.....	39	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	42	.....	43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16†	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17†	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	38	.....	.....	.....	.....	.....	39	.....	.....	.....	.....	.....	42	.....	.....	.....	.....	.....
19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Affected by reflection of sun's rays.

† Barrels lashed in front of thermometer so it could not be seen on the 16th and 17th.

Table of the temperature for July and August—Continued.

AUGUST—Continued.

	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Aug. 20													43						47					
21								42					42						42					
22*																								
23*																								
24													40½						40½					
25							39½						40						39½					
26							40						41						41½					
27							41																	
28																								
29									42															
30							40½						40						38½					
31							40						41½											

* Thermometer wet with spray.

Table showing the condition of the sky for July and August.

b. Blue sky. f. Foggy. m. Hazy. r. Rain. c. Clouds, detached. g. Gloomy. o. Overcast. k. Clearing off. No observations made in harbor.

JULY.

	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
July 1																								
2											b., m.	m.	m.	m.	c.	c.	c.	o.	o.					
3																o.	o.							
4													m.	f.	f.	o., m.	o., m.	o., m.						
5	o., m.							b.	m.	b.	m.	m.	m.	m.	m.			o.			o.			
6														e.		m.			e.					
7	o., m.											o.	f.	k.	b., c.	b.	c.		m.	o.				b., c.
8											c.	c.			m.	f.	r.	r.	o.	r.		r.		
9	o.											k.	b.					c.	r.	c., r.				
10																								
11								c.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	f.	f.
12	f.	f.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	b.	f.
13	f.	b.	b.	b.									b.	b.	b.	b.	b.	f.	f.	f.	o.	o.		
14										o.											f.			
15													f.	f.	f.	f.	f.	f.	f.	f.	f.	f.	f.	f.
16	f.	f.	f.	f.	f.	f.	f.	f.	f.	f.	f.	f.	f.	f.	k.	b.				b.	b.			
17																								
18												k.												
19							o.	o.			o.		o						o.					
20																								
21																								
22																								
23												o.	o.	o.	o.	o.	o.	o.	o.	o.				
24											o.	o.	o.	o.	o.	f.	f.							
25								o.				o.		k.			o.	o.	o.	o.				
26								m.	m.			o.	o.		o.	o.	o.	o.						
27							o.	o.	o.	o.	o.	o.	o.				o., m.							
28							b., f.	b.	b.			b.	b.	b., f.	b., f.				f.					
29							r.	r.	r.	o.	o.	o.	o.	o.	o.	o.	o.							
30										o.	o.	o.	o.	o.	o.	o.	o.	k.						
31																								

U. S. Fishery Laboratory
Beaufort, North Carolina

U. S. FISH COMMISSION
BEAUFORT, N. C.

Table showing the condition of the sky for July and August—Continued.

AUGUST.

	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
Aug. 1																								
2													e.	c.	e. r.	e.	e.	e., r.	e., r.	e., r.	e., r.			
3								c., h.		b., c.	m.	c.	e.	c.	c.	c., r.	c., f.	c., f.	c.	c.	e., f.			
4							e.	e.	e.	e.	e.	e.		b., c.		b.	b.	b.	b.					
5								c.			c.	c.	c.	r. b.	b., c.	b. c.			c.		c.			
6						b.	b.	b., c.			c.	c.	b., c.	c.	c.		e.		b., c.					
7							e., f.		e., m.		e., m.		e., m.		c.	c.				b., c.				
8									e.	e., c.	c.	c.							r.	r.				
9										c.	b., c.		c., b., m.		m.		F.		f.					
10										e.			e.						f., m.					
11								e., m.					e.						e.					
12								e.					c.					b.	b.					
13									m.				e.											
14							c.						e.						e.					
15							e.		e.				c.						b., m.					
16								b.					b.						b.					
17							e.						e.						e.					
18							e.						e.						e.			r.		
19							e., r.																	
20													b.						b.					
21								b.					e., f.						e.					
22								b.					b.						b.					
23								b.					b.						e., f.					
24								e., f					e.						g.					
25							b.	b.					b.						b.					
26							b.			b.			b.						b.					
27							e.																	
28							b.						b.						b.					
29									b.		e.								e.					
30		r.		r.	r.	e.	e.	e.			b.	b.	m.											
31							e.						e.						m.					

Table showing the directions and relative velocities of the wind for July.

Calm, by 0. Just perceptible, by 2. 3 to 10 miles, by 5. 10 to 15 miles, by 13. 15 to 25 miles, by 20. 25 to 35 miles, by 30.
No observations made in harbor.

Date.	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.
July 1												
2											E. by N. 20	E. by N. 20
3												
4												
5								SE. 2	SSE. 2	SSE. 2	SW. 5	SW. 5
6												
7	0											0
8											SE. 5	E. 5
9	WSW. 20											WNW. 20
10								0	0			
11												
12												
13	0	0	NE. 5									
14										W. by S. 5		
15												
16		ENE. 6										
17												

Table showing the directions and relative velocities of the wind for July—Continued.

Calm, by 0. Just perceptible, by 2. 3 to 10 miles, by 5. 10 to 15 miles, by 13. 15 to 25 miles, by 20. 25 to 35 miles, by 30. 35 to 45 miles, by 40. 45 to 55 miles, by 50. No observations made in harbor.

Date.	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.
July 18												
19							SW. 20	WSW. 20			SW. 13	
20												
21												
22												
23												0
24											0	0
25									0	0		NE. 5
26									N. 13	NNW. 13	NNW. 13	NNW. 13
27								0	0	NW. 2	NW. 2	NW. 2
28								NE. 5	NE. 13	NE. 13		ENE. 5
29								S. by W. 5	S. by W. 5			S. by W. 5
30											0	0
31												

Date.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
July 1												
2	E. by N. 20	NE. 20	NE. 20	NE. 20	NE. 20	NE. 20	NE. 20					
3				ENE. 5	ENE. 2							
4	NNE. 13	NNE. 13	NNE. 13	NNE. 20	ENE. 20	ENE. 20						
5	SW. 5	SW. 5	SW. 5	SW. 5	SW. 5	SW. 5	SW. 2		WNW. 20			
6		NE. 13		NE. 5			NNE. 5					
7	0	SW. 5	SW. 5	SW. 5	SW. 5		0	0				ENE. 5
8			NE. 13	NE. 13	NNE. 13	NNE. 13	NE. 13	0		SW. 13		
9	WNW. 13				0	ESE. 13						
10												
11												
12												
13	WNW. 5	WNW. 5	WNW. 5	WNW. 5	W. 13	W. 13	W. by S. 13	W. 20	W. 29			
14									NE. 13			
15	NE. 13	NE. 5	NE. 5	NE. 5	NE. 5	NE. 5	NE. 13		NE. 5		ENE. 5	
16				NE. 13				NE. 13	NE. 13			
17												
18												
19							WSW. 30					
20												
21												
22												
23	0	0		SW. 2				0				
24	0	0	0	0	0							
25	NE. 5	NE. 5			NE. 5	N. 13	N 13	NNE. 13				
26	NNW. 13	NNW. 5	NNW. 5	NW. 5	NW 5							
27		N. 5			ENE. 5							
28	ENE. 5	NE. 2	NE. 2				0					
29			0	0	0							
30	0	0	0	0		SW. 5						
31												

Table showing the direction and relative velocities of the wind for August.

Calm, by 0. Just perceptible, by 2. 3 to 10 miles, by 5. 10 to 15 miles, by 13. 15 to 25 miles, by 20. 25 to 35 miles, by 30. 35 to 45 miles, by 40. 45 to 55 miles, by 50. No observations made in harbor.

Date.	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.
August 1												
2											S. W. 13	S. W. 13
3								S. W. 20		WSW. 20	WSW. 20	WSW. 13
4							0	SE. 2	SSE. 5	S. 5	SSW. 5	SW. 2
5								0			0	NNW. 5
6						E. 2	E. 2	S. 2		SW. 2	0	0
7							WNW. 2		0		0	
8									WSW. 5	W. 5	W. 5	W. 5
9										W by S. 5	W by S. 5	
10										S. W. 30		
11								SW 20				
12								SW. 5				
13									NE. 20			
14					N. E. 50		NE. 50					
15							WNW. 30					
16								NE. 13				
17							NNE. 30					
18							ENE. 5					
19							WSW. 20					
20												
21							NE. 20					
22							NE. 30					
23							NE. 30					
24							NE. 20					
25							NE. 30					
26							NE. 20					
27												
28												
29									SW. 13			
30				0	EE. 5							
31					N. E. 30							

Date.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
August 1												
2	SW. 13	SW. 13	SW. 5	SW. 5	SW. 2	SW. 2	SW. 2	SW. 2	S. 2			
3	WSW. 13	W. 13	W. 5	0	0	0	0	0				
4	0	0		E. 2	E. 5	E. 5	E. 5					
5	NNW. 13	N. 13	N. 13	N. 13			0		NE. 2			
6	N. W. 2	0	0		0		0					
7	0			0				NE. 13				
8	0						0					
9	W. 5		W. 5	W by N. 5			W. 5					
10	SW. 30						W. 30					
11	W. 13						W. 13					
12	ENE. 5					ENE.	NE. 13			NE. 30		
13	EE. 40											

Table showing the directions and relative velocities of the wind for August—Continued.

Calm, by 0. Just perceptible, by 2. 3 to 10 miles, by 5. 10 to 15 miles, by 13. 15 to 25 miles, by 20. 25 to 35 miles, by 30. 35 to 45 miles, by 40. 45 to 55 miles, by 50. No observations made in harbor.

Date.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
August 14	NE. 50						NE. 13					
15	NW. 20						0					
16	NNE. 13						NNE. 30					
17	NNE. 30						NE. 13					
18	0						WSW. 20					
19												
20	NE. 13						ENE. 5					
21	NE. 20						NE. 20					
22	NE. 30						NE. 30					
23	NE. 30						NE. 30					
24	NE. 20						NE. 20					
25	NE. 30						NE. 30					
26	NE. 20						NE. 13					
27												
28							NNE. 13					
29	SW. 30						SW. 20					
30	NNE. 20						NE. 20					
31	NE. 30						NE. 20					

Table showing the height of the barometer for July and August.

JULY.

Date.	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.
July 1												
2								30.23	30.23	30.22	30.22	30.21
3												
4												
5								29.73	29.75	29.75	29.76	29.76
6												
7												30.28
8											30.19	30.18
9	30.05											30.37
10												
11								30.41	30.40			
12												
13				30.46								
14										30.50		
15												30.42
16	30.37	30.37										
17												
18												
19							30.25	*30.36			30.36	
20												
21												
22												
23												30.46
24											30.54	30.56
25									30.50		30.44	30.42
26									30.32	30.34		30.33
27								30.36	30.36		30.36	30.35
28								30.24	30.26	30.24		30.24
29								30.18	*30.30	30.28	30.28	
30											30.18	
31												

Table showing the height of the barometer for July and August—Continued.

JULY—Continued.

Date.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
July 1												
2	30.21	30.20	30.20	30.19	30.16	30.16		30.15				
3				29.92	29.93							
4	29.78	29.78	29.76	29.75	29.72	29.70	29.68					
5	29.76	29.77	29.78			29.80			29.80	29.82		
6				30.05			30.11	30.11				
7	30.28	30.29	30.30	30.30			30.29	30.27				30.20
8					30.13	30.08	30.07	30.08		30.08		
9	30.39				30.41		30.49					
10												
11												
12												
13	30.30	30.30	30.30	30.32		30.40	30.50		30.52	30.50		
14								30.58	35.53			
15	30.43	30.43	30.40	30.43		30.42	30.38		30.36	30.38		
16				30.24				30.26	30.24			
17												
18												
19	30.38			30.33			30.26					
20												
21												
22												
23	30.44	30.43		30.48				30.48				
24	30.57	30.56	30.56	30.54	30.56							
25		30.37	30.36		30.46	30.42	30.43		30.40			
26			30.28	30.28	30.26	*30.38						
27		30.35			30.33							
28	30.20	30.20	30.20				30.26					
29				30.25	30.26							
30	30.12		30.12	30.10		30.06						
31												

*Due to building of fire in cabin.

AUGUST.

Date.	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
Aug. 1																								
2										30.02	30.04	30.04	30.05	30.04	30.04	30.04	30.06	30.14	30.15		30.17			
3								30.24		30.24	30.26	30.28	30.28	30.28	30.28	30.30	30.30	30.33	30.33	30.32				
4							30.27	30.36	30.34	30.34	30.26	30.28		30.40		30.40	30.36	30.40	30.32					
5								30.30			30.26	30.24	30.22	30.22	30.22	30.20			*30.26		30.26			
6						30.24	30.26	30.24		30.27	30.26	30.24	30.24	30.26	30.26		30.32		30.28					
7							30.30		30.28		30.27					30.20				30.16				
8									30.26	30.27	30.26	30.28							30.30					
9										30.37	30.37		30.28		30.26		30.32		30.40					
10										30.26			30.20						30.18					
11								30.06					30.04						30.07					
12								30.11					30.11						30.04					
13									29.92				29.90											
14					29.80		29.74						29.74						29.80					
15							29.89		29.93				30.06						30.00					
16								29.78					29.84						29.84					
17							29.96						29.94						29.96					
18							30.00						30.06						29.95					
19							29.86																	
20													30.12						30.12					

Table showing the height of the barometer for July and August—Continued.

AUGUST—Continued.

Date.	Midnight.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.
Aug. 21								30.18					30.12						30.12					
22								29.92																
23																								
24													30.09						30.14					
25							30.12						30.12						30.11					
26							30.00						*30.06						30.08					
27							30.02																	
28													30.22						30.22		30.23			
29								30.18					30.20						30.16					
30							30.06				30.28		30.22						30.22					
31							30.12						30.08						30.10					

*Due to fire in the cabin.

(*c*) *Tides and currents.*—I had hoped to compile tables that would give definite figures regarding the tides, but on account of the frequent changes of position and the remarkable complexity of the currents near the edge of the banks this was impossible. The first peculiarity one would be likely to notice is that the tide runs up the strait much longer and with greater velocity than in the opposite direction. In fact, some days there was no tide at all down the strait, but corresponding to it would be nearly slack water for seven or eight hours. The tide also, instead of changing every six hours, would only do so twice a day. The observations made August 4 will show this. The velocity is expressed in the number of feet a chip floated in a minute, and the directions are those of the compass. As this varies about 70° toward the west, it will be seen that all the directions given are up rather than down the strait.

Tide August 4.

6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.
NE.	NE.	NE.	NE. x E.	ENE.	E.	.....	E. x S.	.....	SSE.	SE. x S.	SE. x S.	SE.
Slight.	Gentle.	Moderate.	169 feet.	179 feet.	246 feet.	.....	168 feet.	.....	135 feet.	96 feet.	90 feet.	60 feet.

The greater velocity of the tide running north compared with that going south is probably due to the existence of a current on the east side of the strait running up the coast of Greenland. The slack water of six or seven hours at a time would then be when the current and tide just balanced each other. The few icebergs we saw while fishing came from the south. The harbors of Holsteinborg and Sukkertoppen are open much earlier than the more southern ones, owing to the ice that is brought round Cape Farewell blocking up these latter. The existence of this southern ice will be a great barrier to the utilization of the southern fishing banks, making those about Sukkertoppen and Holsteinborg the ones most accessible.

The combining of the tide and current often renders fishing impossible five or six hours at a time, but, as the slack water is usually correspondingly long, the loss of time need not be very great, for by careful observation the fishermen can time themselves so as to sleep while the tide is strong and fish when it is slack water. It must be remembered that in this latitude it is light enough in July to work all night without inconvenience.

The tides and currents are not, however, as simple as the preceding remarks would seem to imply. Often a changing of our position a few miles would bring us into a different combination of currents. The banks occasion variations in currents a few miles apart. The whole coast of

Greenland is indented by deep fiords, 3 or more miles broad and 50 to 100 miles long, and the tides running out of these with great force have an influence miles from their mouths.

Temperature of the water, at every ten fathoms, on the Fishing Banks, off the west coast of Greenland, latitude 66° +. Time, July and August.

July 6. Latitude 66° 25′. Taken between 3 and 4 p. m., during the slack, after the tide had been running north.

	° Fahr.
Temperature of air	38
Temperature of surface	38½
Temperature of 10 fathoms	37½
Temperature of 20 fathoms	36½
Temperature of 30 fathoms	35¾
Temperature of 40 fathoms, bottom	35½

July 7. Same place and time of day.

	° Fahr.
Temperature of air	40½
Temperature of surface	38¾
Temperature of 10 fathoms	37½
Temperature of 20 fathoms	36½
Temperature of 30 fathoms	35½
Temperature of 40 fathoms, bottom	35½

August 2. Taken between 7.30 and 8 p. m.

	° Fahr.
Temperature of air	44
Temperature of surface	42½
Temperature of 10 fathoms	39½
Temperature of 20 fathoms	38½
Temperature of 30 fathoms	38
Temperature of 37 fathoms, bottom	37½

August 5. Taken between 7 and 7.30 a. m. Tide very slack.

	° Fahr.
Temperature of air	46½
Temperature of surface	41½
Temperature of 10 fathoms	38½
Temperature of 20 fathoms	38½
Temperature of 30 fathoms	38
Temperature of 35 fathoms, bottom	37

August 8. Taken 6 p. m. The time of slack different in places a few miles apart; likewise the force and direction of the current.

	° Fahr.
Temperature of air	45½
Temperature of surface	43½
Temperature of 10 fathoms	41
Temperature of 20 fathoms	38½
Temperature of 24 fathoms, bottom	37½

August 20. Taken between 8 and 8.30 p. m. Slight surface tide. About 40 miles WSW. from Holsteinborg.

	° Fahr.
Temperature of air	44
Temperature of surface	43
Temperature of 10 fathoms	41½
Temperature of 20 fathoms	39½
Temperature of 25 fathoms, bottom	38½

The preceding observations, though few, will show very well the temperature of the water on the banks at various depths.

HARBORS.—The harbors of greatest use to the fishermen will be those of Holsteinborg and Sukkertoppen. Of the latter I can say nothing, except that it is reported, by those who have been there, as a good harbor. Holsteinborg, surrounded on three sides by the mainland and on the

other by several islands, is completely protected from the rough water, and is only exposed to the wind on the side towards the strait, from which quarter there is scarcely ever a violent blow. The harbor is large, and has a depth of 10 to 25 fathoms. The harbors mentioned are ninety miles apart, and, as the best fishing we had was about half way between the two, we could easily have run into one of them, whichever way the wind might have been.

Previous to the summer of 1879, which was considered very mild, the fishing vessels went into harbor at least three times a month. This was due to the southwest and northeast winds, which, combined with the strong tides and comparatively shallow water, would soon raise a "nasty sea." These blows, though perhaps not extremely dangerous, would frequently occasion loss if an attempt were made to ride them out, either by the breaking of some part of the rigging, or, if the deck were filled with fish when the wind came, by the loss of a part or all of these.

Nor are winds and waves the only things causing the vessels to seek the harbor. It is frequently very convenient to leave some things on shore, so as to have more room on the vessel. Thus the Bunker Hill left barrels of pickled fins on shore, and Captain Lawson left there, until ready to return home, quite a cargo of codfish he had brought from the Grand Bank, but which was in his way while fishing. New supplies of water must also be secured. The harbor of Holsteinborg is usually open by the middle of May, and perhaps fishing could be commenced by the first of June, but the ice that is brought down the east coast of Greenland, besides blocking up the more southern harbors, will probably render the passage north too dangerous before the middle of June. On this account, and because of the change in the weather about the 20th of August, the fishing here must be carried on in July and August.

3. THE FISHERMEN.

GENERAL CHARACTER OF CREWS AND FINANCIAL ARRANGEMENTS OF TRIPS.—In choosing fishermen for a salt-halibut trip particular care is taken to secure only those whose disposition and ability qualify them for a long trip and continuous hard work. A quarrelsome disposition, bodily inability to stand long, continuous hard work, ignorance either of the proper management of a sailing vessel, or of the methods of fishing employed, are great drawbacks to the financial success of the voyage.

The crew of the schooner Bunker Hill, during the season of 1879, consisted of 14 men, including the captain and cook, and was considered one of the best that ever sailed from Gloucester. They were certainly well acquainted with their business, and, as for disposition, there was no sign of a quarrel during the whole summer. This last is especially remarkable, because of the absence on board of the fishing vessels of the traditionally severe ship discipline. The captain was the only officer on board, unless the cook can be so called. The cabin was open alike to all, and as the bunks, with the exception of the captain's and my own, were chosen by lot, each one of the crew, providing he was sober when the lots were drawn, had as good a chance as his neighbor of securing sleeping quarters there.

The explanation of this general freedom is probably to be found in the co-operative nature of the trip, the financial plan of which was about as follows: The owners of the vessel were to receive 46 per cent. of the net stock, and, besides the vessel, furnished food, salt, and fishing tackle, while 50 per cent. of the net stock, after deducting the cost of tarring the rigging, refilling medicine-chest, pilotage, &c., was to be divided into fourteen equal parts, according to the number of the crew, one part going to each. The captain was to receive, besides one of the fourteen parts, the remaining 4 per cent.* The arrangement was thus, in some sense, a partnership, the owners fur-

* The captain's share is usually 4 per cent. of the net stock, but it may vary either one way or the other.

nishing the capital and the fishermen the labor, the profits to be shared in certain proportions. This general arrangement is not universal, for on some fishing vessels the men are paid a stipulated sum for the trip, the owners running the risk of profit or loss, while on others the crews are composed of both hired men and sharesmen.

EVERY-DAY LIFE, SUPERSTITIONS, &c.—On the evening of the 9th of June, at 6 o'clock, the steam-tug pulled the Bunker Hill from the wharf, so that her sails might catch the wind favorably. We had expected to start several hours earlier, but the little unexpected delays common to such occasions had prevented. Even as it was, on counting up hands two men were missing, so that while we tacked back and forth at the mouth of the harbor, waiting, a dory was sent to find the delinquents. Two hours passed before the return of the dory, and our number was complete; but during this time the wind had died out, rendering it doubtful whether we would succeed in leaving the harbor that evening. At nine o'clock, however, we were outside of the harbor, headed in the direction of Nova Scotia.

The captain had his berth, and one had been assigned to me, but the rest of the crew had as yet no settled sleeping place. The bunks to be chosen were in the cabin and forecastle. The cabin had two double berths on each side; but as the starboard (right hand) ones were reserved for the captain and myself, only two of the berths were vacant. As the berths were large, there was room in the two larboard (left hand) ones for four, making six to sleep in the cabin. The forecastle was arranged with berths on each side and a table in the center, in front of the foremast, where we took our meals.

The crew took their meals in two sets, the first of seven and the second of eight, and this division was made in such a manner as least to interfere with the fishing arrangements. As described below, the dorymates attended to the fishing arrangements of their own dory. Now, many of these things, such as renewing hooks, baiting, &c., could be attended to by one man at a time, and less time would be lost if only one went to meals while the other kept on working than if both went together. On this account the division of the men at meals was made, with one exception, caused by my presence, in such a manner that only one man to a dory would eat at a time. As for the captain and cook, who were exempted from fishing, the captain ate with the first set, while the cook waited until the second.

Another important matter attended to the first evening was the setting of the watches. On leaving the wharf at Gloucester, the captain had taken the helm and kept it until we were well out of the harbor and on our course, when the watches were divided. Two men stand on watch at a time. Each watch is two hours long, and each man is at the wheel half of this time and forward the other half. The captain and cook having no watching to do, this falls upon the other twelve of the crew, who each have, out of the twenty-four, four hours of watching, two of which are spent at the wheel. In order to prevent each man's watch coming the same hour each succeeding day, one man each day omits his watch, and by this means all the watches are pushed backward every twenty-four hours. The man who omits his watch is the one who otherwise would have his wheel between six and seven in the evening.

12–1 p. m.	*a* *b* *c*	6–7 p. m.	*h* *i* *j*
1–2 p. m.	*b* *c* *d*	7–8 p. m.	*i* *j* *k*
2–3 p. m.	*c* *d* *e*	8–9 p. m.	*j* *k* *l*
3–4 p. m.	*d* *e* *f*	9–10 p. m.	*k* *l* *a*
4–5 p. m.	*e* *f* *g*	10–11 p. m.	*l* *a* *b*
5–6 p. m.	*f* *g* *h*	11–12 p. m.	*a* *b* *c*

Thus, for instance, in the table just given, if *f*'s wheel was between 5 and 6 p. m., *g*'s wheel would naturally come between 6 and 7, but *g* omits his watch, and *h*, taking his place, has the

wheel an hour earlier than the preceding day. The next day *g* has the wheel between 5 and 6, and *h* omitting, *i* takes the wheel from 6 to 7.

The watches were arranged so that dorymates watched together every other day. Thus, in the table, suppose that *e* and *f* are dorymates. The first day *e* and *f* watch together, the second day *f* and *g*, while the third day *e* and *f* are together again. Each watch called the next watch. The order of the watches was decided in the following manner: A hat was held crown down, one man from each dory putting a finger upon the border of the opening, while one of the others, commencing at random, counted the fingers in succession until he reached the number nine. Finger number nine being withdrawn, the counting commenced again with one and continued to nine, which was also withdrawn. This continued until no fingers were on the hat. The owner of the first finger withdrawn, together with his dorymate, had the first watch, the owner of the second finger withdrawn, with his dorymate, the second watch, and so on through the whole.

I have said that the watches were two hours long, and this was true while we were on the passage out and back, but not so the intervening time; for while we were anchored in the Strait no watch was kept, because there was little or no danger. When, however, we shifted position, and were expecting to anchor in a very few hours, the time would be divided into twelve equal parts, each man taking one part at the wheel. Thus once or twice the watches were only ten or fifteen minutes long.

The passage from Gloucester to Holsteinborg lasted twenty days, and was along the coast of Nova Scotia through the Gut of Canso, northward in the Gulf of Saint Lawrence, within sight of the western coasts of Cape Breton and Newfoundland, and thence, through the Straits of Belle Isle, into the Atlantic and Davis' Strait. The pleasanter days were occupied by the crew in fixing the dories and fishing-tackle. The crew were very much like bees. On warm, pleasant, sunny days, they were all activity; other days, when it was cold and rainy, they were in their bunks most of the time from breakfast until dinner, and during the rest of the time, with few exceptions, they did little or nothing. This was not on account of any disposition to shirk work, but rather because of there being only enough to do to occupy them on pleasant days; for, after the fishing commenced, they showed themselves to be good, steady workers.

The duties devolving upon the men while on the way north were the sailing of the vessel, fixing the dories, and rigging the trawls. The first was of course attended to principally by the different watches, leaving much time for the others. The fixing of the dories did not take very much time, as it only consisted in making thole-pins, three seats, and two vertical partitions for each boat, and winding the oars with oakum to prevent them from wearing out. The vertical partitions, like the seats, were movable, and were used to divide the dory into three parts. Typically, the stern apartment held the trawls, the central one the fish, while the bow was reserved for the anchors; but whenever the fish were numerous they were put wherever room could be found for them.

The rigging of the trawls, however, kept the men busy much longer than fixing the dories. Four skates had to be rigged for each dory, and all of these were of new material, excepting a large part of the lines to which the hooks are fastened. These short lines, called gangings, had been for two years kept in bundles, with the hooks protected from moisture by a canvas or rubber covering. These must, of course, be examined, in order to test the strength of each ganging, and to free the hooks from rust. Besides this, most of the hooks had to be taken from the line and refastened. This last operation is called "ganging the hooks."

The gangings finished, the ground-line next occupies the fisherman's attention. This being

composed, as already stated, of 50-fathom pieces requires that each of these pieces should have a loop spliced in one end, while the other is fastened by what the sailors call a "wall," so that it will not untwist. The loops and walls finished, and six of the 50-fathom pieces tied together, the ground-line is ready for the attachment of the gangings, which are then fastened to it at every 2 fathoms. Besides the ground-lines and gangings, the buoys, buoy-lines, and anchors had to be made ready, but as these have already been mentioned they will need no further notice here. In doing these things the men would sometimes be in the cabin, forecastle, or on deck, just as convenience and fancy inclined them.

The only difference between Sunday and any other day in the week was that no nail must be driven on that day, for they said that would "nail the trip." Their superstitions are a little curious. The old notion that any enterprise commenced on Friday would be unlucky has, in a great measure, disappeared, on account of the fishermen having read in the papers a long list of great events that had happened on Friday. The objection to hammering on Sunday was so strong that the captain delayed fixing a part of the rigging from Sunday until Monday on this account.

The food during the trip was excellent of its kind. Fresh meat and vegetables were, from the nature of the case, out of the question, but the salt meat could not have been better, and fresh halibut and cod, while the fishing continued, were ever available. There was no milk of any kind, and no canned vegetables. Only enough potatoes were taken to last a few days. A little variety was noticed in the meals on Sunday, for on this day the cook added baked beans and brown bread to the bill of fare. Pea soup was common. Tea was prepared for each meal, and coffee for breakfast, and occasionally also for dinner, but both of these had to be taken without milk. Rice pudding and the famous dish of "duff" appeared occasionally. Neither were we without our mince pies, for the cook made some very fair ones out of dried apples and salt meat. Sugar, butter, and molasses were only wanting the last two weeks. The water obtained in Greenland was excellent, as well as that taken from Gloucester.

The most regular meal was dinner, which came about noon. The other meals were more or less interfered with by the fishing, but while we were on the passage out and back breakfast came about 6 a. m. and supper about 5 p. m.

The course taken coming home was the reverse of that going. Those who have been to Greenland after halibut several years say that after August 20 the weather will permit of but little fishing. Our captain, however, having some salt left, decided to remain a little longer, so we did not start for home until the 28th of August. Then followed the active preparations for going home. The first thing was the bringing on board the barrels of fins, and the careful heading up of these. Next came the repacking of the flitches. After flitches have been packed ten or twelve days, for the first time, they are usually repacked in a more compact form and a little more salt added. During the fishing the packing had been mostly forward of amidships, so that the bow of the vessel was low down in the water, and to trim the vessel better the flitches were repacked farther aft. The trawls were also unrigged and packed away in the hold, but the cleaning of the vessel was left until we were south of the Straits of Belle Isle.

The decks being cleared, and the dories lashed in their places amidships, we started for home August 28. For the first few days the wind favored us, but before reaching Belle Isle it died out, and most of the time after that was unfavorable in direction or a dead calm.

Getting south of the Straits of Belle Isle we found the climate much different from that in Davis' Strait. The captain had brought a bushel or so of very fine black sand from Holsteinborg, and this was now used to scrub the vessel clean of fish slime which had been collecting ever since the fishing commenced.

The passage home was uneventful, the crew being unemployed the greater part of the time. Some read, others walked the deck, smoked if they could get tobacco, and lay in their bunks. Most of the food gave out, until toward the last nothing but salt meat and bread were left. We *reached Gloucester the 17th of September.*

4. THE VESSELS

A part of the salted halibut is brought into port by vessels not exclusively engaged in this fishery. Vessels visiting the Banks after codfish are in the habit of salting the halibut they catch, and even the fresh-halibut fishermen, when the number of fish taken is greater than they have ice for preserving, often salt the remainder. But at present the larger part of the salted halibut is obtained by schooners "fitted out" for catching and salting these fish. These schooners, in size, speed, and sea-worthiness are among the best of fishing vessels. Remaining on the fishing grounds months at a time they often experience heavy weather such as only the stanchest vessels could *possibly survive, and, as the grounds are at a distance from home, size and speed are very desir*able.

The following table gives the names, the tonnage, and the date and place of building of vessels engaged in the Davis' Strait fishery, which has for the last few years monopolized the salt-halibut fishery:

Tonnage, date, and place of building of vessels that have been engaged in the Davis' Strait fishery.

Name.	Tonnage.	When built.	Where built.
Aaron Burnham	89	1870	Essex, Mass.
Albert Clarence	101	1863	Portsmouth, N. H.
Bellerophon	85	1873	Essex, Mass.
Bunker Hill	100	1875	Gloucester, Mass.
Caleb Eaton	104	1866	East Boston, Mass.
Carrie Jones	97	1869	Chelsea, Mass.
Cunard	74	1877	Essex, Mass.
Grace L. Fears	88	1874	Gloucester, Mass.
Henry Wilson	93	1875	Essex, Mass.
Herman Babson	101	1876	Essex, Mass.
John Atwood	109	1865	Kennebunk.
Manbrino Chief	227	1871	East Boston, Mass.
Mary E	67	1871	Essex, Mass.
Nulli Secundus	89	1874	Essex, Mass.
River Queen	198	1853	Haddam, Conn.
Thorwaldsen	88	1871	Essex, Mass.
William S. Baker	103	1860	Essex, Mass.
Average	101+		

5. APPARATUS AND METHODS OF FISHING.

The fishing is done by means of trawls. A trawl is composed of several parts. First, there is the ground-line, which is anchored at each end and lies on the bottom. The hooks are attached to lines 5 feet long, called gangings, which are in turn fastened to the ground-line at every 2 fathoms, sometimes at every 2½. To mark the position of each end of the trawl, a line extends from the anchor at the end of the ground-line to a buoy on the surface of the water.

The main or ground-line is about a quarter of an inch in diameter, and is made up of parts 50 fathoms long. Each of these parts has one end fastened, so that it will not unravel, while the other has a loop spliced in it. The end not spliced is tied to the loop end of the next part by a knot, which is both strong and secure, though easily untied. The trawls can thus, by using

more or less of these 50-fathom pieces, be made of any desired length, but, when not in use, six of these parts are usually kept fastened together, and are then called a tub or skate of trawl, according to the manner of keeping them. In fishing for cod and haddock, and formerly in the halibut fishery also, they were kept coiled up in tubs, whence the name "tub of trawl," meaning 300 fathoms of trawl. But now, in the latter industry, they are kept in what are called skates.

A skate is a piece of canvas about a foot and a half square, having two pieces of rope, 6 feet or so in length, so fastened across it that an end projects from each corner. Upon this canvas the 300 fathoms of trawl are coiled and firmly secured by the ropes, tied together above.

The phrases "tub of trawl" and "skate of trawl" are used interchangeably. Thus, on the Bunker Hill, though no tubs were used to keep the trawls in, it was quite common to hear the fishermen speak of setting two or more "tubs of trawl."

The buoys used on this trip were of two kinds, the "boat-buoys" and "keg-buoys." The boat-buoys were blocks of wood, 3 feet long, cut in the shape of a round-bottomed row-boat, and coated with tar. The buoy-line is attached by means of a swivel to the under part of the buoy, just in front of the middle. Back of the middle is bored a hole from top to bottom, through which passes the flag-pole. This pole fits in loosely so that it turns freely and can be taken out for easy packing in the dory. In order that it may not slip too far through the hole, a piece of leather is nailed round the pole above the hole, and, to keep it upright, a weight is attached to its lower end. The flag is a piece of canvas painted black. These buoys are not, however, so serviceable as the keg-buoys, which are small water-tight kegs, holding a little over a quarter of a barrel. Through the keg runs the flag-pole, tightly wedged in to prevent leakage and strongly fastened by stout lines to prevent its coming out. To this is fastened the flag above and the buoy-line below. The great advantage of these last over the other kind of buoy is their greater buoyancy; for the boat-buoys were continually being carried under by the force of the tide, so much so that it was frequently necessary to use two of them in place of one. On the other hand, the keg-buoys were liable to burst, an accident rendering them fit only for the fire. Unfortunately only ten keg-buoys were brought on this trip; not enough for each dory to have one at each end of its trawl. The matter was settled by using one of these for the outer end of the trawl, while one or two of the boat-buoys were used at the inner end.

The typical manner of setting a trawl is in a straight line, across the direction of the tide; for if the fish swim either with or against the current a greater number will cross the ground-line lying in this direction than in any other. Two men are necessary for the operation. One man sits in the bow of the boat, rowing slowly in the required direction, while the other, in the stern, sets the trawl, by first throwing out the inner buoy, with its attached buoy-line, to be followed by the inner anchor. This, in turn, is succeeded by the ground-line, outside anchor, buoy-line, and keg-buoy. The length of a trawl varies, according to circumstances, from one to four skates, that is, from 300 to 1,200 fathoms.

As already stated, two men in a dory were necessary for setting a trawl, and as there were six dories, three for each side of the vessel, twelve of the crew were required for the fishing, while the captain and cook made the whole number fourteen. Each dory had by lot a particular position assigned to it, and according to this was its relative place of setting the trawl. The vessel at anchor would naturally have her bow toward the tide, and thus the middle dory, on each side, by setting in a line at right angles to the length of the vessel, would set exactly across the tide, the most favorable direction. In order not to be too close together, the dories in front of the middle ones would set in lines running a little forward, while the stern dories would set in lines running

a little backward. This, the typical manner of setting, is varied, of course, by many circumstances—as winds, tides, position of vessel, or the narrow spots to which the fish may be confined.

Before speaking of the hauling of the trawls it will be best to consider the arrangements about the dories and the baiting. Before starting, the crew, according as the disposition of the men inclined them, had become divided up into pairs for dorymates, but not until we were well on our way were lots drawn to decide upon their respective dories. Previous to the drawing of these lots the dories, which were entirely without internal arrangements, such as seats, &c., were kept amidships, three on each side of the vessel, firmly lashed, upside down, one within the other, to the deck. The dories were numbered from one to six, and six slips of paper were prepared, each having one of these numbers on it. These, being thrown into a hat, were drawn by one from each pair of dorymates, each having the dory with the number corresponding to the one on his slip. Boards had been brought for making seats, and, as might have been expected, different degrees of proficiency were displayed by the men in working them up. The men in each dory are expected to do everything pertaining to their own boat, such as taking care of dory, baiting, setting, hauling, and keeping the trawls in good condition.

Two barrels of pickled menhaden were taken to use for the first baiting, or until enough fresh bait had been caught for this purpose. Afterwards the cod and smaller halibut were employed, and when these were not enough the napes of the larger halibut were used. The bait is cut up into strips about six inches long and an inch square at the end. The cutting of this is done mainly on the roof of the cabin, by large, heavy knives. Thick planks had been nailed on top of the cabin for this purpose, and the men of each dory had their places for chopping (for the cutting is more of a chopping than anything else) chosen by lot. There not being room on the cabin for all the men, those of the forward dories used boards laid across the large flitching tubs for cutting their bait.

After enough bait is cut, the skate of trawl is placed on the cabin, and, being untied, the skate is taken away from the coil and spread out on the deck below. The fisherman then commences at the top of the trawl, and, baiting the hooks as he proceeds, recoils it again on the skate below The baited hooks are thrown into the center of the coil. Both the chopping of bait and the baiting are lively times, and wonderful stories are told about the speed with which some fishermen can perform these operations. There is, however, a limit to the speed with which these can be done well, and those who boast most of their quickness are, ten to one, not the best fishermen.

The skates, baited and tied up, are ready for the water, and, if the set is to be made immediately, they are placed in the stern of the dories. When the weather is favorable it takes about fifty minutes to set four skates to a dory, but when either tide or wind is strong more time is necessary. Two to four hours are allowed from the time of setting to the time of hauling.

The hauling is usually commenced from the outer end, so that the men may work toward the vessel and have less distance to row should they be so fortunate as to secure a load of fish. When the buoy is reached the oars are taken in and laid one side, where they will be the least in the way; a roller, whose wheel is four to six inches in diameter, with two or three grooves on its rim, is fastened to the side of the dory near the bow; the buoy is taken in, unfastened from the line, and placed in the stern of the boat, and the hauling commences. The roller is almost indispensable. The line is hauled over this by the man in the bow, who does the hauling, and is then passed on to the man in the stern, to be by him coiled up and put with the buoy in the stern. (The stern is separated from the rest of the boat by a cross-partition of boards.)

After the buoy-line and anchor have been taken into the boat comes the fishy part of the haul

The hooks, whether with or without fish, are not hauled into the dory by the man in the bow, but are kept over the side until, as they are carried along by the ground-line, they reach the other end of the boat, and are there freed either of poor bait or of fish. The bait is easily shaken off by striking the hook against the gunwale of the boat, but the fish are not so easily managed. The large size of the fish necessitates the use of something besides the fishing-hooks for pulling them into the dory. Accordingly large iron barbless hooks, with a loop on one end for the hand to grasp, are used for this purpose.

But the fish must also be killed or stunned before taken into the boat or otherwise considerable inconvenience, to say nothing of danger, might be occasioned by their lively flapping. For this reason killers are used. The "killer," which is also employed for unhooking the fish, is a hard wood club about 2½ feet long. The larger or striking end is round, while the handle is flattened a little and has a notched end.

When the fish comes to the stern of the dory the fisherman hooks it in the eye, or some firm part of the head, with the large iron hook, and, after stunning it by hitting it several heavy blows over the snout with the killer, hauls it into the boat. Frequently the fish has swallowed the hook, and its extraction, were it not for the killer, would require considerable cutting and loss of time. The flattened and notched end of this instrument is run down the gullet of the fish, and, after the line is secured to the other end so as to prevent slipping, the club is turned, until, by the coiling of the line, the hollow of the hook fits into the notched end. Then by a sudden push downward and a jerk upward the hook is loosened and hauled out.

The work continues on in this manner, the man in the bow doing the hauling, while his mate attends to the coiling of the line, shaking off old bait, and taking the fish into the boat until either the boat is full or else the trawl is hauled. In the latter case a return is made to the vessel. Should, however, the boat be filled before the hauling is completed, and any other fishermen be through with the hauling of their trawls, an oar is raised as a signal for a dory to come and take the fish already caught, that the hauling may be interrupted as little as possible. If, on the other hand, all the fishermen are busy when the boat-load is secured, the ground-line is buoyed at the end of one of the 50-fathom pieces, while the load is carried to the vessel. Relieved of their load, the men return to the buoy they have just left and continue the hauling.

Sometimes the trawl is caught in the rocks, so that it is necessary to break it and commence at the inside buoy for the hauling of the remainder. Should it be caught and broken the second time, there is great danger of losing the part which is still in the water, unless it can be caught by the grapple. The grapple is a chain, with an iron bar at one end, and having, at several places along its length, circles of iron points 3 or 4 inches long, directed away from the end to which the bar is attached. It is used in the following manner: Three men go in the dory, two to row and one to attend to the grapple, which, fastened to a line by the end toward which the iron points are directed, is let down until the iron bar drags upon the bottom, but not so low as to permit the whole chain to drag. The men row back and forth over the spot where they think the trawl is, and, if they are right in their calculations, it is hard to see how they can fail to grapple it.

The fish are taken from the dories by the large iron hooks, already mentioned as being used in the small boats. When a load of fish is brought to the side of the vessel, one of the fishermen holds the stern and another the bow painter, while the man in the stern hooks the fish and hands them up to his dorymate, who stands on deck ready to haul them on board.

The last set was made August 27, and was done while the vessel was under sail. Comparatively little fishing had been done since the 20th, for the strong wind had prevented the setting of

the trawls, though the hand-line showed that the fish had not departed. The captain accordingly decided to run into harbor and prepare for going home, but finding the wind near the shore rather gentle and the water smooth, thought best to see how the fish would bite near the mouth of the harbor. As this was the first time we had set under sail, I was curious to see how it was managed.

The dories set in turns. First one is towed astern, while the outside buoy and buoy-line are being thrown overboard, then it is set adrift and the rest of the trawl set at right angles to the direction the vessel is sailing. The rest of the dories go through with the same operation in succession, by which time the first dory has finished setting and is taken in tow by the vessel. Some of the dories are left fastened to the buoy-line to mark the place of the trawls while the vessel sails back and forth an hour or two, until the time of hauling comes. The hauling is done in the usual manner. This manner of setting is practiced quite frequently on the banks of Newfoundland to find out whether the fish are abundant. If the fish are found in considerable numbers, the anchor is dropped, and the trawls run out again in the regular way. Only eighteen fish were caught this haul, so we turned the bow toward the harbor.

6. DRESSING AND SALTING THE CATCH.

After all the trawls have been hauled the men usually attend to the dressing of the fish. For this operation the men had prepared four legless tables, about 6 feet long and 3 feet wide, which, in use, were inclined against the side of the vessel in such a manner that one end rested upon the rail while the other remained on deck. Two men worked at a table, one on each side.

The knives employed were of different shapes and sizes, but the one seemingly the most in favor has the blade about 8 inches long, an inch and a half wide, and not so thick but that it had a good spring to it. All were sharp pointed, and most of them of good material.

Iron hooks, similar to but smaller than those used for taking the fish out of the dories into the vessel, are used for fastening the fish upon the table. To the loop end of the hook a short rope having a cross-piece of wood is fastened. The fish is hooked in the small of the tail, and being drawn up on the inclined table is secured there, head downwards, by placing the rope in a notch cut in the top edge of the table, the cross-piece of wood preventing its slipping back.

It will be remembered that the halibut is shaped somewhat like our common flounder, or flatfish. The backbone, with its spines lying in the same plane with the body, leaves, on each side, a thick layer of boneless flesh. These layers, called flitches, are what the men are after. After the flaps of the dorsal and ventral fins have been cut off close to the body, a cut, deep enough to reach the plane of the backbone and extending from the head to the tail, is made, about 2 inches from and parallel to the dorsal line of the body, followed by a similar cut from the gills to the tail, but on the ventral edge of the body. These two are then connected at the head by a cut parallel to a gill plate and at the tail end by a straight cross-cut. For the better handling of the flitch a slit, large enough to admit the hand, is made at each end. The flitch is then grasped at the posterior part with one hand, and, as it is raised by this hand, is cut free from the backbone with the other. The fish is then turned over and the other flitch taken off in the same manner.

The cuts made parallel to the dorsal and ventral edges of the body, being 2 inches or more from these, leave strips of flesh and fat attached to the inner bones of the fins, which, when pickled, bring a good price under the name of halibut fins. Accordingly, after the flitches, these strips are cut off and pickled. The rest of the fish, consisting of the bones, head, and viscera, is then thrown overboard and another fish is placed on the table.

After the flitches are cut from the fish they are thrown into large tubs, called flitching-tubs, to be there rinsed free from blood and dirt, previous to being salted in the hold. It is one man's duty to attend to the washing of the flitches and to the passing of them below, while three men are salting. The hold is divided by plank partitions, into six large bins, three on a side, in some of which the salt is kept until needed for salting the fish in the others. One man carefully places the flitches in layers, one above the other; a second man, with a scoop such as grocers use for flour and sugar, covers them with the salt, while a third shovels the salt within reach of the second. The Bunker Hill left Gloucester with 270 hogsheads of salt, and out of this salted 9,000 fish, amounting to 140,000 pounds of flitches, having used a little over nine-tenths of the whole quantity. This salt came from Cadiz, Spain, and cost $1.50 per hogshead, or $405 for the whole.

7. TABULAR VIEW OF A SUMMER'S WORK IN DAVIS' STRAIT FISHERY.

The following tables represent in a concise form the time of setting and hauling the trawls, the number of fish caught at each haul, together with the depth of water, tides, weather, &c., while the trawls were in the water. I have taken the time when the men left the vessel for setting and hauling to represent the time of these operations. To set four skates of trawl usually took a little less than one hour, while for hauling the same, especially if there were many fish, required three, and often four, hours.

Since the outer end of the trawl was set last and hauled first, this would remain in the water less time than that represented by the tables, while the inner end, set first but hauled last, would be in the water much longer. Yet, as a rule, more fish were caught on the outer than on the inner end. Many things are unfavorable for the trawls remaining long in the water. In the first place, if the fish are present they will soon hook themselves, and more time than is necessary for this is, of course, wasted. Then, again, the tide, fish, or both combined, are apt to entangle the trawls in the rocks, if these are left too long in the water; besides, the voracity of the little shrimp would soon leave nothing but the bones of the halibut for the disappointed fishermen, were they allowed many hours to satisfy their appetite. So plentiful are these little creatures in some places that they could be scraped off the fish by the handfuls, and, when the trawls had remained in the water two or three hours, they had left the branchiostegals hanging loosely, besides making a general assault on the whole body.

There were three days of fishing before the 5th of July (the date first mentioned in the table) of which I have no detailed notes, and have therefore omitted mentioning them in the table. The fish caught during these days, together with those caught on the hand-line from the side of the vessel, would certainly make the whole number taken during the trip over 9,000. Sixty-six hauls are recorded in the table, by which 8,616 fish were taken, averaging 139 for each haul. The smallest number taken at a single set was 4, the depth being 27 fathoms, and the largest number was 497, the depth being between 25 to 30 fathoms. The depths expressed, owing to the irregularities of the banks and the extent of surface covered by the trawls, are, of course, only approximate, but whenever this was measured I have used the depth where the vessel was anchored in preference to the rough calculations of the fishermen, for I have found them, in this respect, a little inclined to overestimate. It will be observed that the depth in August was less than in July:

Table for July and August, representing the times of setting and hauling trawls, number of fish taken, depth of water, and remarks on weather, tides, &c.

Date.	Set.	Hauled.	Fish.	Depth.	Remarks.
				Fath.	
July 5	2.30 p. m.	4.05 p. m.	48	40	Wind SW. Cloudy, with slight mist. Tide slackening from running N. Shifted position.
5	8.15 p. m.	11.40 p. m.	96	40	Wind WNW. and increasing. Cloudy.
6	2.50 p. m.	5.25 p. m.	144	40	Wind NE. Hazy. Tide slackening from running N.
6	7.45 p. m.	10.05 p. m.	24	40	
7	3.15 p. m.	6.55 p. m.	90	40	Wind SW. and nearly calm toward the end. Partly cloudy. Tide slackening. Shifted position.
8	4.05 p. m.	6.45 p. m.	56	50	Wind NE. Rain. Tide slackening from running N. Fish small. Shifted position.
9	3.45 p. m.	6.30 p. m.	352	50	Calm at first, wind rising from ESE. Cloudy. Tide quite strong, but slackening from running NNE.
10	5.50 p. m.	8.45 p. m.	95	50	Wind WSW. Raining. Tide slackening from running N. Shifted position.
11	7.30 a. m.	10.20 a. m.	66	(?)	Calm. Sky clear. Tide slack.
11	2.50 p. m.	6 p. m.	48	(?)	Calm. Sky clear. Tide running slight toward the SSW. Shifted position.
12	6 a. m.	10 a. m.	158	50–60	Calm. Sky clear. Tide not strong; running N.
12	3.45 p. m.	6 30 p. m.	282	50–60	Wind slight, SW. Sky clear. Tide slackening.
13	8.30 a. m.	11.45 a. m.	157	50–60	Wind slight, WNW. Sky clear. Tide running W.
14	6.40 a. m.	(?)	12	50–60	
14	4 p. m.	7 p. m.	37	(?)	Wind gentle, NE. Foggy.
15	1.20 p. m.	4.15 p. m.	93	55–60	Wind NE. Foggy.
15	7.55 p. m.	1 a. m.	65	55–60	Wind NE. and ENE. Foggy.
16	2.30 p. m.	6 p. m.	14	55–60	Wind NE. Sky clear. Shifted position.
18	11.35 a. m.	2.10 p. m.	4	27	Wind SW. Clearing from fog. Tide quite strong. Shifted position. Three skates to a dory.
19	12.55 p. m.	2.15 p. m.	54	40	Wind SW. Cloudy. After hauling ran into Holsteinborg Harbor.
23	7.15 a. m.	10.45 a. m.	148	35–40	Calm. Cloudy. Tide running strong toward N. Two skates to a dory.
23	2.50 p. m.	5.40 p. m.	389	35–40	Calm. Cloudy. Tide slackening from running N. Four skates to a dory.
24	8.30 a. m.	12.25 p. m.	328	35–40	Calm. Cloudy. Tide running strong to the NE. Four skates to a dory.
24	4.15 p. m.	9 p. m.	127	35–40	Calm. Cloudy. Threatening fog from the W. Tide strong toward the W. Two skates.
25	6 a. m.	9.20 a. m.	305	35–40	Calm. Cloudy. Tide moderate at setting, strong at hauling. Four skates to a dory.
25	4.05 p. m.	7.45 p. m.	257	35–40	Wind gentle, NE. and N. Cloudy. Tide strong. Four skates to a dory.
26	6.45 a. m.	10.45 a. m.	162	35–40	Wind gentle, N. Misting. Tide running strong to NE. Shifted position.
27	6 a. m.	9.30 a. m.	24	55–60	Calm. Cloudy. Tide running northward. Four skates to a dory. On edge of bank.
27	12.45 p. m.	3.40 p. m.	25	55–60	Calm. Cloudy and misting. Tide slackening. Two skates to a dory. On edge of bank. Shifted position.
28	5.30 a. m.	8.40 a. m.	7	(?)	Wind slight, NE. Low fog; clear above. Tide moderate. Two skates to a dory. Shifted position.
31	5.10 a. m.	8 a. m.	76	40–45	Wind moderate, SW. Cloudy, with rain. Tide strong, running NE. Two skates to a dory.
Aug. 1	Noon	2.30 p. m.	138	40	Two skates to a dory.
1	5.30 p. m.	7.15 p. m.	61	40	Two skates to a dory.
2	5.15 a. m.	7.15 a. m.	30	40	Wind SW. Raining. Tide strong. Two skates to a dory. Shifted position.
2	1.15 p. m.	4.15 p. m.	113	40	Wind slight, SW. Raining. Tide slackening. Two skates to a dory.
2	5.45 p. m.	8.45 p. m.	48	40	Wind slight, SW. Raining. Tide commencing to run. Two skates to a dory. Shifted position.
3	1.45 p. m.	4.45 p. m.	305	40	Wind moderating, W. Cloudy. Tide strong, but slackening. Four skates to a dory.
4	1.15 p. m.	4.30 p. m.	289	40	Calm. Sky clear. Tide slackening, running E. Four skates to a dory.
4	7.15 p. m.	11 p. m.	18	40	Shifted position.
5	2.30 p. m.	6 p. m.	274	35	Wind gentle, N. Clear, with few clouds. Tide slackening. Four skates to a dory.
6	3 a. m.	5.45 a. m.	84	35	Wind very slight, E. Sky clear. Tide nearly slack when hauled. Two skates to a dory.
6	3.20 p. m.	(?)	172	(?)	Calm. Cloudy. Tide slackening. Four skates to a dory.
7	7.15 a. m.	10 a. m.	251	25–30	Calm. Cloudy. Tide commencing to run strong. Two skates to a dory.
7	2.15 p. m.	8 p. m.	407	25–30	Calm. Nearly clear. Tide slackening. Four skates to a dory.
8	2.15 p. m.	5 p. m.	497	25–30	Calm. Cloudy.
9	2.40 p. m.	5.30 p. m.	430	25–30	Wind slight from the W. Hazy, followed by fog.
10	9 p. m.	(?)	234	25–30	Wind moderate, WSW. Cloudy. Tide slackening. Four skates to a dory.
11	4.15 a. m.	7 a. m.	61	25–30	Wind moderate, SW. Two skates to a dory.
11	1 10 p. m.	5 p. m.	53	25–30	Wind W., moderating. Cloudy. Shifted position.
13	4.50 p. m.	7.30 p. m.	254	35	Wind gentle, ENE. Clear. Tide slack. Two skates to a dory.
15	4 a. m.	6.45 a. m.	60	35	Wind NW., freshening. Cloudy. One skate to a dory.
15	4.45 a. m.	7 p. m.	63	35	Calm. Clearing, followed by blue sky. Two skates to a dory.

Table for July and August, representing the times of setting and hauling trawls, &c.—Continued.

Date.	Set.	Hauled.	Fish.	Depth.	Remarks.
				Fath.	
Aug. 16	6.30 a. m	8.10 a. m	102	35	Wind gentle, NE. Sky clear. Tide strong, running to windward. Two skates to a dory. Shifted position.
16	2.30 p. m	4.45 p. m	112	30	Wind gentle, NE. Hazy. Tide moderate, running to the east. One skate to a dory. Fish large.
16	6 p. m	8.30 p. m	111	30	Wind moderate, NE. Clear. Tide running to windward. Two skates to a dory.
17	6 p. m	8.10 p. m	112	30	Wind moderate, NE. Cloudy. Tide slack. Three skates to a dory. Shifted position.
18	7.10 a. m	Noon	200	30	Wind light, ENE., becoming calm. Cloudy. Tide strong. Three skates to a dory. Fish excellent. Holsteinborg.
20	4.35 a. m	7.45 p. m	68	25	Wind gentle, NE. by E. Clear. Tide running strong, SSW. Three skates to a dory.
21	5.30 a. m	10 a. m	74	25	Wind moderate, NE. Clear, followed by fog. Tide strong to windward. Three skates to a dory.
21	4.30 p. m	7.30 p. m	81	25	Wind moderate, NE. Foggy. Tide slackening. Shifted position.
24	11 a. m	2.40 p. m	123	30	Wind moderating, NE. Clouds broken. Tide running to windward. Shifted position.
27	7.15 a. m	(?)	18		Set under sail on the inner ground, near the mouth of Holsteinborg Harbor.
	Total		8,616		

Average time between setting and hauling in July, 3 hours.
Average time between setting and hauling in August, 2 hours, 53 minutes.
Average depth of water in July, 45.5 fathoms.
Average depth of water in August, 33 fathoms.

Number of fish caught in July	3,764+
Number of fish caught in August	4,852
Total	8,616+

8. THE HALIBUT IN ITS RELATION TO THE FISHING.

In the preceding tables, under the head of "Remarks," quite frequently occurs the phrase "Shifted position," which signifies, in this connection, a little more than merely changing the position of the vessel; it implies that the fish, for some reason, are no longer to be caught where they may have been, up to that time, quite abundant. Are the fish of a roving disposition, or do the individuals remain within restricted limits? I shall not attempt to decide, but will merely mention some facts which may have a bearing on the question.

The fishermen seldom expect to catch many fish near the vessel after the first flitching. If you ask for an explanation of this, they will tell you that the "gurry" drives the halibut away. By "gurry," they mean the refuse of the fish which is thrown overboard at the time of flitching. There is only a single case, that I know of, which would seem opposed to this explanation. It is that of a large halibut which had eaten the head, backbone, and viscera of a fish that had been flitched. It cannot be that the flesh of their own species is distasteful to the halibut, for this is what the fishermen use for bait, nor can it be that they mistake the white gleam of the flesh for sharks, for the sharks caught here were of a very dark color. Whether we know the cause or not, it is none the less true that the fish cease to bite near the vessel after the first flitching, whereas, if this operation be delayed, or if the tide at that time be strong enough to carry the gurry away a considerable distance, the fish continue to bite freely. Considering, then, that the gurry has this effect, what is the result of remaining in one spot several days? Evidently the mass of gurry will increase, and, being drifted by the tides, will cause the vessel to be the center of an ever-increasing spot where the halibut will not bite. It is thus necessary either to set the trawls at a greater distance from the vessel or else to move her to a new spot. The latter method, of course, is the easier.

On the 23d, 24th, and 25th of July over 1,500 fish were taken from a limited area, at some distance from the vessel, where the gurry did not reach, because the tide ran in the opposite direc-

tion, but there appeared little if any decrease in the numbers. The spot could be easily distinguished from the rest of the bottom by the absence of the tree-like stems of hydrozoa. On the 26th only two of the dories succeeded in setting on this spot, and these two got fish, while the others failed. The attempt to bring the vessel nearer failed so utterly that the trawls did not touch the spot again. 1,700 fish had been caught in four days on a spot not a mile square. I am inclined to think that as fast as some were caught their places were filled by new arrivals, and were it not for the gurry, a vessel once anchored in a favorable position would not have to move until a load had been secured.

But, it will be asked, will this gurry permanently injure the fishing? Probably not. There are many carnivorous animals, besides the little shrimp already spoken of, which would soon eat up everything except the bones of the fish, and it is hard to see what harm these can do. Nevertheless, there does seem to be some effect produced by the fishing of one year upon the abundance of the fish in the same place the succeeding years; for the fishermen complain that the halibut off the coasts of New England, Nova Scotia, and Newfoundland must be sought in deeper and deeper water year after year. If this be so, it is hard of explanation. For, if we consider the halibut as of a roving disposition, why should they shun their former haunts because they have been fished on, or if, on the other hand, they are not rovers, how can they, considering their great fecundity, be so easily exterminated, as their disappearance from these haunts would imply?

Their fecundity must be very great. In a fish about 6 feet in length I calculated the ovary had 2,782,425 eggs. This was done by counting the number of eggs in a straight row an inch long and from this finding how many there were in a cubic inch. The number of cubic inches in one of the boxes in which the codfish hooks came was calculated and the box filled with eggs. These eggs were then weighed. The whole mass of eggs was next put on the scales and their weight divided by the weight of one cubic inch, to ascertain the number of cubic inches of eggs. This result, multiplied by the number of eggs in one cubic inch, would give the number of eggs in the whole ovary. The estimate may be too large, though I cannot conceive how any error so great as to make the number less than two millions could have crept in. I do not know whether all these eggs would have been laid at one time or not, but as they appeared to be nearly of the same size I judge that such would probably have been the case.

There was no way of determining accurately at what stage of the tide the fish were the most voracious, but they appeared to take the bait best the latter part of the stronger tide, for it was then that the hand-line was most successful, and the men expected the best luck with the trawls.

Though the fish are of the same species as those caught on the Grand Bank, nothing was found in them, in the shape of hooks or food, indicative of a migration from any other place.

August 5th I made several observations upon the temperature of the rectum of the halibut, when they were first taken by the hand-line, and found, with one exception, the temperature to be 39° Fahr. These observations were made within an hour or two of the time the temperature of the bottom was taken. The exception referred to was where one halibut showed a temperature of 39½° Fahr., half a degree higher than the others.

The food of the fish was different for different places and times. Where we first fished it was composed of crabs and other crustacea, with now and then a fish of the genus *Cyclopterus*. But when we shifted to a spot 20 miles or so south of this, we found some of the species of crustacea had disappeared, and the principal source of food was a small fish called "lant." There was also a great difference in the condition of the fish in these two places, those of the last place being far better and more vigorous. The males were above six to one female in the first place, whereas the

females in the latter place predominated greatly over the males. I take the following from my diary of August 8 to show the difference in the two places:

"The fish on this bank have none of the large shrimp in their stomachs that were found in the stomachs of the halibut on the other bank. Here they have mostly lant, there mostly shrimp. None of the common cod have as yet been caught." A few were caught after this. "Sharks and catfish are likewise very few. There are no walruses or seals, few whales, and many birds. The birds are not as hungry as on the other bank, and it is harder to shoot them, for they do not fly very near."

NW. from Holsteinborg, July.	WSW. from Holsteinborg, August.
Food, principally crustacea.	Food, principally lant.
6 males to 1 female.	1 male to 7 females.
Fish poor.	Fish fat and vigorous.
Fish in spots.	Fish more evenly distributed.

The halibut do not always swim near the bottom. I saw one leap out of the water where the depth was 40 fathoms, and have caught them on the hand-line when it was only half-way down. Several have followed the bait to the surface, and one even followed the thermometer up twice in succession. Feathers were pulled out of the mouth of one, and the skeleton of a gull, *Larus tridactylus*, was found in the stomach of another.

Blank page retained for pagination

PART II.

THE COD, HADDOCK, AND HAKE FISHERIES.

1.—THE BANK HAND-LINE COD FISHERY.

1. Early history.
2. The fishing grounds.
3. The fishing vessels.
4. Apparatus and methods of fishing.
5. The care of the fish.
6. The Marblehead hand-line fishery.

2.—THE LABRADOR AND GULF OF SAINT LAWRENCE COD FISHERIES.

1. Early history.
2. The fishing grounds.
3. The fishermen.
4. The fishing vessels.
5. Apparatus and methods of fishing.
6. Former importance of the Labrador fishery.
7. Causes of the decline of the Labrador and Gulf fisheries.
8. Winter fishing by Gloucester vessels on the west coast of Newfoundland.
9. Early Labrador fishery from ports in Maine.

3.—THE BANK TRAWL-LINE COD FISHERY.

1. The fishing grounds.
2. The fishermen.
3. The vessels.
4. Apparatus and methods of fishing.
5. The care of the fish.
6. Financial profits.
7. History of trawling.
8. Report on a cod-trawling trip to the Grand Bank. By Henry L. Osborn.
   a. Itinerary of the cruise.
   b. Meteorological observations.
   c. Natural history of the cod.
   d. The vessel and outfit.
   e. Apparatus and methods of fishing.
   f. The care of the fish.
   g. Bait and baiting.

4.—THE GEORGE'S BANK COD FISHERY.

1. Origin and present importance of the fishery.
2. The fishing grounds.
3. The fishermen.
4. The vessels.
5. Apparatus and methods of fishing.
6. The care and disposition of the catch.
7. Financial profits and extent of the fishery.
8. The fitting out of the George's fleet.
9. History of the George's fishery from Gloucester.

5.—THE COD FISHERY OF ALASKA.

1. Natural history of the Pacific cod.
2. History of the fishery.
3. The fishing grounds.
4. The vessels and the fishermen.
5. Apparatus and methods of fishing.
6. The care and disposition of the catch.
7. Capital invested in the industry.
8. Financial profits of fishermen and curers.

6.—THE GILL-NET COD FISHERY.

1. Introduction.
2. Construction and rig of the nets.
3. The Newfoundland fishery.
4. The American fishery.

7.—THE HADDOCK FISHERY OF NEW ENGLAND.

1. The fishing grounds.
2. The fishermen.
3. The vessels.
4. Apparatus and methods of fishing.
5. The manner of caring for the fish.
6. Productiveness of the fishery.
7. Running for the market.
8. The manner of outfit.
9. The haddock fishery fifty years ago.

8.—THE HAKE FISHERY.

1. The fishing grounds.
2. The vessels.
3. Apparatus and methods of the fishery.
4. The products.

Blank page retained for pagination

PART II.

THE COD, HADDOCK, AND HAKE FISHERIES.

1.—THE BANK HAND-LINE COD FISHERY.

By G. Brown Goode and J. W. Collins.

1. EARLY HISTORY.

Since the earliest days of the discovery of America there has been an extensive fishery with hand-lines for cod upon the Grand Bank of Newfoundland and the neighboring banks. In the seventeenth and eighteenth centuries and in the first half of the present century the fishing was carried on from the decks of the vessels in the same manner as is now the common practice on George's Bank. This method was continued to a limited extent until 1860, and there were in 1880 still a few vessels that followed this fishery. These were manned by old-fashioned fishermen from the coast of Maine. Cod hand-lining, at the present time, is carried on almost entirely from dories.

The introduction of the practice of hand-lining from dories on the Banks appears to have taken place between the years 1855 and 1858, though these little boats had long been used in the fisheries near the shore.*

The following history of hand-lining from dories in Maine was prepared by Mr. Earll:

The first vessel in this section to take dories for going out from the vessel to fish with hand-lines was the schooner American Eagle, of Southport, Capt. Michael Read, in 1858. Mr. Daniel Cameron says that they had been fishing with dories in Massachusetts only a year or two at this time, and that the idea originated with the fishermen of Marblehead.

The American Eagle sailed about April 10, in company with the schooner Ceylon, for Banquereau, and by the 10th of June had a full trip of 900 quintals, while the Ceylon, fishing from deck, had only 160 quintals.

On starting for home the American Eagle lent her dories to the Ceylon, which in turn began filling up very rapidly, and arrived home July 4 with 600 quintals.

The following season a number of the Southport vessels carried dories, and it was thought that they averaged one-third more fish in the same time than vessels hand-lining from deck, while the fish averaged about the same in size, about two-thirds large for each method.

In 1860, according to Mr. A. P. Hodgdon, North Booth Bay sent her first vessel with dories for hand-lining, and Booth Bay Harbor began about the same time.

*The Barnstable Patriot, May 10, 1859, says: "It is becoming a custom quite general among the Grand Bank cod fishermen to take dories with them upon the fishing grounds, and fish in them at a short distance from their vessels. Codfish will often take a hook from a dory while they will not notice a hook from the vessel anchored within a rod from the boat. * * * The motion of the boat, giving a quicker movement to the hook, renders it more attractive to the fish than that from the vessel. It is a great change of habit in fish, thus to desert the vessel for the dory."

Mr. B. F. Jewett states that Westport continued in the old way until 1872, when Capt. James McCarty bought a set of dories for the Eastern Clipper, but the results did not seem to warrant the extra expense, and the vessels of the island have not adopted the method very extensively in the Bank fisheries.

The result of this style of fishing has not been very satisfactory, especially to the shoresmen, who claim that the fish caught average much smaller than in the old way, and that the additional expense of dories much more than counterbalances the extra weight of fish. They all strongly favor going back to hand-lining from deck, but the crews object, and generally refuse to go in that way. The fish taken in this way in 1879 averaged between one-third and one-half large.

2. THE FISHING GROUNDS.

Before the beginning of the present century the fishing was almost exclusively carried on upon the Grand Bank, on its shallow portions, the early fishermen rarely attempting to fish in water of a greater depth than 40 fathoms. At the beginning of the present century vessels fished to a considerable extent upon Western or Sable Island Bank and Banquereau. A fleet also visited Brown's Bank and Seal Island Ground. These vessels were from the coast of Maine, but it is recorded that many of the Marblehead fleet used to fish on Brown's Bank previous to the Revolutionary war, and this locality has been a favorite resort for the past thirty years, of the Gloucester hand-line fishermen—the so-called George's-men—who often find it more profitable to go there than to visit George's Bank.

Since the introduction of the use of dories in hand-lining, the favorite fishing grounds have been the Grand Bank, more especially in the vicinity of the Virgin Rocks, the shoal water or "rocky bottom" of Banquereau, and Western or Sable Island Bank.

There is no fishing for cod on the Grand Bank in winter, though unsuccessful trials have in past years been made.

The Cape Cod vessels rarely leave home for the Grand Bank until April, May, or even June. Occasionally, however, an earlier start is made.*

Captain Hurlburt thinks that cod spawn after May 15, on the the Grand Bank. The fishermen find the fish on the southern and western edge of the Bank in April and May; later they are lost track of, though many remain throughout the year. A smaller school goes up the shoal parts of the Bank later in the season, following the schools of capelin.

3. THE VESSELS.

The vessels employed in the early history of the fishery were much smaller and less thoroughly equipped than the modern fishing schooner. During the first century of the American fisheries they were usually of the rig known as the "ketch"; occasionally, also, the old-fashioned vessels known as "snows" were employed. In the eighteenth century there were employed in this fishery a large number of schooners of 40 to 70 tons, old measurement. The "schooner" appears to have been invented about the year 1714. The best records indicate that the first vessel of this class was built at Gloucester by Andrew Robinson.†

---

*1870.—"The schooner Storm King sailed from Provincetown for the Grand Bank on Tuesday of last week. She is the first vessel that has sailed from that port for the Banks so early for many years. About the year 1835, Capt. Godfrey Ryder started for the Banks about the middle of March in the schooner Godfrey. He encountered severe weather and intense cold, the fishing lines freezing stiff as they were drawn in over the rails. This, however, did not prevent his catching a full fare and returning home in time to make another successful voyage the same season to Chaleur Bay."—*Gloucester Telegraph, March 23, 1870.*

†Sabine, p. 130.

Prior to the Revolutionary war Gloucester, Marblehead, Beverly, and other Massachusetts ports had employed in the Bank fishery many square-sterned vessels of this rig, some of which survived until the latter part of the first half of the present century. The square-sterned schooners of the olden time had high quarter decks, corresponding to the old-fashioned poop deck, and, in later days (when they had grown to be considered as antiquated in structure, and the lower quarter decks had come into fashion), they were known as "heel-tappers," the name referring to the resemblance of the high quarter decks to the heels of boots.

In 1731 there were 5,000 or 6,000 men employed in the fisheries of Massachusetts; a large portion of them undoubtedly in the Bank cod fishery. In 1741 there were no less than 400 fishing vessels owned in Massachusetts—160 in Marblehead alone. The average size of these vessels was 50 tons. There were also at least 400 ketches, shallops, and undecked boats.*

In the present century the vessels used for hand lining have been mostly of the same build as those employed in other branches of the fisheries, and the change of methods and manner of fishing were generally not accompanied by any change in the structure of the vessels. In some instances, however, the hand-line cod fishing vessels have been built much larger than those employed in other branches of the Atlantic food fisheries, and in a few cases these vessels have been rigged as three-masted schooners. These large schooners are often employed in some branch of the merchant carrying-trade in winter and are somewhat fuller in the midship section, and have proportionately greater carrying capacity than the average fishing vessel. The Lizzie W. Matheson, of Provincetown, one of the largest of the Bank hand-line fleet, is a three-masted schooner of 193 tons register, and has a carrying capacity of 5,000 quintals of fish.

This fishery is carried on entirely in the summer months, and, consequently, there are among the dory hand-liners, as well as among the trawlers, many vessels below the grade of the average Gloucester schooner. A vessel is fitted out for dory hand-lining in the following manner: Her anchors are lighter than those of a halibut trawler, or even those of a cod trawler, weighing from 250 to 400 pounds for a schooner of 75 to 100 tons. To the anchor is usually attached a piece of chain from 30 to 35 fathoms in length, by which it is connected with the manila cable. The cables are lighter than those used on the halibut schooner, and their length, including that of the chain, is about 200 fathoms. A chain is substituted for a hawser next to the anchor, in order to avoid chafing upon the rocky bottom, upon which the vessels usually lie at anchor. To the upper end of the chain is fastened a warp, a rope 2½ to 3 inches in circumference, which is of less length than the depth of water, and is attached to a large buoy, usually a 50 or 60 gallon cask, which is thrown over when the vessel is at anchor. The object of this arrangement is to float up the lower end of the cable and to keep it off the bottom. When a greater amount of cable is out other buoys are attached at a distance of 50 or 60 fathoms apart, it being undesirable that any part of the hawser should touch the bottom.

Many of the hand-liners, especially those from Cape Cod, coil their "riding cable" upon the starboard side of the forward companion-way instead of upon the port side, which is the universal custom on Gloucester vessels. Hand-liners carry no ballast except salt, water, bait, and provisions. The hold is divided into compartments, in which the salt is stowed and the fish are packed. The manner of fitting up these compartments varies in vessels from different ports and in different vessels from the same port, and cannot be definitely described, some vessels having simply the bulkheads extending from side to side of the hold, while others have the compartments between the

* Sabine, p. 131. Sabine makes a distinction between *vessels* and ketches or shallops. It is probable that by vessels he means schooners, since there appears to be no other good reason for not calling the ketches and shallops by the common name of vessel.

bulkheads subdivided into three or four sections. The water is in the forward part of the hold, and often on the Banks is taken on the deck to make room for the fish. The hold is almost entirely filled with salt, and as fast as the pens are emptied the partitions are knocked down, and when the hold is filled with fish there are no divisions left, the fish forming one great pile in the body of the vessel from the keelson to the deck-beams.

The provisions, as in other fishing vessels, are stowed next to the forecastle bulkhead, but when the vessel is well filled up they are often moved from this position and packed away wherever it may be most convenient.

Many of the hand-liners of the present day have the deck provided with a set of checker-planks similar to those already described as in use upon the halibut trawlers. The arrangement on deck in other respects corresponds in the main to that on the halibut vessel, though most of them have booby-hatches over those leading to the hold, the object of these being to prevent the splashing of salt water into the hold when the vessel is rolling—this being much more necessary with a load of salted fish than with a load of iced fish.* This arrangement, though very convenient, is not practicable on board of the halibut-catchers during the winter season, and therefore it is not in favor at any time. Another objection to their use on the halibut vessels is that the halibut cannot be conveniently passed through a hatch protected in this manner, on account of their weight and the difficulty of lifting them to the necessary height above the deck. The hand-liners require no bait-boards on account of the character of the bait used in this fishery.

The old-fashioned deck hand-liners were accustomed to carry on each side of the deck several—usually from three to four—"fish kids." These were boxes 7 or 8 feet long, and about 3½ or 4 feet wide, and about the same height as the bulwarks. They were arranged along the rail on each side of the vessel and divided into two compartments. When there were two upon one side of the vessel's deck one was placed between the fore and main rigging, and the other one on the quarter between the main rigging and the taffrail; when there were three, two of them were usually placed on the main deck between the fore and main rigging and the other on the quarter. In the interval between the "kids" stood two fishermen, each of whom were thus provided with a receptacle for his fish.

The quantity of salt carried by a hand-liner is the same as that carried by a cod-trawler of the same size. The supply of water is, however, very much greater, since, unlike the trawlers, the hand-liners do not expect to visit any harbors during their voyage, after they have once reached the Banks. The quantity of water carried is from 60 barrels to 120 barrels, while the trawlers rarely carry more than 30 barrels.

4. APPARATUS AND METHODS OF FISHING.

BOATS.—The old fashioned deck hand-liners, like the George's-men, carried a single yawl boat at the stern.

When dories were introduced, the vessels at once adopted the custom of carrying a dory for every man in the crew except the skipper and the cook. The number at present carried will vary from 8 to 20, according to the size of the vessel. The dories are generally 12½ to 13 feet in length on the bottom and, at night or during rough days on the Bank, they are piled in two or three nests on the quarter of the vessel, bottoms down. During the passage, the nests of dories are turned bottom up and lashed down.

A dory fully equipped for fishing and ready to leave the vessel is fitted with the following arti-

* It is impracticable to have booby-hatches on halibut schooners, since it is often necessary, especially in winter, to move the dories amidships during gales, when the vessels are at anchor on the Bank.

cles: Anchor, anchor line or "rode"; one pair 8-foot oars; one or two pairs of woolen nippers; two hand-lines on reels, with gear attached; bait-bucket; bait-board; dinner-box; spare hooks; gaff; bait-knife; water-jug; bailing scoop; and gob-stick. If fishing in a locality infested by sharks a shark-lance forms part of the outfit, and also, at certain seasons, when squid or birds can be obtained for bait, squid-lines and jigs, or bird-lines. The painter, stern-becket, thole-pins, and dory plug may be considered to be parts of the boat since they are usually attached to it in a permanent manner.

The tackles for hoisting the dories on the deck are attached differently from any yet described, the forward tackles being fastened to the after main-shroud, and the after ones to the main-boom topping-lift.

FISHING GEAR.—The gear used in hand-lining from the deck resembled, in a general way, the George's gear elsewhere described, except that the leads did not generally exceed 4 or 5 pounds in weight, and the spreaders, or "sling-dings," had not been invented.

The gear used by the dory hand-liners of the present day, in some respects, resembles the George's cod-gear, but is smaller. The lines are of the size weighing from 14 to 16 pounds per dozen, and the leads are 3 to 5 pounds in weight, the heaviest being used on the Western Bank, where there is considerable tide. The dory-lead, unlike the George's lead, has no tail, the line being bent into a hole in the top of the lead; the horse is usually made of line, though sometimes of metal or wood, and is shorter than that in the George's lead. When two snoods are used the spreaders are generally omitted, though sometimes they are employed, but frequently only a single snood is used. This is usually the case in fishing about the Virgin Rocks or on the "rocky bottom" of Banquereau, where large numbers of dories congregate together upon the same spot of ground, hundreds of them frequently lying side by side. It is an unwritten law among the fishermen that only one snood shall be used on these fishing grounds, and any infringement would be punished in a summary manner. The objection against the use of two hooks on these occasions is that it would tend to cause a snarling of the lines of the different fishermen. The hooks used are usually about No. 12 in size.

Hand-lining from dories is rarely carried on in water deeper than 45 fathoms. Two lines, each having 50 to 75 fathoms of line, are used by each fisherman, these being wound up on light wooden frames called "reels." In the vicinity of the Virgin Rocks most of the fishing is done in the neighborhood of 3 to 25 fathoms of water in depth, while on the shoalest parts of Banquereau the water is but little, if any, over 15 to 18 fathoms.

BAIT.—The ordinary bait is salted clams (*Mya arenaria*) or squid, which are very extensively used, but when capelin or fresh squid can be obtained on the fishing grounds, these are used in preference to any other bait. Birds are sometimes utilized for bait when they can be obtained in sufficient quantities. The kinds principally used are the hagdon (*Puffinus major*), the noddy (*Fulmarus glacialis*), and petrels, or Mother Carey's chickens (genera *Cymochorea* and *Oceanites*). These are caught on hook and line and knocked down with clubs. Vessels ordinarily carry about 50 barrels of clams for a trip of two and a half months to four months. These clams are obtained very largely from the coast of Maine. Many of the vessels go to Portland, the principal depot for bait of this description, and there obtain their supply; again, large quantities are sent from Portland to the ports where hand-liners are fitted out. The price of bait in 1881 was about $5 to $6 per barrel, which is not far from the average price each year. The Cape Cod vessels, and perhaps others as well, often carry large quantities of salt squid, which are used instead of clams. Hand-liners never visit the British Provinces for bait, this practice being confined to the trawlers. Several clams are used every time the hook is baited, the hook being passed first through the soft parts

and then through the tough, muscular portions about the siphon. When baited, the hook is entirely covered.

THE MODE OF FISHING.—A dory hand-liner having arrived upon the Banks and anchored, the mainsail is usually unbent and stowed away below, its place being supplied with a riding-sail. This operation the fishermen call "going to housekeeping." A vessel may remain for weeks in one place if the fishing is good, though usually she makes occasional changes. Vessels fishing on the Virgin Rocks or on the rocky parts of Banquereau frequently lay for several weeks in one berth.

Fishing begins at or before sunrise. The dories are put out on both sides of the vessel, and supplies of bait and lines are placed in them. Each man takes his own dory and rows away in search of a good place for fishing. Sometimes the dories scatter in various directions, trying here and there in the hope of finding an abundance of fish. At other times, as in the vicinity of the Virgin Rocks, all the dories in the fleet will gather in some favorite locality, crowding closely together side by side. When hand-lining was more common than at present it was not unusual for 500 or 600 dories to be fishing together about the Virgin Rocks or on Banquereau. In other localities they are apt to be more scattered. The direction in which they row from the vessel is, to a great extent, governed by the tide and force of the wind. When one of the fishermen is perceived to have good success, his mates are apt to gather around him and try their luck on the same spot of ground. While the dories are out fishing the skipper and the cook generally fish from the deck of the vessel. The men continue their solitary employment until nearly noon, when they are recalled to the vessel by a signal announcing that dinner is ready. In clear weather the signal is made by hoisting some conspicuous object, generally a large basket; in thick weather by the blowing of a horn. The men return to the vessel, unload their fish, and after partaking of their meal again go out in their boats, remaining at their work until they are again recalled by the skipper. The second recall is usually about the middle of the afternoon. The men then go on board, get their supper, and proceed to dress their fish. A careful record is kept by the captain of the number of fish caught by each man, and upon this record depends each man's share of the proceeds.

Even when men are working for wages, extra pay is given to the man who proves to be most efficient. In this fishery, as in all others where record is kept of the achievements of individuals, there is a strong emulation among the crew to be high-line.

When there is good fishing a man may get four or five dory loads a day, under which circumstances he will necessarily return to the vessel more frequently than he is recalled by the skipper.

On the old-fashioned deck hand-liners the men fished much as in the George's fishery, except that they were stationed on both sides of the vessel and often fished "watch and watch." The day and night were divided into watches of four hours each, half of the crew being thus constantly occupied in fishing. While one watch was fishing the other watch was employed in dressing the fish and then in sleeping until they were called. It has been stated that on the dory hand-liners the skipper and the cook usually fished from the deck of the vessel; in some instances there is a dressing gang on board, consisting of the skipper, cook, and a boy, or "green hand," also in some cases a salter. Under these circumstances the men on board do not fish, but devote their time to dressing and salting the catch; and, if not hired, they draw a definite share of the proceeds of the voyage.

The number of fish which may be caught by a crew of hand-line fishermen is shown by the accompanying memorandum of the work of each member of the crew of the schooner Gertie Lewis, of Portland, Me., on her first trip to the Western Bank in 1879.

This list illustrates the ordinary variations in the catch of different men in the crew:

No. of share.	No. of fish caught.	No. of share.	No. of fish caught.
1 (high line)	4,657	10	3,080
2	4,036	11	3,070
3	4,000	12	3,017
4	3,969	13	2,771
5	3,913	14	2,726
6	3,831	15	2,422
7	3,652	Total	52,068
8	3,474		
9	3,450		

The following extract from the Gloucester Telegraph of October 26, 1870, shows the result sometimes obtained by dory hand-lining: "Schooner Lizzie Lee, of Trenton, Me., has had extraordinary good luck thus far. She is about 90 tons measurement, and for the first and second years she brought home 1,700 quintals of fish each year, and this year she has a fare of 1,800 quintals. Captain Stubbs, of Bucksport, has had command of her for the three years." Some of the large vessels from Provincetown have in several instances brought home fares of between 3,000 and 4,000 quintals.

The Expert, of Stonington, is said to have been the first "Bank fisherman" ever fitted from Connecticut. She returned in 1815 with 1,000 quintals.*

5. THE CARE OF THE FISH.

The manner of dressing and salting the fish corresponds precisely to that on board the trawlers.

A correspondent of the Cape Ann Advertiser, writing to that paper January 23, 1863, over the signature of "Antiquarian," gives some very entertaining reminiscences of the fishing carried on from the port of Gloucester at the beginning of this century. He says:

"There were about 70 sail of vessels engaged in the Grand Bank fishery at that time, all low-decked vessels, very similar in model, built with high quarter decks, which extended nearly half the length of the vessel, about 4 feet higher than the main deck, and reached by a flight of steps. There were no bulwarks around the main deck, the waist, 14 inches high, being the only protection. The rigging was not especially neat, the spars being short, with clumsy caps and cross-trees. The bowsprit was pitched at an angle of 45 degrees, being lashed to a huge gammon-knee underneath. The cabin was quite spacious, and contained an immense chimney and fire-place—stoves not then being in use—while the entrance to the forecastle served the double purpose of chimney and companionway. This was considered the most comfortable part of the vessel, but in very rough weather the crew were obliged to put on the scuttle and retreat aft to safer quarters.† The vessels at that time made usually three trips yearly, starting for the Banks about the 1st of March and ending the season by the middle of November. The crew consisted of seven men, who generally went on their own hook, each man furnishing his own provisions, which consisted of hard crackers, salt pork, molasses, &c.—fish being the principal dish while on the Banks.

"On their arrival in port 'washing out' was the first ceremony. This was effected by hauling the 'pound' alongside—a large square pen, half-filled with water, which was attached to the vessel

*Alexander Starbuck.

†The old Manchester is cited as the last of the old fleet. She was sold from Gloucester about 1843, and in 1863 was still employed in the coasting trade.

by means of tackles, into which the fish were thrown, and, after being thoroughly cleansed, were taken into a boat alongside and carried ashore, where they were carted to the flake-yard, at the Cut, to be 'made.' After all had been cured, they were weighed off, and the price per quintal which the crew were to receive was decided upon by disinterested parties and their proportional parts paid them. After taking out the store bill there was not much balance left, and the consequence was that there was much poverty among most of the fishermen of that time. The fish were mostly sent to Bilboa and other foreign ports, where they generally sold for $6 and $7 a quintal. It was not uncommon for some of the vessels to carry their fish to France before they were cured.

"At the close of the season some of the vessels were usually fitted out for trading voyages to Virginia.

"The Bank fishery gradually died out, giving place to the mackereling business and the George's fishery."

6. THE MARBLEHEAD HAND-LINE FISHERY.

The following description of the cod fishery of Marblehead, published in the Boston Sentinel of September, 1839, is of special interest, since it acquaints us with the methods of the Bank hand-line fishery at the time of its greatest relative importance:

"There are about eighty vessels, all schooner-rigged, employed from Marblehead in the Bank fishery, and are built, principally of oak, in Massachusetts. They make about two fares in a year: the first fare commencing early in April, at which time they sail for the Bank of Newfoundland, commonly called the 'Grand Bank'; the second fare commences early in September. The duration of each fare depends, of course, on the degree of success attending it, but four months must be passed each season in fishing in order to secure the bounty offered by the General Government for the encouragement of the fisheries, amounting to $4 per ton on all vessels of 90 tons and under, no allowance being made for any excess of burden. Each vessel takes from 120 to 130 hogsheads of salt for a fare, at from $3 to $3.25 per hogshead. Cadiz salt is preferred, but occasionally other kinds are used. More salt is now expended in curing the fish than formerly, and 100 quintals of fish require about 13 hogsheads of salt. Occasionally, though not seldom, a 'spring fare' is made, when the vessel is expected to return by old 'election day.' This fare is called 'spring fish,' and usually consumed in the neighborhood, being a superior quality. The word 'fare' applies as well to the cargo or lading of the fish as to the voyage.

"The 'shoresman,' as the title implies, and who is generally sole or part owner of the vessel, superintends all operations on the shore relating to the fare. In addition to the vessel he furnishes the salt and bait, the latter article being either salted clams or mackerel in barrels. He also supplies the knives for splitting the fish, mittens for the crew while splitting and salting, and trousers of oil-cloth or canvas for the 'salter.' This part of the outfit is called the 'great general,' three-eighths of which is paid for by the shoresman and five-eighths by the crew (consisting generally of a skipper and five men) at the final settlement of the fare. In contradiction to the 'great general,' the 'small general' is furnished by the crew, consisting of their sea-stores, the expense of which is entirely defrayed by themselves; and each man provides his own fishing apparatus. Barrels are provided by the shoresmen to contain their store of fresh water, but all subsequent cooperage is paid for by the crew.

"A fair passage to the Bank is made in a week, and on their arrival there they generally 'lie to and try for fish;' and when 'they strike a school,' as the phrase is, they anchor. The depths at which they fish are various, from 30 to 60 fathoms; but generally from 35 to 50 fathoms. When the fish are plentiful, the fare is made up in about six weeks—that is, when they have wet or expended

all their salt. Fish caught with mackerel bait are larger than those caught with clams, for the supposed reason that a larger bait of mackerel can be put on the hook than of clam, and the largest fish take the largest bait. Whatever may be the reason the fact is incontrovertible, and the proportional difference is about thus: Fish caught with clam bait will average about 25 quintals to 1,000 fish, and those caught with mackerel bait about 40 quintals to the 1,000.

"This is a general result, but there are occasionally variations from various causes, the principal of which is a different depth at which the fish are taken, the largest fish being taken in the deepest water. The flesh of a sea-bird called a 'hagdon' is a fine bait for codfish, and is frequently used.

"The equipment of a fisherman is singular and grotesque. Over their common dress they wear a pair of 'petticoat trousers,' made very wide, and descending to the calf of the leg; generally they are made with an insertion for each leg, but sometimes like a woman's petticoat, with no intersecting seam, and are of coarse canvas or oil-cloth. A pair of thick cowhide boots of a russet color, and with soles an inch or more thick, reach quite to the knees, with tops to turn up and cover the thighs. The barvel, or leather apron, extending from the breast to the knees, and a tarpaulin hat complete the costume, which secures to the occupant perfect immunity from the assaults of the element in which he procures his subsistence. The hands are preserved from the cutting of the fishing-lines by a sort of digitless woolen gloves called 'nippers.' Each man tends two lines, and they generally fish near the bottom of the sea, but sometimes the codfish will ascend to mid-water, or even much higher, in pursuit of herrings, capelins, and other fish of that class, which swim in immense shoals near the surface; and in such cases the labor of the fishermen is much lightened, and the fish are taken with much greater celerity. In the day-time during the first fare all hands generally fish, and at night the crew is divided into watches that fish alternately; but circumstances create variations in this mode, such as the scarcity or abundance of fish, the inclination of the skipper and crew, &c. During the season of the second fare the fish feed principally in the night, at which time most of them are taken, and on the succeeding day they are prepared and secured below. At any time, however, when the decks are full of fish, they proceed to cure them, and this is the process: The operators being placed in juxtaposition before a bench or platform, about mid-height, the 'cut-throat,' wielding a sharp two-edged knife, which bears the same sanguinary and ominous name, seizes the fish, and separating the connecting integuments between the head and body he then passes his knife through from the nape to the vent and abstracts the viscera. He then passes it to 'the header,' who by an adroit process, separates the articulation of the spine at the shoulder and detaches the head from the trunk, which he passes to the 'splitter,' who, commencing at the shoulders, proceeds to lay the fish open to the tail and detach the sound bone. The fish being thus prepared is thrown into the hold to the 'salter,' who strews on the salt, and stows it neatly away, in compact layers, with the skin down. And in this manner they proceed daily until all the salt is wet, if they are so fortunate as to get a full fare. They are sometimes obliged, however, by the scarcity of fish, by losing their anchor, by sickness or casualty on board, or by other causes to return without wetting all their salt.

"Besides the bodies of the codfish and the bounty, there are other emoluments accruing to the adventurers, such as the oil extracted from the livers of the cod, of which about 15 barrels to 800 quintals of fish is produced, and is sold at about 50 cents per gallon; and halibut, which was mostly thrown away formerly, and now constitute a considerable portion of the profits. It is salted like the codfish, and sold green from the vessel on arrival, at about $2 per quintal, the subsequent process of drying and smoking for the market being performed by the purchasers. This article is mostly derived from the second fare, and about 15,000 quintals are annually brought

into Marblehead, and with the oil is divided in the same proportion as are the codfish and the bounty. As regards the proportional proceeds of the fare, on return of the vessel to the port, one-quarter part is considered to be the property of the shoresman and the other three-quarters of the crew, but the shoresman is allowed one-eighth part more on articles that it is his province to prepare for the market, such as drying the codfish, &c. The sounds or air bladders and the tongues of the codfish, with the fins of the halibut, collectively called 'garney,' are the perquisites of the crew, but of which the shoresman is allowed some proportion according to mutual convention. From 20 to 30 barrels to a fare are saved, the fins selling for about $8 per barrel, and the sounds and tongues from $6 to $7. When the vessel returns she is moored head and stern at about a cable's length from the shore, and the crew proceed to 'wash out' the fare, which is done by unlading it into boats, taking it into 18 inches depth of water, when it is washed clean and then transported to 'the fence,' as the inclosure is called, where the fish are dried. It is then placed in 'water-horse,' that is, it is staked up in a pile, with the skin up, to drain; from thence it is taken to 'the flakes' to be dried. The flakes are a series of horizontal hurdles, at a convenient height from the earth, for the shoresman and his hired men to spread, turn, and take off the fish, the labors of the vessel's crew ceasing with the 'washing out.'"

The following notes in regard to the fitting of the hand-liners from Marblehead previous to 1850, the method of fishing, &c., have been obtained from an interview with Mr. John Ford, of Gloucester, a former resident of Marblehead, and who was employed in the fisheries from that place a few years later than the date mentioned above:

When a vessel was fitting out for the Bank, the owners or fitters supplied her with salt, bait, beef, flour, beans, pork, tea, coffee, and one keg of molasses. In addition to the above list each man carried a fit-out of his own, the variety and extent of this depending on his means and inclination, as well as upon the expected length of the proposed trip. As a rule, however, each one supplied himself with a sufficient quantity of hard bread, sugar, molasses, and gin (from 2 to 14 gallons of the latter was taken by each man). Butter was not carried, as a rule, though occasionally the skipper might take a small quantity. In addition to food, each individual provided himself with fishing gear—leads, lines, hooks, gaffs, and reels. In settling, the salt was considered as the "great general," and was deducted from the "gross stock," while the other provisions, bait, &c., furnished by the fitters, were considered the "small generals." The value of the latter is deducted from the crew's share.

About 1850 the custom was introduced of employing boys of twelve to fifteen years of age to act as cooks, though previous to that time the fishermen usually took turns cooking, each man having his day or week, as the case might be. There was, of course, little cooking to be done compared with the present time. The diet, while on the Bank, consisted largely of fish, chiefly halibut, prepared in various ways. Large numbers of birds, principally hags (*Puffinus major*), were eaten. The fishermen relished these birds very much, and since they could be obtained in large quantities they formed an important item in the bill of fare. It is related of the old Marblehead fishermen, those who have not been to sea for many years, that they will exchange a turkey for a pair of hags which the fishermen from this port often bring home from the Bank in the fall. Almost with no exceptions, hard bread was the only kind used, "soft tack" being rarely cooked. Duff was boiled once a week and "fat-cake" baked on Sunday, on which day no fishing was done. The fat-cake was a sort of short-cake, without sweetening, composed of flour, water, pork, &c. After being mixed, the dough was spread on one side of a barrel-head and patted down to about one-third of an inch in thickness, after which it was baked in front of the fire-place.

Six men and the boy cook usually constituted the crew.

When fish were plenty, and could be caught equally well both night and day, the crew was divided into two gangs, the men fishing watch and watch, each gang dressing its own catch after the next watch took the deck. Sometimes, however, when the cod could be caught during only a portion of the twenty-four hours, all of the men fished while it was most profitable to do so, be that either night or day, and slept the rest of the time—always, of course, dressing the fish before turning in.

Salt clams (*Mya arenaria*) and menhaden slivers were used as the principal bait, though bank clams and hags, when obtainable, were also utilized for the same purpose, being preferred to salt bait.

2.—THE LABRADOR AND GULF OF SAINT LAWRENCE COD FISHERIES.

By G. Brown Goode and J. W. Collins.

1. EARLY HISTORY.

This fishery, in years past participated in by various New England ports, is now of very slight importance. In 1879 not a single vessel from the United States fished on the coast of Labrador, though it is said that before the war of 1812 several hundred American vessels were engaged in this fishery. In 1880 a single vessel from Newburyport visited this coast, returning with 1,000 quintals of cod and 400 barrels of herring. In 1878, also, a single vessel from Newburyport was on this coast. In 1817 Newburyport had a Labrador fleet of 60 schooners, 1 brig, and 4 sloops; in 1860, a fleet of 16 vessels; in 1870, 26 to 30 in the Gulf of Saint Lawrence; in 1872, 2 on the coast of Labrador. The Gloucester Telegraph of June 15, 1870, contained the following paragraph:

"Only two vessels, the Edward Lee and White Sea, have gone to Labrador from Newburyport this season. They are in the employ of Messrs. Boardman and Sanborn, who have pursued this business for the past thirty years, and although it does not pay as well as it should, they take a pride in keeping alive this branch of industry which was once so prominent there. It is only a few years since quite a large fleet went to Labrador, and codfish seemed more plenty then. Now they depend upon herring to make themselves whole."

In 1820, according to the estimate of Captain Robinson, of the English navy, there were 530 sail of American schooners, with a few sloops and brigs, engaged in this fishery. The number of men employed was estimated at 5,830.*

The aggregate catch of the United States fishermen was estimated at 530,000 quintals, and the catch of English fishermen, in the same waters and about the same time, 134,580 quintals.†

The fishery in the Gulf of Saint Lawrence was also extensively prosecuted in years past, in part by vessels going to or returning from Labrador and in part by a special fleet of vessels. At present the number of vessels engaged in this fishery is very limited. In 1881 the number of these hailing from Provincetown was 12, and few or none engage in this fishery from other New England ports. In 1882 10,300 quintals of cod were taken in this fishery by 15 vessels from Provincetown and other Massachusetts ports.

The history of the Labrador and Gulf fishery cannot now be presented in any detail. The time at our command will not allow the necessary elaboration of the extensive material in the

* Journal of Geographical Society, 1834.

† Hind, *op. cit.*, p. i, p. 163.

archives of the Fish Commission, and we shall attempt only an outline, reserving the full discussion for some future occasion.

2. THE FISHING GROUNDS.

The fishing grounds of Labrador and those of the west coast of Newfoundland, which were also frequently visited by the Labrador fleet, are described as follows by Prof. Henry Youle Hind: "The fishing grounds on the Atlantic coast of the Labrador, as far north as Sandwich Bay, have been occupied to a greater or less extent for one hundred and twenty years. Those extending from Sandwich Bay to Cape Harrison or Webeck have also been visited by fishing craft for a generation or more; but north of Aillik, about 40 miles from Cape Harrison, the coast has only been frequented by Newfoundland codfishing craft during the last fifteen years. A Quebec and London house have possessed detached salmon-fishing stations as far north as Ukkasiksalik or Freestone Point (latitude 55° 53″, longitude 60° 50″), for about thirty years, but these have all passed into the hands of the Hudson Bay Company. Until the recent publication of Staff-Commander Maxwell's surveys* our knowledge of the Labrador coast has been chiefly derived from the Moravian missionaries and the surveys of certain harbors far removed from one another by the officers of Her Majesty's vessels.

"A glance at Commander Maxwell's chart, when compared with any document published previous to 1876, shows how little is known respecting the geographical outlines of this extended coast line, which, from its amazing fish wealth, promises to become a very important commercial adjunct to Newfoundland.

"The leading characteristics of the coast northwest of Aillik are as follows:

"1. The shore-line is deeply serrated by a constant succession of profound and narrow fiords stretching from 30 to 50 miles into the interior.

"2. It is fringed with a vast multitude of islands, forming a continuous archipelago from Cape Aillik to Cape Mugford, averaging 20 miles in depth from the mouth of the fiords seawards.

"3. Outside of the islands, and about 15 miles seawards from them, are numerous banks and shoals, which form the summer feeding grounds of large cod, while outside of the shoals there appears to be a second range of banks and slopes, which are probably their winter feeding grounds.

"4. The island-studded area forms an immense codfishing ground, which covers between Cape Harrison (Webeck) and Cape Mugford a boat fishing ground, exclusive of the shoals and banks outside, nearly as large as the combined area of the English and French boat fishing ground on the coasts of Newfoundland.†

"For the sake of distinction I have styled the area under review, 'The Northern Labrador Fishing Grounds,' beginning at Cape Harrison (Webeck), and, for the present at least, terminating at Cape Mugford.

"*Area of the Northern Labrador boat fishery.*—The following table shows approximately the area of the boat fishing grounds about the island of Newfoundland and the Northern and Southern divisions of the Labrador. From this table it will be seen that the area of the Northern Labrador fishing grounds alone, exclusive of the Banks, amounts to about five-sixths of the entire area of the British and French boat fishery on the coast of Newfoundland. The area of the inner range of banks cannot be even approximately stated:

*See Colding "On the Laws of Currents in Ordinary Conduits and in the Sea," in Nature, December, 1871.

†See paper by H. Y. Hind entitled "Notes on the Influence of Anchor Ice in relation to Fish Offal and the Newfoundland Fisheries," Parts I and II. Saint John's, Newfoundland, 1877.

Comparative table of Newfoundland fishing-ground area.

	Area of fishing grounds (geographical square miles).
Northern Labrador boat fishery—Cape Harrison to Cape Mugford, 260 miles, averaging 20 miles deep (among islands)	5,200
Newfoundland boat fishery, French shore—Cape St. John, via Cape Bauld to Cape Ray, 696 miles, by 3 miles deep (shore fishery)	2,088
South shore of Newfoundland boat fishery—Cape Race to Cape Bonavista, 294 miles, 3 miles deep (shore fishery)	882
Northeast shore of Newfoundland boat fishery—Cape Bonavista to Cape St. John, 225 miles, 3 miles deep (shore fishery)	675
Northeast shore of Newfoundland boat fishery—among the islands in Bonavista Bay and Bay of Notre Dame, 120 miles, 7 miles deep	840
Area of British Newfoundland boat fishery	4,116
Area of French Newfoundland boat fishery	2,088
Total area of Newfoundland boat fishery	6,204
Area of Northern Labrador boat fishery—Cape Harrison to Cape Mugford	5,200
Area of Southern Labrador boat fishery—Cape Harrison to Blanc Sablon, estimated, 5 miles deep	1,900
Total area of Labrador boat fishery	7,100

"*Physical outlines of the coast.*—As in Norway, so on the Labrador, the whole coast, from the Straits of Belle Isle to Hebron, is deeply cut by profound fiords, penetrating the land from 30 to 70 miles. These fiords have been mapped so far as Hamilton Inlet by the officers of Her Majesty's vessels, but beyond that point no surveys have been made and published, with the exception of those before mentioned. As an illustration of one of the unsurveyed fiords, I append a sketch plan, made this summer, of Kypokok Bay, the next bay north of Aillik. It is 53 miles deep, estimated from Aillik Head, and has an average breadth of 3 miles. Opposite the Hudson Bay Company's post, 35 miles from Aillik Head, the water is more than 50 fathoms deep, although not above a mile across. This bay or fiord has been excavated by glaciers, like all the other fiords on this coast, and the innumerable islands of the coast are rocky eminences, which have escaped the general glacial denudation. But the glaciers of Labrador have probably left even more valuable records, in the form of moraines, of their early existence here than deep fiords or innumerable islands. These are the shoals or banks which lie some 15 miles outside of the islands, and on which icebergs strand in long lines and in groups. I have styled them the Inner Range of Banks, to distinguish them from a supposed Outer Range in deeper water, where large icebergs sometimes take the ground. The inner banks, as far as they are known, are stated by fishermen to have from 20 to 40 fathoms of water on them. Commander Maxwell's soundings between Cape Harrison and Gull Island, near Hopedale, and just outside of the island zone, rarely show depths greater than 40 fathoms. In one instance only, in a distance of about 110 nautical miles, is a depth of 59 fathoms recorded.

"*Absence of islands on the Southern Labrador.*—The Admiralty chart portrays a very important confirmation of the Labrador coast line, from Saint Lewis Sound to Spotted Island. The trend of the coast line between the Battle Islands, south of Saint Lewis Sound, and Spotted Island, Domino Run, a distance of 65 miles, is due north, and, with very few exceptions, there are no islands off the coast throughout this distance, excluding the group close inshore between Spotted Island and Stony Island. As soon as the coast line begins to turn northwesterly, islands become numerous and continually increase in number as far as Cape Mugford, and even towards Cape Chudleigh. Between Cape Harrison and Cape Mugford the island zone may be estimated as having a depth of 20 miles from the mouth of the fiord seawards. The cause of the general absence of islands south of Spotted Island and Stony Island can probably be traced to the never ceasing

action of northern ice, driven on the coast line where it suddenly makes its southerly bend by the influence of the rotation of the earth upon the arctic current. This current sweeps past the Labrador coast with a speed of from 1½ to 2 knots an hour, and a westerly pressure, due to the earth's rotation, which may be estimated at about 11 inches. That is to say, the mean level of the sea on the coast of Labrador is supposed to be about 11 inches above the level it would assume if uninfluenced by the earth's rotation. As soon as the ice-ladened current reaches Spotted Island it is in part relieved from this pressure by the trend of the coast from southeast to due south; hence the current changes its course southerly and onto the land. But the effect of this sudden change in the direction of the current near the shore is to throw the icebergs onto the coast from Spotted Island to Cape Saint Lewis, where they may be seen stranded each year in great numbers. The islands which doubtless once existed here have been removed by constant abrasion, acting uninterruptedly for ages, and with the islands the moraines lying seawards. We may thus trace the cause of the vast difference between the distribution of stranded icebergs south of Spotted Island and northwest of it. In one case they are stranded near the coast line, wearing it away and deepening the water near it, assisted by the undertow; in the other case they are stranded some 15 miles from the island fringe and continually adding to the banks the débris they may bring, in the form of mud streaks, from the glaciers which gave them birth in the far north and northeast. It is more than probable that this distribution of icebergs has a very important bearing upon the food and feeding of the cod, which justifies me in referring here with so much detail to the action of glacial ice.

"*The inner range of banks.*—The foundation of the inner range of banks consists, very probably, as already stated, of glacial moraines. In their present state they may reasonably be assumed to be formed in great part of remodeled débris brought down by the same glaciers which excavated the deep fiords.

"The absence of deposits of sand in the form of modern beaches on every part of the Labrador coast visited this season, except one, was very marked. The exceptional area observed lies between Sandwich Bay and Hamilton Inlet, Cape Porcupine being the center. It is protected from the northern swell of the ocean by the Indian Harbor Islands and promontory. Here large deposits of sand are seen, covering many square miles in area. The reason why sandy beaches are not in general found on this coast, notwithstanding that enormous quantities of rock are annually ground up by coast ice and ice pans driven on the shore, arises from the undertow carrying the sand seawards and depositing it on the shoals or banks outside of the islands.

"It may be advisable here to advert to a popular error which assumes that the depth of water in which an iceberg grounds is indicated by the height of the berg above the level of the sea. It is commonly stated that while there is one-ninth above there will be eight-ninths of the berg below the sea-level. This is approximately true only with regard to volume or mass of the berg, not with regard to height and depth. A berg may show an elevation of 100 feet above water, and yet its depth below may not exceed double that amount, but its volume or mass will be about eight times the mass it shows on the surface. Hence, while icebergs ground in 30 and 40 fathoms of water, they may expose a front of 100 or 150 feet in altitude, the broad, massive base supporting a mass about one-ninth of its volume above the sea-level.

"*The climate.*—Experience, now extended over twelve years, shows that the seasons are sufficiently late and long to permit Newfoundland fishermen to come from their homes after spring fishing is over there and their garden work attended to. They may arrive on the Northern Labrador fishing grounds from the 10th to the 20th of July, or even later, if they go north beyond

Nain. They may return in general by the 10th to the 20th of September to Southern Labrador rooms, or even to their homes, with full fares of green fish.

"The extremities of many of the deep fiords from Cape Harrison to Ukkasiksalik, or Freestone Point, a distance in an air line of 120 miles, contain timber fit for spars, for the construction of 'fore-and-afters,' and for all ordinary building purposes. The climate there, namely, at the bottom of many of these deep fiords, permits of the cultivation of potatoes and other garden vegetables. Between Aillik and Ukkasiksalik there are at present about sixty resident settlers in the deep fiords, most of whom have been in the service of the Hudson Bay Company or the fishing firms already named, and some of them are married to Eskimo women.

"There are several other points of great interest in regard to the Northern Labrador which are worthy of notice, but the details would swell this paper to dimensions far exceeding those of a brief descriptive outline sketch of a comparatively new field for that kind of enterprise and industry in which Newfoundland is so distinguished, and from which she annually derives so much wealth.

"The expansion and preservation of her fishing grounds for the use of her own people appears to claim, however, thoughtful and liberal consideration, and not only from those who may profit by the industry, but from those also who may be able to assist in lessening the difficulties with which it is beset, in ameliorating the hardships inseparable from its pursuit, and in aiding the development of the resources of the vast area it may yet be made to occupy."*

The fishing grounds in the Gulf of Saint Lawrence frequented by the vessels of the United States were chiefly south of the line of Cape Ray and Cape Gaspé. In the spring the vessels have of late years fished principally on the east and north coasts of Cape Breton, and in former years there was a great deal of spring and summer fishing about the Magdalen Islands, but these grounds have been but little frequented since the introduction of trawl fishing. Later in the season fishing is carried on about Bradley Bank, Orphan Bank, Miscou Flat, off the mouth of Bay Chaleur, and on Pigeon-Hill Ground, lying along the coast between Shippegan Island and Miramichi. More or less fishing is carried on in other parts of the Bay of Saint Lawrence, as it is called, by our fishermen, including that part of the Gulf between Cape North and Cape Gaspé.

3. THE FISHERMEN.

These fisheries were carried on at a time when all the fishermen of the United States were native born. At present there is nothing particularly distinctive about the men in this fleet. A large percentage of the Provincetown schooners fishing in the Gulf of Saint Lawrence hire part of their crews on the Nova Scotia coast.

4. THE VESSELS.

The vessels are, with the exception of a few Gloucester vessels which make one trip to Cape North in the spring, among the oldest in the off-shore fishing fleet. They are generally employed only in the summer, and are equipped in the old-fashioned way. The arrangement of decks and hold is much the same as that on the Grand Bankers. They carry no ballast, excepting the salt which is to be used in curing the fish. Some of the Provincetown vessels carry on deck large tierces, such as are used on the whaling-vessels for oil. In these the fish are "struck" or pickled in brine previous to stowing away in the hold.

The vessels of the Labrador fleet always carried four or five boats of the pattern now generally

* H. T. Hind. The Effect of the Fishery Clauses of the Treaty of Washington on the Fisheries and Fishermen of British North America. 1877. Part II, pp. 68, 69.

known as the "Hampton" boat, but about Newburyport still known as the "Labrador" boat. These boats were made at Seabrook, N. H., and were often called whale-boats. The average length was about 19 feet on the keel and 23 feet over all, lap-streaked, very sharp forward and aft, and with a straight stern-post. They were generally provided with two masts and rigged with sprit or leg-o'-mutton sails. These boats were stowed upon deck, two on each side, with one swung upon the davits at the stern.

About 1815 a fishing company was established at Gloucester, Mass., for the purpose of carrying on the Bank and Labrador cod fisheries. This company had a fleet of vessels built numbering 10 or 12 sail. Most of these were topsail schooners, the others being fore-and-aft rig. The former were most generally employed in the Labrador fisheries, though they occasionally visited the Banks. Their size varied from 50 to 80 tons, old measurement. The rig was peculiar on account of the single square topsail on the foretopmast. They had full, bluff—almost square—bows, straight sides, very round bilge (usually called "kettle bottom"), short, full run, square stern, and high quarter-deck. The latter was usually elevated 4 to 5 feet above the main deck, and reached by step-ladders. Being so high, and quite short (as a rule but little more than one-fourth the length of the hull), the quarter-deck had much the appearance of the heel on an inverted shoe, and for this reason these schooners were spoken of in later years as the old fashioned "heel-tappers." Top-sail schooners were also employed in the Labrador fisheries from Newburyport and Provincetown, according to Mr. Daniel Sayward, of Gloucester, who says that vessels of this class belonging at the above-named ports often came to Gloucester to cure their fish.

These vessels were similar in all respects to those of the same class engaged in the coasting trade of that period (1820 to 1850), varied in size from 130 to 150 tons, old measurement, and, as a rule, were old schooners. The quarter-decks were not so high as those of the vessels formerly sailing from Gloucester.

There can be no doubt, however, that the Labrador fleet was mostly made up of fore-and-aft schooners, of the ordinary types employed in the fisheries at that period.

5. APPARATUS AND METHODS OF FISHING.

TRAWLS.—Trawls are now exclusively used in the Gulf of Saint Lawrence, and have been during the last twenty-five years or more.* The equipment of dories is similar to that of a Grand Banker. In former years the fishing in the Gulf of Saint Lawrence was carried on by hand-lining from the deck of the vessel, in a manner now practiced in the George's fishery, excepting that the leads were much lighter, weighing 4 to 5 pounds, and that the vessels often fished while drifting with the wind and tide.

The trawls used in the Gulf of Saint Lawrence are similar to those used on the Grand Bank.

Captain Atwood states that before the introduction of trawling in the Gulf of Saint Lawrence the majority of the fish were comparatively small, about seventy being required to make a quintal. On Bank Bradley, for instance, the cod would usually be about as large as a common haddock. Occasionally one would be taken as large as a porpoise, weighing 70 or 80 pounds, perhaps one or two to every hundred. When trawling was introduced great quantities of these large fish were taken, and for several years a considerable fleet of Provincetown vessels frequented these grounds. The large fish were nearly all caught up in time, however.

* We learn that quite a number of our fishing-vessels are fitting out for a trip to the Bay for the purpose of trawling fish, which are said to be quite plenty in the vicinity of Cape North. This is somewhat of a new field for our fishermen. * * Several of the Marblehead and Beverly fishermen have fished there in past years and found fish abundant. The vessels start about the middle of April, and will probably stay two or three months.—(*Cape Ann Advertiser, March 30, 1860.*)

Large fish were taken in considerable numbers at least as late as 1879, on the fishing grounds of the Gulf of Saint Lawrence, especially in the vicinity of Miscou Flat, some 10 to 14 miles from Point Miscou. A peculiarity of these great cod, many of which would weigh nearly 100 pounds, *was that they could be caught only in the night—they were "night fish." A trawl set during* the day would catch only small fish, while, on the same ground, a considerable number of large cod, and only a few small ones, would be caught on a trawl set between sunset and dark.

The large cod appear, both in size and habits, to be a distinct school of fish from the smaller kind. Among the latter it is rare to find an individual more than 35 inches long, so that there seems to be no intermediate sizes between the day school of small cod and the night school of large fish. Of the latter, one is rarely taken that would weigh less than 45 to 50 pounds. This is all the more remarkable, since, on all the outer fishing banks, there appears to be a regular gradation from the smallest to the largest cod.

HOOKS AND LINES.—The gear used by the Labrador fishermen in hand-lining from their small boats was an ordinary boat-gear, with a single hook and a lead weighing about one pound and a half. In former years a special form of hook, known as the "jigger," was used by the Provincetown fishermen, this being an implement made in the shape of a fish, with a cod-hook soldered to it. This was used when bait could not be obtained, and to deceive and attract the cod by imitating the movements of a small fish, it was drawn up and down in the water at a short distance from the bottom.

NETS.—Vessels fishing on the Labrador coast were accustomed to carry seines for the capture of capelin. Vessels fishing in the Gulf of Saint Lawrence carry gill-nets, 2½ to 2¾ inch mesh, from 15 to 20 fathoms in length and 2½ fathoms deep. When the vessel is on the fishing ground they are set from her stern. Bait is sometimes sought at the Magdalens in the spring, and the nets are then anchored near the shore.

BAIT.—On the coast of Labrador the bait chiefly relied upon is capelin, as will be shown in the description of the methods of fishing. Herring and lant are also used when capelin are not to be had. In the Gulf of Saint Lawrence herring is the principal bait; mackerel also are often used, and squid when they can be obtained.

METHODS OF FISHING.—The manner in which the codfishery is prosecuted on the coast of Labrador is well described by Mr. Charles Hallock, who, in 1861, visited this region on a fishing vessel. Mr. Hallock's notes are supplemented by extracts from the autobiography of Capt. N. E. Atwood, who forty years before was engaged in this fishery as one of the crew of a Provincetown fishing schooner.

Mr. Hallock writes: "This fishery is perhaps equally divided between the Provinces and the States, though the number of men and vessels employed by the former is much the largest in proportion to the population. * * * Little idea has the world of the populous community to be found on the Labrador coast from the 1st of June to the end of September. Every little harbor as far up as latitude 56° is filled with vessels, and fleets are constantly moving from place to place, following the vagaries of the fish. * * * Many parties have salting rooms and dressing stages on shore, but the majority of vessels cure their fish on board.

"When the fish bite sharp, all is activity and bustle throughout the fleet. Boats are constantly leaving for the fishing grounds, or returning loaded to the 'gunnel,' and all day long is heard the cheery song of the dressing gang on deck, and the splash of the offal as it falls from the 'splitting table' over the side to the water below. At early evening, after the labors of the day, the seine boats go in quest of capelan (bait), carefully searching the little coves and inlets and creeping along the shores; three men pulling in the usual way, an oarsman in the stern standing up and pushing,

while he scans the surface of the water for the ripple of passing schools, and a lookout in the bows, motionless as a figure-head, resting upon his elbows and peering into the depths before him. Now one gives warning, and over goes the seine smoothly and noiselessly, and with a rapid circuit the bait is impounded and quickly hauled on board. One cast is generally sufficient, for the capelan swarm in millions, swimming so densely that often a dip-net can be filled from a passing shoal. They keep near the shore to avoid their finny pursuers, and are left floundering upon the rocks by every reflex wave. The cod often leap clear of the water in their pursuit, and at such times may be taken by the hook almost the instant it touches the water. The capelan is a delicate fish, about 6 inches in length and not unlike a smelt; his back a dark olive green, sides of changing rainbow hues, and belly silvery white. * * * Later in the season, after this bait-fish disappears, launce are used for bait, and herring in their turn.

"Returning to the vessel the seines are hung to dry, and from every masthead flaunt like gossamer veils swayed by the evening breeze. The boats float alongside, moored to outriggers, and with their vessel seem like fledgelings nestling beside the parent bird. From many a deck lurid fires flash and flicker in the gathering darkness, revealing dusky figures grouped around—the fishermen preparing their hasty supper. They use no stoves, but build their fires in halves of hogsheads filled with sand. Then follows a night of refreshing slumber, and at earliest dawn they start for the ground again.

"At the stages on shore work goes briskly on. From the loaded boats the cod are thrown upon the platform with pitchforks. There they pass respectively through the hands of the 'cut-throat' and 'header,' who remove the livers, tongues, and sounds; thence to the 'splitter,' who takes out the backbone, and thence, divested of the entrails, which are shoveled into the water, below to the salter, who piles them in 'kenches,' head and tail, salting profusely between the layers. After remaining thus for three weeks the water and 'gurry' are absorbed, and they are then placed upon the 'flakes' to dry. At the end of three days they are said to be 'made.' After this they are piled in 'kenches' again for a day to 'sweat them'—that is, to remove remaining moisture—and are again thrown upon the flakes for a day. They are then ready to be stowed in bulk in the vessel. Thus cured they bring from $2 to $3.50 per quintal.

"Woman, too, hath a part in this business, and in the recesses of the moss-roofed hovels her voice may be heard singing gaily as she 'heads,' while the unceasing splash of the water beneath fitly chimes in unison. These are wont to stand in tubs while at work, protected from the filth and offal by long gowns—cod-liveries—of oil-cloth extending to the floor; and when their task is done they emerge from these like butterflies from their chrysalids, clean and intact, *in statu quo*. An expert will split 8,000 fish per day, or head twice that number. The lodging shanties are constructed of spruce poles or sheds, generally boasting but a single apartment, and here both sexes occupy in common, the only partition being that mathematical one which excludes all objects not within the line of vision."*

Captain Atwood writes: "We sailed from Provincetown on June 6, 1820. We went to the coast of Labrador, but, as it happened, we were unfortunate in getting codfish. Our men were not the best of fishermen, so we got only a very small share. We carried 160 hogsheads of salt and brought back about 30. I don't know how far north we went, but it was to the locality familiarly known to us as Grosswater Bay. Our mode of fishing then was to let the vessel lie in the harbor and send the boats out. At that time Provincetown had not a single vessel on the Grand Bank, and had two or three small vessels which went to the Gulf of Saint Lawrence for mackerel. All the fishing vessels were on the coast of Labrador. We carried four boats. We used one to get capelan for bait when capelan

* Harper's Magazine, xxii, 1861, 595.

were plenty during the capelan school. The bait boat would seldom go fishing. The fishing boats were baited out of her. We had one of the crew to throat, one to head, and one to split, and a salter in the hold of the vessel salting them as they came down. On our arrival on the coast of Labrador very few could be caught until the capelan came in, and then the capelan schools of cod came in also. The capelan school lasted about three weeks. After they went away we picked up fish very slowly. After the capelan had finished spawning the fish slacked off, and we used to say that the cod were 'capelan sick.'

"In the spring of 1821 we started, about the 10th of May, for the coast of Newfoundland; being ahead of the capelan school, we fished with clams about the Straits of Belle Isle and Bonne Bay. When it was time to go north to meet the capelan school we left the Newfoundland fishing and fished in Indian Harbor on the south side of Grosswater Bay. Here we remained until we had consumed all our salt, excepting a few hogsheads. We got about 1,200 quintals of fish, which was considered a good fare. Then we came down into the Straits of Belle Isle and went to a place called Pinwire, where we washed our fish out and took them ashore to dry them on the rocks. We had to turn and dry them on both sides. I think we staid here about four weeks. We then took our fish aboard for home. On our arrival here, the fish were not dry enough for market and we went to Gloucester and took them out and dried them over again, and then carried them to Boston where we sold them.* My share of the voyage amounted to $83.

"In 1823 I again shipped for the Labrador fishery in the schooner Favorite. I think we carried 160 hogsheads, or 1,280 bushels of salt. We sailed from Provincetown about the middle of May, and proceeded first to the northern coast of Newfoundland, making a stop at the Bay of Islands where we commenced fishing with clam bait, which we carried with us. We were too early for the capelan school. After fishing here eight or ten days we proceeded and arrived at Indian Harbor, on the north side of Grosswater Bay. Soon after we arrived the capelan came on the coast, and while they remained we wet nearly all our salt. The school lasted about three weeks. Having some salt left, we proceeded homeward, stopping at the Straits of Belle Isle at a place called Henley's Isle. The capelan were gone, and we were compelled to fish with launce, or sand-eels. We used up all the rest of the salt, excepting a few bushels; left the coast and proceeded on our voyage homeward, arriving about the 20th of September.

"In 1824 I shipped on the schooner Independence, of Boston. We sailed for the Gulf of Saint Lawrence on the 27th of April, but could not get into the Gulf on account of the ice. We first harbored at Barrington, near Cape Sable; then we moved eastward and anchored in Liscomb's Harbor. By the next move we got to Canso, where we remained several days, the northern part of the strait being filled with ice. After some days of southerly wind the ice drifted northward, and we made another move, harboring again at Port Hood, where we were detained a few days. We were bound for the Magdalen Islands. A few days later the ice cleared away, so that we could reach the Magdalen Islands, and we anchored in Gridley's Harbor. We went out into the Gulf and brought back a part of a fare of fish, which was cured by a French fisherman on the island. He received 10 per cent. for curing them. We then went over to Bank Bradley, fishing

* Mr. Daniel Sayward, of Gloucester, Mass., in describing the topsail schooners employed in the Labrador fisheries, said: "Several of this class of vessels, belonging at Newburyport and Provincetown, resorted to Cape Ann, during the first half of the present century, to cure their fares of fish, which had been caught at Labrador. At first the favorite locality for curing was at Wheeler's Point, on 'Squam River, but afterwards some of the schooners visited Gloucester Harbor for this purpose. The vessels generally arrived home from Labrador about September. A flake yard was hired, and the crew, who remained on board, 'handled' the fish and prepared them for market. The time necessary for the proper curing of a Labrador trip was usually about five to six weeks." It would seem from this that, as a rule, the fish were not dried any before reaching Gloucester.

The crews of the vessels, according to Mr. Sayward, were hired.

also off North Cape, Prince Edward Island. We didn't get more than two-thirds of a cargo of fish when it was time to come home. We came home, notwithstanding the fact that there were some 40 hogsheads of salt not used.

"In 1825 I shipped on the schooner President. This schooner measured 84 tons and carried 160 hogsheads of salt. This and the previous year we used mackerel exclusively for bait, and had no trouble in catching as many as we wanted. The mackerel were caught with 'jigs,' the offal which was thrown from the decks being sufficient to keep the fish at the surface. We used the spawn of codfish as toll-bait with which to keep the mackerel at the surface. We fished, for the most part, on Bank Bradley and at the North Cape of Prince Edward Island and along the west shore from Escumenac Point to Point Miscou. We used up all our salt. We wet all our salt and came home, arriving the latter part of September."

During the last thirty years the cod-seine has been used on the coast of Labrador, especially by vessels from Newburyport. Fishing with the seine is thus described by Mr. W. A. Wilcox: "A small boat is first sent to look over the ground, a water telescope being used—this being a small box 8 by 10 inches square, with a glass bottom. By the use of the water telescope the cod school may be seen moving through the water. When the fish are discovered the seine is set around them; the length of the seine is usually about 100 fathoms; its depth, 55 to 75 feet, the mesh ranging from 3¼ to 4½ inches. From 2,000 to 12,000 codfish have been taken at a haul. Herring are also often taken in nets and salted; these are brought home as part of the cargo. These are caught near Bradore and Assizes Harbor."

6. FORMER IMPORTANCE OF THE LABRADOR FISHERY.

Mr. Wilcox writes: "Since 1875 only one Newburyport firm has been engaged in the Labrador fishery. This same firm has prosecuted this fishery for over thirty-five years, with from one to four vessels each year; and, until within the last five years, not one unprofitable trip was made."

The Labrador fishery is still extensively prosecuted by British Provincial fishermen. We quote from Professor Hind the following description of the status of the Northern Labrador fishery in 1876:

"About 400 fishing craft, from 18 to 90 tons burden, are supposed to have passed Cape Harrison this season. Taking the average of the entire fleet, they carried each eight men, three fishing boats, and one shore boat. Out of the 3,200 hands we may assume that 2,400 were actually engaged in fishing. The estimated catch was 60 quintals per man, or in the aggregate 144,000 quintals. This work was accomplished in an average aggregate of twenty-four fishing days, and to a large extent with the jigger, that is, without the use of bait. The average weight of the fish is about 3 pounds fresh. Allowing one hundred and thirty fish to the quintal the number taken would be about eighteen millions, the number wounded and lost about four and a half millions, although some fishermen consider that one fish out of three is wounded by the jigger and lost when the fish are very numerous.

"During the gale of the 11th and 12th of September there lay next to us in Indian Harbor, off Hamilton Inlet, a small craft of 30 tons burden, just arrived from off Nain. She had been fishing about the islands near the Missionary station, in latitude 56° 40′, about 600 miles northwest of Saint John's, and in three weeks had taken 300 quintals. Her complement consisted of six men and two fishing boats. She arrived, like all the fishing fleet this year, too late to take advantage of the season. The cod had 'struck in' many days before she commenced fishing. Had she arrived a fortnight earlier she might easily have taken 80 quintals to the man in place of 50,

but she had used all her salt, and the crew were satisfied with the result. Her fishing days were eighteen in number, excluding Sundays, which are always observed by fishermen on this coast.

"Another craft, also lying alongside and hailing from Notre Dame Bay, was of 60 tons burden, her complement twelve men and four boats. She reached the islands off Hopedale (latitude 55° 27′) on the 22d of July, fished for six weeks, and took 700 quintals of fish, or about 60 quintals per man. She takes her green fish direct to Notre Dame Bay to make there. No fish are made or cured on this shore, as yet, north of Long Island Tickle, some 25 miles northwest of Cape Harrison.

"Hitherto on the Northern Labrador coast the jigger, as already stated, has been almost exclusively used; it is only lately that launce have been tried as bait, and with marked success. But it is well known that only the smaller sized cod come into shallow water, the larger fish remaining to feed on the banks outside and in deeper water. Very few attempts have been made to fish on the Labrador Banks, but when tried, I have been assured by trustworthy persons that large fish have always been taken with bait.

"Larger boats than those used about the islands are required for this kind of fishing; indeed, a totally different organization and equipment will be necessary for the Northern Labrador bank fishery, which appears destined to become, under proper encouragement and management, the fishery of the future."

The Gloucester Telegraph of March 19, 1842, says:

"In 1807 four vessels fitted out at Newburyport for the Labrador cod fishery. These were the first vessels from the United States that made their fares in Esquimaux Bay."

Lorenzo Sabine, in his report on the American fisheries, published in 1852, gives the following account of the Labrador fishery as carried on at that time:

"The first American vessel which was fitted for the Labrador fishery sailed from Newburyport towards the close of the last century. The business, once undertaken, was pursued with great energy, and several hundred vessels were engaged in it annually previous to the war of 1812. A voyage to Labrador, unlike a trip to the Banks of Newfoundland, is not without pleasant incidents even to landsmen. The coast is frequented for a distance of 10 or 12 degrees of latitude. It has been preferred to any other on account of its security, and a general certainty of affording a supply of fish. Arriving in some harbor early in June, an American vessel is moored, and remains quietly at anchor until a full 'fare' has been obtained, or until the departure of the fish requires the master to seek another inlet. The fishing is done entirely in boats, and the number usually employed is one for about thirty tons of the vessel's register. Here, under the management of an experienced and skilful master, everything may be rendered systematic and regular. As soon as the vessel has been secured by the necessary anchors, her sails and light rigging are stowed away, her decks cleared, her boats fitted, and a day or two spent in fowling and sailing, under color of exploring the surrounding waters and fixing upon proper stations for the boats, and the master announces to his crew that they must try their luck with the hook and line. Each boat has now assigned to it a skipper or master and one man. At the time designated the master departs with his boats, to test the qualities of his men and to mark out for them a course for their future procedure.

"The love of power, so common to our race, is exemplified even here, since the skippers of these boats, though commanding each but a single man, often assume airs and exercise authority which are at once ridiculous and tyrannical; while their ingenuity in explaining the causes of a bad day's work, really occasioned by idleness, or by time spent in shooting sea-birds, frequently puts the patience and the risibility of the master to a severe trial. If fish are plenty, and not too distant from the vessel, the boats are expected, in good weather, to catch two loads in a day.

Their return, if laden, is the signal for the dressing-crew, who are left on board, to begin a series of operations which, when completed, leave the fish in the form in which the consumer buys them. From the dressing-table the fish are thrown down the hatchway to the salter, who commences the process of curing by salting and placing them in layers in the bottom of the vessel. If the master intends to remain on the coast until his fish are ready for market, they are commonly taken on shore as soon as caught, and there dressed, salted, and dried before being conveyed to the vessel. If, on the contrary, it is his intention to dry them at home, as is now the common practice, the salter's duty is the last that is performed aboard. The bait used in the Labrador fishery is a small fish called capelan. This small but useful fish seldom remains on the fishing ground for more than six weeks in a season; a time which is long enough for securing a full supply, and which an experienced and energetic master does not often allow to pass away without one. The average produce of this fishery may be estimated at about 10 quintals to every ton of the vessels employed in it, though the best masters are dissatisfied when they fail to catch a fourth or fifth more."*

Concerning the Labrador cod fishery from Newburyport, Mr. John G. Plummer writes us as follows: "Capt. Charles Sandborn says that he went first in 1833, and there were then about eighteen or twenty large vessels. One was a ship of 360 tons. They went down to Salmon River, anchored in the river, and went down along the shore in boats and caught most of the cod with nets or seines. They used those seines that were knit flat and gathered at the sides, so as to have them bag some, and when they could not take all the fish in the boats they used to buoy up the lead-line and leave the fish in the nets until they returned for them. Sometimes they used large bags made of nets, which they would fill with fish and anchor them until the boats could return for them. The vessels carried fine-mesh nets in which to catch capelan for bait.

"The voyage usually lasted about three months. The fish were dried at home and the cost of drying, one-twelfth, was paid in shares. They were packed in drums and shipped to the West Indies, to Bilboa, Spain, and up the Straits.

"The vessels employed were not very high cost, and were fitted at low rates. They had a codfish bounty from the Government, and so made good voyages, but after a while the Government cut off the bounty, and the cost of vessels and expense of fitting, including wages, increased so that there was no money in it. One after another the vessels were withdrawn, until November, 1881, not one is left. Last year there was one vessel, and this year none.

"The cod that were dried here in Newburyport and packed in drums brought the best price in the West Indies of any in the world. They were not very salt and were thoroughly dry, so as to stand the heat.

"Fishermen all say that even now, with good large vessels, and with little assistance from the Government, they could compete with the French and English fishermen and make it pay; but where the French get a good bounty from the Government and we get none, and the cost of fitting is higher than in France, it is impossible to make the fishing pay. These small Labrador fish have to be shipped to the same market as the English and French fish.

"Our vessels carried mostly men and boys and taught them to be sailors. Some of these were in our Navy during the war, and one or two in the Kearsarge when she sunk the Alabama; about twenty of them, I think, were in the Navy.

"We used to have great times here when the vessels came in from Labrador. All the men and boys we could scare up were employed in washing, hauling, drying, and packing the fish, and shipping them to market. The oil was shipped mostly to Philadelphia, and the vessels usually brought back coal, corn, sugar, and molasses.

* American Fisheries, pp. 170, 171.

"The first American vessel to engage in the Labrador cod fishery sailed from Newburyport about the year 1794, and from that time until the year 1879 there was scarcely a year when one or more Newburyport vessels have not visited the Labrador coast. In 1806 this fleet numbered 45 sail; in 1817, 65 sail; in 1860, 60 sail; in 1874, 2 sail; in 1876, 2 sail; in 1879, none; in 1880, one vessel.

"Captain Sandborn thinks there were not more than twenty or twenty-five Newburyport vessels that engaged in the Labrador fishery when it was at its zenith, but I thought there were more than that number. I can't tell of any cause for their leaving off except what Captain Sandborn says, that if Government would help us as other Governments help the fishermen we could beat them out of their boots."

In 1858 a vessel from Northern New York participated in the cod fishery on the coast of Labrador. This was the schooner Charlotte, of Rochester, Captain Farnham, which fitted out in that city in 1858, and proceeding down the Saint Lawrence River and through the canals made hardly a reasonably successful voyage, returning home in September. On the 2d of September she entered in the Rochester custom-house with the following cargo, consigned to A. Wilder, esq.: 6,000 pounds of codfish, 3½ barrels of salmon, 2 barrels of halibut, ½ barrel of sounds and tongues, 300 pounds of trout, 24 seal-skins.

Contemporary newspaper paragraphs stated that the Charlotte obtained 90,000 pounds of codfish and a large quantity of salmon and seal-skins. An examination of the custom-house records, made by Mr. W. T. Hornaday, shows that the cargo was small. It is, however, a remarkable circumstance that a vessel from this locality should have attempted to engage in the sea fisheries.

7. CAUSES OF THE DECLINE OF THE LABRADOR AND GULF FISHERIES.

The causes of the decline of the Labrador and the Gulf fishery are not thoroughly understood. There appears to be no scarcity of fish in those regions. Two reasons for the abandonment of these grounds by American vessels are mentioned, (1) the demand in American markets for larger fish than can be found on the Labrador coast, the exportation of salt codfish, for which small fish were formerly preferred, having fallen into the hands of the British Provinces and Norway; (2) the introduction of trawling upon the off-shore grounds, which has been accompanied by improvements in the fishing vessels, the capture of larger fish, and in an increase of skill and daring on the part of our fishermen, so that it is now unnecessary for our fleet to go so far from home, or engage in voyages where the vessels lie in harbor while fishing, since fares of higher-priced fish can be readily obtained on the banks lying off the coast.

8. WINTER FISHING BY GLOUCESTER VESSELS ON THE WEST COAST OF NEWFOUNDLAND.

This fishery, though of no great importance, deserves mention. It is so different from the summer fishery, which has just been described, that it seems more appropriate to make reference to it in a separate paragraph. In the winter of 1861 and 1862 four vessels fitted out and started on a cod fishing trip for the west coast of Newfoundland. One of these, the Ocean Traveller, was lost on the passage. The others resorted to Bonne Bay and the Bay of Islands, but were not very successful. Other vessels have since that time made occasional trips in the winter to the same localities, but on account of the extreme severity of the weather at that season, the results have rarely been favorable.

9. EARLY LABRADOR FISHERIES FROM PORTS IN MAINE.

During the first half of the present century, writes R. E. Earll, the Labrador fisheries were extensively prosecuted from the towns of Westport and Booth Bay.

The first vessel engaging in the business of which we get any trace was the schooner Ruby, 115 tons (old measurement), Capt. James Sennett, of Harpswell. The vessel was sent from North Booth Bay about 1817, and was joined the next year by the schooner Union, 84 tons, Capt. Timothy Kemp, from the same place. The next season (1819) there were two other vessels, the Dennis, 78 tons, from North Booth Bay, and one from Westport.

These vessels continued yearly to visit Labrador, but it seems that they were about the only ones from this section to engage in the business for some years. They fished in and about the Straits of Belle Isle and frequently farther north, to Cape Harrison, starting about the 10th of June and returning by the middle or last of September.

The fish were generally very light salted, only 8 bushels being used to 10 quintals. The vessels got full trips and frequently took a part of their fish out and spread them on the rocks to partially dry them and thus lighten the vessel and save salt. They always brought full fares of from 1,000 to 1,500 quintals, but the fish were small and brought a low price. Mr. Timothy Hodgdon, an old man who was interested in curing at that time, is authority for the statement that in those days no large fish were ever taken by these vessels, and that when thoroughly dried it took one hundred and thirty in number to make a quintal. After being cured they were invariably sold to Boston parties for exportation to Bilboa, and came to be known as "Bilboa fish."

The business in later years began to grow, and about 1840 East Booth Bay began sending vessels, while Westport sent a larger fleet. Mr. Daniel Cameron, of Southport, thinks that in 1844 Westport and East Booth Bay each sent four vessels, while North Booth Bay had a like number. This seemed about the height of the business, and soon after it began to decline, so that by 1850 almost no vessels were sent, but through William T. Maddocks, we learn that his father sent the Osprey as late as 1856 from Southport.

The vessels averaged about 100 tons, the extremes being 45 and 140 (old measurement), carried yawl boats at first and always remained in the harbors while the men were fishing. The crew were divided up into a dressing and fishing gang, the former remaining on board and dressing the catch of the others. They were provided with small drag-seines and caught their bait each morning before the fishing began. They used capelin wholly, which were always found in great abundance in the shoal waters along the shore. The crews fished in shoal water and usually very near the vessel, fished at the halves, counting their fish as they were thrown aboard the vessel, and generally averaged about $140 to $160 per man for the trip.

The fishing was always good, and we get no record of a vessel from this section returning without a full fare, neither can we learn of either a man or vessel being lost. But, notwithstanding the abundance of fish, they were so small that they brought even less than those classed as small from other localities, and the firms were driven out of the business.

The following additional statements concerning this fishery are made by Capt. A. P. Hodgdon:

While fishing in the vicinity of Partridge Harbor in 1844 or 1845 the crew of the schooner Dennis, Captain Hodgdon, caught 1,100 quintals in fourteen days. The fish came in great numbers after the capelin, and frequently the water would be filled with them for acres at the surface, where they would make a good deal of noise splashing about in chasing their prey. They only

remained a few days, and when they struck the fishermen had to work pretty hard to get their trip before the fish left.

During the height of the season, fifteen to twenty-five days, the men would "turn out a little after 2 in the morning and fish until about 11 at night." They used what they called "set lines," which were merely hand-lines tied to the side of the boat and reaching to the bottom; and "jigs" for fishing near the surface, made on something the same principle of the mackerel jigs. While fishing at the bottom with "set lines" they frequently caught large cod, but with the jigs they often got the small ones as fast as they could haul them, and had an arrangement for slatting them from the hook to save time.

Among the first vessels to go to Labrador was the schooner Angler, Capt. Thomas Pinkham, belonging to Wiscasset, while the smallest one that ever went from this section was the schooner Frederick Reed, of East Booth Bay, being only 45 tons, old measurement.

Most of the fishing towns in Eastern Maine engaged in the Labrador fisheries to a greater or less extent during the early part of the present century. The fishermen of Vinal Haven (one of the Fox Islands) began to visit Labrador about 1805. They did not pursue this fishery with much regularity, sending two or three vessels some seasons, and perhaps none for several years in succession. No vessels went after 1840. Lamoine, Maine, sent two vessels, 65 and 67 tons respectively, to Labrador in 1850, but has never at any other time engaged in the cod fishery of that locality.

Capt. J. S. Mayo, of Tremont, Maine, says that the Labrador cod fishery was pursued by the fishermen of Mount Desert and the adjacent islands as early as the beginning of the present century. The fishery prospered until 1839, after which time it declined and was finally abandoned about 1845. The reasons that induced the fishermen of Mount Desert to give up this branch of the fishery were (1) the shortness of the season, (2) the uncertainty of obtaining bait, without a full supply of which it was impossible to procure a fare of codfish, and (3) the small size of the fish taken and consequent low market value of the same.

The fleet belonging at Southwest Harbor and Cranberry Islands that fished on the Labrador coast in 1839 numbered eight schooners, namely: the Brainard of 78 tons, Temperance of 56 tons, (from Cranberry Islands); Four Sisters of 35 tons, Bannister, 68 tons, Eratus, 46 tons, James, 70 tons, Sea Serpent, 75 tons, and Leo of 56 tons, (from Southwest Harbor), the total tonnage employed being 484 tons, old measurement. These vessels were usually engaged in the Magdalen herring-fishery in the spring; making one trip for herring before starting for the Labrador coast.

According to Capt. E. B. Stanley, of Cranberry Islands, the Labrador cod fishery revived somewhat after 1845, and in 1857 three schooners owned at Cranberry Islands engaged in bringing home a total of 2,100 quintals of codfish.

The fishery was kept up by two or three vessels until 1862, since which time no one at Mount Desert has engaged in it.

Mr. W. E. Hadlock states that the first vessel which went to Labrador from the Cranberry Islands was a schooner of about 40 tons, under command of Capt. Samuel Hadlock. This trip was made in 1810. The fish were cured at Cranberry Island, after which they were loaded on board of the same vessel that had caught them, and carried to Spain.

The schooner Starlight, of Cranberry Island, made a cod fishing trip in 1862 to Bellesimore Bank, off the coast of Labrador. She secured a good fare of large fish, but the prospects were not sufficiently encouraging for her or others to engage in the same fishery afterwards.

3.—THE BANK TRAWL-LINE COD FISHERY.

By G. Brown Goode and J. W. Collins.

As has already been stated in the chapter on the Bank cod hand-line fishery, an extensive industry has for several centuries been prosecuted on the Grand Bank of Newfoundland and neighboring off-shore banks, the principal object of which has been the capture of cod, though of late years a considerable quantity of halibut has been taken incidentally by the same fishermen. Except in the George's cod fishery, the practice of hand-lining from the deck of the vessel, which was formerly the only method, has been discontinued almost entirely within the last twenty-five or thirty years, though a number of vessels are still fitted with hand-lines and dories. A very large majority, however, of all the vessels fishing on the off-shore Banks use trawl-lines, these being exclusively employed by the French fishermen and almost exclusively by the Canadian fishermen.

The American trawl-fishery is so recent in its origin but little can be said about its history, and this chapter will be devoted to a discussion of the methods in use at the present time which are essentially the same as those introduced when trawling first became customary.

1. THE FISHING GROUNDS.

The American trawlers frequent all the off-shore banks as well as those in the Gulf of Saint Lawrence. The most important fishing ground is of course the Grand Bank of Newfoundland. This great shoal throughout its entire extent is an excellent fishing ground for cod, though in some seasons there are limited areas which are more or less barren. The gully called "Whale Deep," having a muddy bottom, is never resorted to. The trawling vessels ply their lines over a larger area than the hand-liners, which, for a greater part of the year, congregate in the shoaler waters in the vicinity of the Virgin Rocks. From April to June the best trawling is usually obtained on the southern part of the Bank, between the parallels of 43 and 45. From July to October the fish are distributed over a much larger area, and fishing is carried on from latitude 44 to the extreme northern limits of the Bank.

In July and August a favorite locality for the trawlers is that portion of the Bank lying east of the Virgin Rocks, a distance of 15 to 45 miles, and known as the "eastern shoal water." The portion of the Bank lying between the parallels 44 and 45.20 is a favorite fishing ground for cod at all seasons from April to October.

Next in importance to the Grand Bank, so far as the American fishermen are concerned, is the Western Bank, on which Gloucester vessels can be found in nearly every month of the year, and which in summer is resorted to by bankers from nearly every port. Large numbers of Canadian vessels fish here during the spring and summer months, but the French vessels are excluded by the provisions of the convention of 1818 from all grounds within 100 miles from the coast of Nova Scotia, and therefore are never seen on any of the fishing banks south or west of Banquereau. The Western Bank affords excellent fishing over its entire surface.

Banquereau is also extensively resorted to by American, Canadian, and French vessels, though it is not so favorite a fishing place for the Gloucester trawlers as the Western Bank. Like the Grand Bank fishery, that upon Banquereau is exclusively a spring and summer fishery.

Saint Peter's Bank is now almost abandoned to the French, though it was formerly a favorite spot for the American trawlers, especially those of Gloucester.

Green Bank, until very recently, has not been resorted to for cod, but the influence of the halibut trawlers has carried the Gloucester trawlers thither, and it has proved to be an excellent ground for cod as well as halibut. The former ignorance concerning this Bank is accounted for by the fact of its proximity to Saint Peter's and Grand Bank, which were so well known to be good that the fishermen had no disposition to leave them in search of uncertain luck elsewhere.

The other off-shore Banks frequented by trawlers are La Have Bank and La Have Ridges, Brown's Bank, Roseway Bank, and banks in the Gulf of Saint Lawrence, especially that about Cape North, for spring fishing. All these banks, however, are of slight importance to the trawl fishery in comparison with those previously mentioned.

Except upon the fishing ground off Cape North, cod trawls are rarely set at a depth exceeding 60 or 70 fathoms, the common depth being from 25 to 45 fathoms on all the banks. At Cape North trawls are set at depths of from 75 to 110 fathoms.

The general character of the trawling grounds is more fully discussed in Section II, on fishing grounds.

2. THE FISHERMEN.

Trawling for cod is carried on from Gloucester, Provincetown, Beverly, Hingham, and a few other places in Massachusetts, and from several ports in Maine.

The crews are made up somewhat differently from those in other branches of the fishery. It is true that Gloucester vessels fishing on the Western Bank carry picked crews which will compare favorably with those in any other branches. Vessels going from Gloucester, Provincetown, and elsewhere on long trips to the Grand Bank carry a considerable number of inexperienced men—young men trained up in the shore fisheries of the British Provinces and Maine, who have not yet learned the routine of the vessel, and who can be hired at a low price. In setting the trawls two men go out in each dory, one of whom, the "skipper of the dory," must be an experienced fisherman, while the other, the "bowman," needs only to possess courage and endurance and to be a good boatman. In fitting out vessels from Gloucester four or five men, who are sharesmen in the voyage, often get the vessel ready and take her down to the Canadian coast, where at some of the ports they hire the remainder of their crew.

The trawling fleet has now become the training school for young fishermen, the introduction of the purse-seine in the mackerel fishery having broken up the practice of carrying a number of boys on each schooner. It is a feeling of old fishermen at Provincetown and elsewhere that the introduction of this element into the fishing crews has had the effect of lowering their former standard of intelligence and efficiency, the young men of fishing towns being unwilling to enter upon careers as fishermen in competition with others so much their inferiors in capacity and social position. This, however, is probably unavoidable, for the educated sons of the fishermen of the last generation would naturally feel little inclination to enter upon the laborious livelihood in which their fathers were engaged, even though they were not confronted by this particular objection.

In the chapter on the characteristics of the fishermen will be found a full discussion by Mr. H. L. Osborn of the routine life and the characteristics of the crew of a Gloucester trawling vessel, which may be regarded as fairly typical not only for this fishery, but for the other vessel fisheries of New England.

3. THE VESSELS.

The vessels used in the trawl fishery are of the largest class of fishing schooners, ranging from 60 to 125 tons in register. There were in 1880 about 200 schooners in the American trawling fleet, one of them, which sailed from Beverly, being a three-master andt he largest of all.

The trawling vessel is usually one of the stanchest class of fishing schooners of the ordinary type, though there are a number of second-class vessels sent out from Provincetown, Beverly, and Plymouth, the summer voyage to the Grand Bank not being a very severe one. The Gloucester trawlers are all first-class vessels, being employed, when not trawling for cod, in some branch of the winter fishery, such as the Newfoundland herring trade, or in fishing for haddock or halibut.

In their general rig the trawling vessels have no peculiarities to distinguish them from those in the haddock and halibut fleets.

The arrangement of the deck is very similar to that described elsewhere in the discussion of the halibut schooners, the checker-boards, the bait-boards, and the manner of stowing cables and dories being essentially the same. A few Gloucester trawlers carry a gurry-pen, placed forward of the house, in the same manner as that described in connection with the George's schooner. This is used for the storage of the spare gear and to give more room for cutting up the bait. The anchors are precisely the same as those carried by other fishing vessels. The cables are of the same size as those carried by the halibut fishermen, but shorter, their usual length being 200 or 250 fathoms. The dories are the same size as those carried by the halibut fishermen. Vessels from other ports do not generally carry such large cables and anchors as are taken by the Gloucester schooners.

The trawler carries on its deck from three to five "liver butts," which are ordinary molasses hogsheads, with a capacity of 130 to 175 gallons. Three or four of them are stowed together in chocks and lashed to ring-bolts in the deck, just forward of the house, and with their ends toward it. Others are sometimes carried, stowed on their bilges in front of the main hatch, or standing upright, lashed to the fore or main rigging. These butts remain in these positions during the voyage, and are filled up with livers through the scuttle-holes in the tops, the water being drawn off from time to time through the "spile-holes," bored in the heads or in the staves near the bottom. The scuttle-holes are covered with canvas or boards to keep out the water.

The splitting tables and dressing tubs, which are used when the vessels are dressing fish on the fishing grounds, will be described hereafter.

The interior fitting of a trawler is somewhat peculiar. As a rule these vessels carry no ballast, the quantity of salt, provisions, and water carried for a bank trip being sufficiently heavy to serve in its place until the vessels begin to fill up with fish. The greater portion of the hold is occupied by salt-pens, which are built of single boards nailed to stanchions and extending along the sides of the vessel, beginning at either side of the bait-pen, in the after part of the hold, and extending forward nearly to the store-room, which occupies the forward part of the hold.

Amidships, between the after hatch and main hatch, the hold is completely filled with salt-pens; these are called the "midship pens," in distinction from the others which are known as "wing-pens." Under each hatch is a clear space called the slaughter-house. The forward slaughter-house, or that under the main hatch, is used in salting and kenching the first fish before the pens begin to empty, while that under the after hatch serves as a storage for spare gear and also as a passage-way. The pens, which vary from 12 to 18 according to the size of the vessel, hold from 15 to 25 hogsheads of salt each, the aggregate capacity varying from 180 to 300 hogsheads.

The bait-pen is built forward of the cabin bulkhead and between this and the after hatch. It is 9 or 10 feet wide and 10 or 12 feet long, holding about 60 barrels of bait in addition to the ice necessary for its preservation. The bottom of the pen is raised about a foot above the keelson, and it has a center partition by which it is divided into two sections. This is necessary in order that one pen may be kept closed and protected from the air while the bait is being used from the other. The bait-pen is built double, the boards breaking seams to prevent the passage of air, and in the forward bulkhead it has a door on either side of the partition opening into the after side of

the slaughter-house. The sills of these doors are about two feet above the bottom of the pen. When the bait is being iced and stored the door openings are gradually filled up by boards sliding into grooves to prevent the fish from falling out, and after the bin is entirely full the door, which is not hinged, is secured in its place by means of a horizontal bar.

The store-room or forehold is connected with the forecastle by a door and is used as in other vessels for fresh water and provisions, and also by the cook for a pantry.

As fast as the salt-pens are emptied they are knocked down; the space they occupied is filled up with salted fish, so that when the fare of the vessel is completed the hold is entirely clear, with the exception of the store-rooms and bait-pens, and is filled with fish, and even the latter are also often filled with fish.

The supply of water for a trawler is much less than for a hand-liner, since the latter rarely visits any harbor after they have once reached the Bank until the voyage is completed. The trawler seldom carries more than 30 barrels, while the hand-liner carries from 60 to 120.

4. APPARATUS AND METHODS OF FISHING.

THE APPARATUS.

EQUIPMENT OF DORY.—The cod trawl-line is described in detail in another section of this report under the heading "Apparatus of the fisheries."

Each vessel carries from 4 to 6 dories, which are in the main equipped as in the halibut fishery, though with some slight differences. One of these dories ready to leave the vessel is fitted with the following articles:

1. Painter, 5 fathoms of 2-inch manila rope. 2. Stern becket, 3 feet of 2-inch rope. 3. Stern painter, 3 fathoms of buoy-line. 4. Two pairs of 9-foot ash oars. 5. Wooden scoop for bailing. 6. Gob-stick, 2 feet long. 7. Gaff in wooden handle, 2½ feet long. 8. Single-score trawl roller. 9. Two pairs woolen nippers. 10. Plug with becket and line. 11. Four thwart lashings, each 3 feet long, of buoy-line. 12. Rubber boot-heel bumper on stem. 13. Leather on forward ends of dory ribband strakes. 14. Dory knife, 5½-inch pointed blade. 15. Brass dory compass in wooden box (compasses are not always carried). 16. Four to six tubs of trawl. Each tub of trawl is rigged in the following manner: Ground-line of 11½ 25 fathom skeins of 18-pound tarred cotton line, 300 No. 14 cod-hooks (center-draught eyed), 5⅔ feet apart, on ground line, gangings 3 feet long, of 6-pound tarred cotton line. 17. One buoy, rigged with staff, swivels, and black ball. 18. One buoy, rigged with staff, swivels, and small flag. 19. Two buoy-lines. 20. Two 16-pound anchors, served in ring and part of stock with spun yarn and strap bent into ring. 21. One and a half dozen thole-pins.

The tackle for hoisting the dories on deck is like that used on halibut schooners, rather than those used in the hand-line cod fishery.

BAIT.—In the early part of the season the vessels trawling on the Western Bank bait with frozen herring, *generally that brought from Grand Manan and Newfoundland, and later in the year* use herring and mackerel which they obtain in the various ports of Nova Scotia and New Brunswick. Mackerel are sometimes obtained from seining vessels encountered on the passage to the Bank. *Vessels going to the Grand Bank in April usually carry a few barrels of salted clams, but* rely chiefly upon herring obtained at Newfoundland in spring and capelin in June and the early part of July, and squid, which are used for the remainder of the season, are obtained also at Newfoundland. Not infrequently a full supply of squid can be obtained on the Bank by the crew of a vessel. From 150 to 200 barrels of bait are required by an ordinary banker for a season's work; sometimes the quantity is as great as from 300 to 350 barrels.

In the course of a season on the Grand Bank the vessels are accustomed to visit the Provincial ports three or four times for bait, and sometimes much more frequently. These baiting trips occupy, according to circumstances, from four days to three weeks, occasioning great loss of time and more or less demoralization among the fishermen. One of the greatest needs of this fishery is the invention of some method by which the necessary supply of bait can be obtained by the bankers without interruptions of this kind. The salt which it is necessary to carry occupies so large a part of the vessel's hold that there is no room for the great bulk of fresh bait which is required for catching a full fare of fish. A still greater difficulty is found in the impossibility of keeping bait fresh longer than from twelve to twenty-one days.

The vessels frequenting the Western Bank also make three or four baiting trips, though occasionally, when fish are very plenty, the vessel is partially filled up at one baiting, and it is found more profitable to carry in the fare while it is green and weighs heavy than to get a new supply of bait and return to the Bank for an additional catch of fish.

The method of icing bait on a "salt trip" is as follows: When bait has been secured, the ice is removed from the pens and taken on deck. Four or five men, with fish-forks, pick the ice up fine in hogshead tubs, putting in a cake of 100 to 200 pounds at a time. Others of the crew are engaged in passing the baskets of herring and fine ice to those who are icing the bait. There are generally two men in the hold, one in the bait-pen and another at the hatchway. A layer of ice is first put upon the floor of the pen, after which a thin layer of herring, then another layer of ice, and so on, until the pen is nearly full. The whole is covered by a quantity of ice varying from six inches to a foot in thickness, according to the season, the pen to be opened last having the largest quantity.

Mode of fishing.—The Western Bank trawlers, as has already been implied, leave home in February and March, and continue fishing until October, making on an average five or six trips a year, while the Grand Bankers, leaving home in April, as a rule return home in August or September, having made one trip. The schooners of a smaller class fill up and return home sooner. Occasionally a vessel makes two trips to the Grand Bank, but this practice is not so common as in past years. The fish are now found to be scarce on the Grand Bank after the first of September, and there is often much difficulty in procuring squid for bait. Within the past year or two fish have been scarce on the Western Bank in the fall months, and the trips among the Western Bankers have been less.

The routine on a trawling vessel is very different from that on a vessel fishing with hand-lines, for the former never "goes to housekeeping" in the old-fashioned way. The mainsail is never unbent and stowed away, but is simply furled up whenever the riding-sail is hoisted. Years ago, when the trawlers rarely went to Newfoundland for bait, and depended on "shack fishing," or baiting with birds and refuse fish which they obtained while lying at anchor, they were accustomed to remain for a long time in one berth, as do the hand-liners now, and then they sometimes unbent their mainsails, but this custom was abandoned about 1870. Life on a trawler is much less regular and monotonous than on a hand-liner. The crew of the hand-liner rests on Sunday; that of a trawler seldom or never. The trawl fishermen work with all their might—frequently day and night—until their bait is used up, and then weigh their anchors and are off for port, where they have an opportunity for rest and change of scene.

The day's work begins with breakfast, which is served at daylight or before, the first gang being called out at 3 or half-past 3 in the morning in mid-summer. As soon as they can see, the fishermen start out to haul their trawls, which have been set all night. From four to six dories are rowed out from the vessel in different directions toward the outer ends of the trawl-lines unless the

fog is so dense that there is no probability of finding their outer buoys, in which case they commence at the inner ends and haul outward. Fishermen, however, become so expert in rowing through the fog that they often succeed in finding the outer buoys when it is impossible to see more than one-eighth of a mile through the fog. A row from 2 to 3 miles brings the dory to its destination, and the line is hauled in the manner elsewhere described, the operation requiring from three to six hours. The length of time depends upon the strength of wind and current, the number of fish on the hooks, and the dexterity of the fishermen. Sometimes the boat has to carry five or six loads of fish to the vessel during the process of hauling a whole trawl. When it is necessary to leave a trawl which has been partially hauled the anchor is kept in the boat and the end of trawl-line is fastened to the buoy with the black ball and left swinging free in the tide. If the men are hauling from the inner end of the trawl the inner buoy is used for the same purpose. At the present time two or two and a half dory-loads from a string of trawl would be considered very fair fishing. A fair average dory-load of fish would weigh from 1,500 to 1,800 pounds, though in smooth water as much as 2,500 pounds might be carried.

In using their trawl-lines the bankers, as a rule, pursue the method known as setting and hauling, though the process of under running is not unusual. The manner of setting is thus described by Capt. D. E. Collins: "One man sitting on the forward or midship thwart rows the dory, while the other, standing aft, first throws over the buoy and then pays out the buoy-line until he reaches the end which is fast to the anchor. He then lifts a 'tub of trawl' upon the thwart in front of him, and clearing the end makes it fast to the anchor. He then throws out the anchor and the trawl follows it, hook after hook being thrown over the side of the dory, the thrower seizing each time the ground-line and heaving it out with a quick, nervous jerk. Considerable dexterity is required to set a cod-trawl without fouling the line or getting the hooks in the clothing or hands of the fishermen. When one tub is out the bottom end of its line is bent fast to the top end of the next tub and the empty tub put aside, and so it goes on until the end of the last line is reached. This is bent to the anchor, the anchor is thrown overboard, the buoy line paid out, and last of all the buoy is thrown over: this, if the outer buoy, has a 'black ball' on it. Owing to the small size of the hooks and baits the men are obliged to bait the hooks bare-handed, and in cold weather they suffer severely."

The same expert describes the method of hauling the trawl: "A 'patent roller,' similar to that used in the halibut fishery, is attached to the gunwale of the dory 3 or 4 feet from the stem, the iron shank being shipped in a hole in a cleat which is fastened to the inside of the gunwale. This apparatus is used to aid in hauling the trawl-line, which passes over it, and the new method is a decided improvement over the old in pulling the line over the side of the boat. While hauling the 'first buoy-line' the positions of the men are the same as when hauling a halibut trawl, one standing forward and the other aft. When, however, the anchor has been lifted and the trawl cast off from it, the after man shifts his position farther forward so as to stand just behind the man that hauls. Placing his tub on the thwart in front of him he coils in it the trawl, 'slatting' (or jerking) the fish off behind. Such as do not come off with a 'slat' he unhooks by using the 'gob-stick.'" At the end of the process of hauling, the trawl-line has been coiled in the tubs to be carried on board the vessel to be rebaited."

When fish can be caught, both at night and during the day, and the weather is suitable, two sets are usually made each day. It frequently happens, however, especially on the Grand Bank and in the Gulf of Saint Lawrence, that but few fish can be caught in the daytime. In such cases the trawls are set only once in the twenty-four hours, being put out about sundown and hauled the following morning. Owing to this peculiarity of the cod which frequent the Grand Bank,

the fishermen have of late years come to use much longer trawls than formerly, finding it to be more profitable to set long strings of gear, and make but one set a day, instead of two, as was formerly the custom.

On some of the banks where fishing can be carried on with equal success both night and day, and where there is not too strong a current and comparatively shoal water, the fishermen find it to their advantage to underrun their trawls, instead of hauling and setting. Captain Collins, above quoted, says: "Underrunning codfish trawls differs entirely from hauling, insomuch, that, although the same results are obtained, the trawl is not hauled into the dory, but across her, coming in one side and going out over the other, the fish being taken off and the hooks baited as the line passes over the boat. The advantages of underrunning are: First, a larger amount of gear can be handled, or the same trawl more frequently—for instance, a trawl can be underrun three times a day easier than it can be hauled and set twice; second, it requires only one-half the rowing, as it is all baited and set when it is left, and the pull out and back, incident to setting a trawl, is dispened with; third, it being always in the water, it has more time to fish. Cases have often occurred, where there was good fishing, that the men would keep on underrunning, and getting a load of cod each time, until fish enough for the day had been taken, which was sometimes as many as 75 or 80 tubs; the fourth reason is that the dories are not 'cluttered up' with gear, but have more room to put fish in. Trawls cannot be underrun very well where there is much tide in more than 40 fathoms, and are not often set for that purpose, excepting where cod are abundant."

The different methods of setting trawls for underrunning are described in another section of this report.

Each dory's crew has a station around the house for baiting their trawls which corresponds to the berth they set their gear in—for instance, a dory's crew who set their trawls ahead of the vessel bait on the forward end of the house, those who set lines on the starboard bow or beam bait on the forward end of the starboard side of the house, and so on. These stations are secured by lot, the crews belonging to the dories on each side of the vessel drawing their respective berths for setting trawls as well as for their positions for baiting. Plank are secured to the sides and ends of the house to protect it from being injured by the knives with which the bait is cut. When the order is given to "bait up," one man from each dory goes in the hold and fills a basket with herring, squid, mackerel, or whatever kind of bait they are using, and reaches this to his dorymate, who empties the lot on top of the house in the berth where they stand to bait their trawls. As soon as the bait is cut up (a herring making from five to eight pieces) each man begins on a tub of trawl. The trawl is turned out onto the house near the edge, the tub set on deck (occasionally on the house), and as fast as the hooks are baited the line is coiled in the tub, considerable care being taken in placing the hooks around the edge of the tub so that they will not foul when the trawl is being set. Only one piece of bait is put on a hook. The operation of baiting is very quickly and dexterously performed, an expert being able to bait five hundred hooks in three-quarters of an hour or less.

The operation of baiting consumes from an hour and a half to two hours, and is always deferred until after the fish are dressed and salted, unless the men are in haste to make a second set of the lines.

To dress the fish requires from half an hour to fifteen or twenty hours, depending, of course, upon the quantity of fish taken, which may vary from one to one hundred tubs. Each tub contains from 600 to 800 pounds of round fish, which, when salted and kenched, would weigh from 200 to 300 pounds. When there is a large catch the men are obliged to work all day and nearly all night. From 1870 to 1874, when squid were very abundant on the Grand Bank, there were instances where

vessels caught more than a hundred tubs of cod in a single day's fishing, and in several cases such fishing continued for several days. The schooner Ben: Perley Poore, of Gloucester, in one season found fish so abundant that the men were kept constantly at work night and day for several days in succession, until the vessel was entirely filled up. When the crew were heaving up the anchor some of the men were so fatigued that they fell asleep with their hands on the windlass-brakes. On an ordinary long trip to the Grand Bank a day's catch is likely to vary from one to forty tubs of fish. The vessel seldom fills up from one anchorage, even if it does not go into port to bait. Sometimes they do not change more than five or six times, and sometimes more than fifty times, as they work after the fish.

The trawl-fishermen, of course, are subjected to the same inconveniences of fog and squalls which have been alluded to in the chapter on the hand-line fishery. On foggy days horns are frequently blown while the dories are out, in order that they may be kept informed of the position of the vessel. The danger of loss is very much greater, however, than in the case of the hand-liners, because of the longer distance which the trawl-line fishermen go from their vessels in thick weather. But when a dory is hauling from the outer end of the trawl-line the danger of going astray is not so great, since the fishermen gradually draw nearer to the schooner, and they are assisted by the trend of the line, by which the direction of the vessel is indicated.

"The man who ventures on a trip in a 'trawler,'" writes Mr. George H. Procter, "finds little of the 'pleasing content' described by the early voyager. For him at least there is little of romance in 'the apostles' own calling.' Life on the Banks he finds a constant round of drudgery so long as he is able to make his daily rounds. He must rise early and work late in order to visit his trawls, remove his fish, rebait and reset the lines, and take care of the day's catch. Tossed on the waves in his frail dory, at greater or less distance from his vessel, he is subject to perils unknown to the fisherman of the olden time. His frail boat rides like a shell upon the surface of the sea, but in experienced hands no description of small sea craft is safer. Yet a moment of carelessness or inattention or a slight miscalculation may cost him his life. And a greater foe than carelessness lies in wait for its prey. The stealthy fog enwraps him in its folds, blinds his vision, cuts off all marks to guide his course, and leaves him afloat on a measureless void. Instances are on record of many a wearisome trip, of days and nights without food or water, spent in weary labor at the oars, at last to find succor from some chance vessel or by reaching a distant port; and imagination revolts from the contemplation of the hardships experienced, the hopes awakened and dispelled, and the torturing fate of the many 'lost in the fog,' of whose trying experiences nothing is ever known."*

Each dory being manned by two fishermen, only the captain and the cook ordinarily remain on board.

The dories have usually all returned from their morning's task by 9 or 10 o'clock, but when fish are scarce they are back much earlier. If the vessel is setting its trawls only once a day, as is at present the ordinary practice on the Grand Bank, the dories do not go out again until near sundown, when an hour and a half or two hours' work is sufficient for the laying out of the lines for the night. When the weather is rough the task is a much longer one. Capt. D. E. Collins, in his journal of April 9, 1879, writes: "We had 19 tubs of large fish to-day, and with such a good prospect we feel like making extra efforts; so, although there was a smart breeze of wind, we hove out the dories, and the men started to set at 4 p. m. It was rough enough, and some of those who set to leeward had all they could do to get back to the vessel. To pull a light dory nearly two miles against a fresh breeze and a short choppy head sea is not child's play, for the utmost strength of two men is barely sufficient to force her to windward, and though the pull continues for hours

* Gloucester and its Fisheries, 1876, pp. 57, 58.

before the vessel is reached, every stroke of the oars must be as strong as the one which preceded, or the boat goes astern instead of ahead."

On the Western Bank, where two sets are generally made daily, and on the Grand Bank, when this is done, the dories make their second trip in the forenoon and haul in the middle of the afternoon.

5. THE CARE OF THE FISH.

The manner of dressing the fish is essentially the same as that practiced on the George's-men and the dory hand-liners. It is graphically described in the journal of Capt. D. E. Collins:

"First premising that a 'deck of fish' means the fish that are on the deck at one time, a good catch being spoken of as a good deck, I will proceed to explain how a deck of fish is dressed down and salted.

"Generally we 'rig up' two gangs on deck, though on special occasions we may have three. A splitting-table is put up on each side of the vessel abaft the main rigging and held in its place by shipping one of its ends on a cleat or a pair of pins in the rail, while the other is kept in position by a board brace placed against the bottom of the waist. By this arrangement the tables can be put up or taken down in a few moments. In rough weather they are stowed away to keep them from being washed overboard. The dressing-tubs, which are halves of large molasses hogsheads, are placed near the splitting-tables, abaft the one upon the starboard side and forward of that upon the port. A tub partly filled with water is placed at the end of each splitting-table, and into this the fish fall as they come from the knife. When there are two gangs, the crew is divided up so that there shall be three men in the hold, and three men—the header, gutter, and splitter—in each dress-gang, and four idlers, whose duty it is to pitch the fish along and fill the tubs and also to pitch the fish out of the washing-tubs into the hold. When there are three gangs, as is the case when there is a good deck of fish, there is but one idler, who is, notwithstanding his name, the busiest man of the crew. Of the three men in the hold two are salters and one, who is called the 'devil,' has for his duty the filling of the salt basket and the passing of salt baskets and fish, if necessary, to the salters.

"The tubs being filled, the header seizes with his left hand a fish by its nose, and hauling it along so that the back of its neck lies across the edge of the tub, proceeds to head it. One quick downward cut for the throat, a rip down the belly, a quick motion of the knife on either side of the head, unjointing the bones, and a "yank" of the left hand, and the head is detached and thrown overboard. The gutter grabs the fish by the nape with his left hand, removes the liver, which he puts in a basket standing by his side, and throws the guts overboard, passing the fish at the same time to the splitter. On Provincetown vessels and on those of some other ports the head is broken off by the gutter. The splitter, working at the splitting-table, cuts out the backbone and lets the fish fall into the washing-tub.

"In salting the fish we make the first kench across the forward part of the hold next to the water barrels. Some vessels have a bulkhead, against which they salt the first fish. The kench is built four or five feet wide fore and aft and wider at the bottom than at the top. Some salters take the salt from the baskets and scatter it over the fish with their bare hands, but the majority of them prefer to save their hands by using a scoop.

"No part of the work on a 'salt trip' requires so much care and judgment as the salting. The salters must have a perfect knowledge of how to test the strength of the salt, know at a glance just how much each fish requires and on what part the most is needed. Otherwise the fish either come out 'slack' and strong-smelling for want of salt, or 'dry as a chip' from oversalting.

"As fast as the salt is used out of the pens these are knocked down and additional kenches formed, and so on to the end. When the fish settle, which they always do, they are 'packed up' by removing a portion from the after kenches and packing them on the top of those which are forward until the latter extend up to the deck. After this process has been two or three times repeated the settling does not amount to much."

At the present time codfish-roe is never saved by the Bank fishermen, but all the livers are carefully preserved in the "liver butts," already described. As the oil begins to make its appearance at the top of the cask, or "makes out," as the fishermen describe it, it is dipped out into water barrels and stowed away in the hold. Sixty barrels of liver yield from 20 to 24 barrels of oil. The livers are fattest in midsummer and have least oil in winter.

The sounds are occasionally saved by the cook, and, less frequently, the tongues, and these are the perquisites of the person who saves them. On some of the Western Bank trips, when hake are abundant, the cook's profits from the saving of sounds often amount to as much as his share of the voyage.

The manner of discharging the cargo of a banker is somewhat different from that customary with other vessels and should be briefly referred to. The fish are first taken out upon the wharf and weighed. They are then pitched into a tank of water, or very frequently into an old dory, which serves instead of a tank. Men standing around with brushes clean off the slime and dirt which remain upon the skin and flesh of the fish, and they are then thrown upon barrows and wheeled into the salting building, where they are either packed in kench for "water-horseing" or resalted in butts. The process of curing is described elsewhere.

6. THE FINANCIAL PROFITS OF THE TRAWL FISHERY.

The statistics of the Bank fishery from Gloucester are discussed in Section II, Geographical Review of the Fisheries, pages 155, 156, and several examples of large fares are noticed, which show the profits sometimes realized in this fishery.

The following statement shows the result and the manner of settling the proceeds of a trawling trip on the schooner Victor, of Gloucester, sailed July 12 and returned October 13, 1879:

71,200 pounds large cod, at 2 cents	$1,424 00
7,440 pounds small cod, at 1 cent	74 40
280 pounds halibut	3 50
Oil sold by captain	27 20
Livers landed in Gloucester	20 00
	1,549 10
Stock charges	236 57
	1,312 53
One-half to vessel	656 26
	656 27
One-half of one per cent. for widows' and orphans' fund	3 28
	652 99
General charges	29 50
Balance to crew and skipper	623 49

This amount, $623.49, was shared among the crew and skipper, the twelve receiving $51.96 per man. In addition to his share as one of the crew, the skipper received 4 per cent. of the net stock, $1,312.53, or $52.50.

Under the head of stock charges are included the following items:

Bait and ice	$234 15
Customs fees	2 42
	236 57

The general charges include:

Water and extra provisions	$16 00
Nippers	7 00
Sawing wood	1 50
Medicine	3 00
Milk	2 00
	29 50

7. HISTORY OF TRAWLING.

STATEMENT OF CAPT. N. E. ATWOOD.—It is said that in early days a treaty between England and France forbade French vessels from anchoring on the Grand Bank, and in those days trawling was, of course, an impossibility. The American vessels fishing on the Banks were in constant terror of the great French ships as they drifted hither and thither over the fishing grounds. At the time of Captain Atwood's first visit to the Grand Bank they were in the habit of setting trawls from their shallops as at the present day. As early as 1843 Captain Atwood set trawls for halibut in Massachusetts Bay. Before that he had been in the habit of putting two or three hooks on the rode-line of his dory, close to his anchor, and would occasionally catch a fish or two when he pulled in the anchor. As early as 1843 he was accustomed to set a regular trawl-line 60 fathoms long, with snoods 4 or 5 feet in length, placed 4 or 5 fathoms apart. About 1845 the schooner Oneco, Charles Aspley, a Welshman, master, went to the Grand Bank fitted out for trawling like the French vessels. She made only about 5,000 fish, 150 quintals. When he had made a miss it stilled the Provincetown fishermen on the subject of trawling. So they said nothing more about this kind of fishing.

About 1851 or 1852 an old Irishman down at Swampscott bought an old dory and went to work rigging a trawl as he had been accustomed to do in the old country. The Swampscott fishermen laughed at him and the idea that he could catch any fish with his clumsy trawl; but when he went out they soon changed their tune, for he could catch two fish to their one. They then fitted out trawls for themselves and went fishing with them, and thought it was nice. They soon encountered another difficulty, however, for an entirely new class of fishermen, mostly Irish, were called in, and their monopoly of the Boston market was destroyed. A great many Irishmen began trawling, and they soon began to build little vessels, such as they had on their own coast. The first one they got was a little boat called the Moby Dick, and they made money like shells. These Irish boats rapidly increased in number, and they had the St. Patrick and the St. Mary, and the Daniel O'Connell and the Maid of Erin; and in 1857 there were seventy-five Irish boats tending Boston market. The Swampscott fishermen began to be alarmed, and petitioned the legislature for laws forbidding the use of trawl-lines; but they had leave to withdraw their petition.

In 1858 another petition was sent in by the Swampscott people, begging that trawling should be forbidden within three miles of the shore. They thought if this could be passed the small fishermen would be driven out of the business. Their petition was again refused. Captain Atwood's account of this occasion is interesting as a matter of history, and particularly so, as it fixes the time at which trawling became common at Provincetown. In 1856 the captain was at home engaged in manufacturing cod-liver oil, and his brother, Capt. John Atwood, with three others, entered into partnership for the purpose of buying the winter shore catch of fish, to send them to Boston market. Captain Atwood consented to become the fifth partner and to be on duty at Central Wharf. That fall he was elected to the State legislature, and was obliged to furnish a substi-

tute at the wharf. This year trawls were just coming into general use, and an unusually large quantity of haddock were caught. The enterprise was, however, fairly successful. He paid his substitute $90, and made $90 in addition as his share of the winter's work. The following year trawls were used by every one, and haddock, which had formerly been as valuable as cod, were so abundant that the company was nearly swamped. Their agreement with the fishermen was that both cod and haddock should be paid for at the rate of $1.25 a hundred-weight. This year haddock brought only 37½ cents a hundred-weight at Boston, and, though cod were worth $2.25, the venture was a losing one, and the captain had to pay $90 back to the firm in addition to the $90 which he paid to his substitute.

It was at this time that the second petition from the Swampscott people was brought up in the Massachusetts legislature, and was referred to the committee of fisheries, of which Captain Atwood was the chairman. The committee voted "that the petitioners should have leave to withdraw;" but the bill was brought up by the Hon. Caleb Cushing, of Newburyport, who made an eloquent speech on the floor of the house in favor of the petition, stating that he had been told that the custom of trawling was rapidly exterminating the haddock, and from present appearances they would soon be as scarce as salmon, and that he was told that even at that time poor people could not afford to eat them. When he got through, says the captain, most of the members were apparently deeply impressed, and those that loved haddock evidently thought that they had eaten their last one. Mr. Cushing closed by calling upon the chairman of the committee on fisheries, who, he understood, was a practical fisherman, to state his own experience in the matter. This was Captain Atwood's first speech, but, though he felt somewhat diffident, he felt sure of his ground. He rose and said that it was necessary for him to speak somewhat in detail, and began to recount the history of the haddock in Massachusetts Bay. He told how in the days of his boyhood they had been extremely scarce, so that not more than one haddock was taken to every three or four hundred cod; how they had increased gradually in numbers until at the present time they were swarming in the waters in the greatest abundance. The gentleman from Newburyport had stated that they would soon be as scarce as salmon, and that poor people even then could not afford to eat them, and had asked him for his practical experience in the matter. "I would state, Mr. Chairman, that I am one of a company of five fishermen in Provincetown who entered into partnership for the purpose of buying all the fish which should be brought to the shore this winter; that this very morning we received 4,000 pounds of haddock, for which we paid $1.25 a hundred, and which we were obliged to sell for 37½ cents; not 37½ cents a pound, Mr. Chairman, but 37½ cents for a hundred pounds; and if any of the members will take the trouble to walk down by Commercial Wharf they may see women going back into the city with their arms full of haddock, the small fish, which are called unmarketable, for which they had paid not more than 10 cents for all that they could carry. They might not be too plenty for the people, but they are too plenty for the dealer and too plenty for the fishermen." The speaker's time had now expired, but he was allowed by unanimous vote to continue his remarks; and at their close it was voted "that the Swampscott petitioners have leave to withdraw."

HISTORY OF TRAWLING IN THE VICINITY OF BATH, WISCASSET, AND BOOTH BAY DISTRICTS.—Mr. Daniel Cameron, of Southport, gives the following statements about the introduction of trawls into this section:

"The first ever known of trawling here was a report brought from Cape Ann of Peter Sinclair using them on the schooner Anna as early as 1854 or 1855. He used them on the Cape shore and Banks for cod and halibut, and was remarkably successful. In 1858 Booth Bay sent her first trawler, the schooner Albatross, Captain Farmer, belonging to N. McFarland. She went to the

Bay of Saint Lawrence and fished in from 15 to 30 fathoms around Bank Bradley and the Magdalen Islands, bringing home about 900 quintals of very large fish that brought a much higher price than large fish taken with hand-lines. The impression seemed to be at that time that trawl-fish were better than those caught in the old way. She kept on in the business and in 1860 was joined by the schooner Island Queen, Captain Orchard, belonging to Cameron and Orne, of Southport.

"This method was new to the owners at the time and they were afraid to risk the whole chance of a trip, so they took a crew of Captain Cook and eight men, gave them material for two trawls, each 1,000 fathoms long, with No. 9 hooks, one fathom apart, and hand-lines for fishing in the usual way. They used manila six-thread line, about the size of the present buoy-line, for the ground-line, and had buoys at intervals of 100 fathoms, so that if the line parted they might get it again. The boats taken were Hampton boats, 15 to 18 feet long, two men going in each.

"They were also provided with a bait-mill to chop bait for tolling the mackerel, which were taken with hooks, to be used for bait, and with a string of eight herring nets, 40 yards each, to catch herring for the same purpose. They sailed about June 15, after she had made a trip to the Banks, for the Bay of Saint Lawrence, and began fishing in the vicinity of the Magdalens. She soon found the fish so plenty that the hand-line fishermen on board gave up their fishing and spent their time dressing the fish taken on the trawls and catching mackerel and herring for bait. The closer they came to shore, especially in the vicinity of Dead Man's Island, the better, and frequently one end of the trawl came nearly to the land. The average depth was about 5 to 10 fathoms.

"The fish taken were very large and averaged only ten to the quintal when dried. They saved nearly 30 quintals of small cod that were taken from the mouths of the large ones, *i. e.*, the small ones would swallow the bait and get caught when a large one would bite at the small one and thus the large and small would come up on the same hook. The vessel returned after an absence of two and a half months, landing 750 quintals of large fish, averaging ten to the quintal, while other vessels fishing in the same locality required seventy to eighty fish to the quintal.

"After curing, the fish were sold to Moses B. Nickerson, of Portland, at $4 per quintal, while other large fish were bringing only $3.25. They were resold to Crowell, of New York. The success of these vessels had a tendency to bring trawling into general use, and by 1862 most of the vessels of the section used them and continued to do so up to a late date.

"But a reaction has taken place since the fisheries have been paying so poorly, and owners have refused to supply trawls for their Bankers owing to the extra expense and great loss of gear. For fully eight years the tendency has been to do away with them among Bankers, and in 1878 and 1879 the same ideas are being advanced by the shore-fishermen, so that we now have but three Bankers using trawls, and an occasional shore-fisherman hand-lining from deck and claiming to make more money than the trawlers.

"The price has also been affected so that instead of trawl-fish bringing more, as they did up to 1876, we find the fresh-fish market at Booth Bay refusing to buy them, claiming that they will neither keep as well in ice, nor stand shipping as the hand-line fish do."

FRENCH METHODS OF TRAWLING IN 1843.—The Gloucester Telegraph, of October 18, 1843, has the following description of the French method of fishing with set lines or trawls on the Grand Bank:

"French vessels, it appears, mostly anchor in latitude 44° N. and longitude 50°.20′ W., in about 45 fathoms water, veer 90 or 100 fathoms of cable, and prepare to catch codfish with two ¼-inch lines of 3,000 fathoms long each. On these a small cork is placed at every 12 feet, and while metal hooks, baited with parts of small fish (by us called kiblings) [capelins are no doubt meant],

are alternately fastened by snoods of 3 feet long, 6 feet apart, and the whole neatly coiled in half-bushel baskets clear for running out. Half the number of baskets are then placed in a large, strong-built lug-sail boat on each side, at 3 o'clock in the afternoon; both make sail together at right angles from the vessel, and when the lines are all run out straight, sink them to within 5 feet of the bottom.

[This is probably a mistake of the writer, since the ground-lines of the trawls were undoubtedly, as now, sunk to the bottom.]

"The crew having rested all night, they proceed again the next morning at daybreak to trip the sinker, and while hauling in lines, unhooking fish, &c., the men left on board heave in the other end with a winch. When in that manner 400 codfish are caught in a night, some are then employed in line-clearing, fish-beheading, splitting, salting, and stowing them away in layers across each other below; livers and refuse boiled to oil put in large casks on deck. Three months seems to be the average time employed, arriving early in June and departing again in October.

"As British fishermen are said to be continually holding lines in a perpendicular position over the side in all sorts of weather, for the same purpose, owners of vessels, we conceive, should give the above method some consideration."

8. REPORT ON A COD-TRAWLING TRIP TO GRAND BANK IN 1879.

By Henry L. Osborn.

a. ITINERARY OF THE CRUISE.

A BRIEF ITINERARY OF THE SUMMER TRIP.—We ran out of Gloucester harbor with a light northerly breeze at 3 o'clock on Saturday afternoon, July 12, 1879. As we rounded Eastern Point the wind died out and we lay in a flat calm until late at night. The following day, Sunday, was clear and pleasant. Land had sunken out of sight and we were moving very slowly east half south. Had it not been the Sabbath the men would have begun at once to rig their trawls, but, partly from respect to the day and partly using it as an excuse for not working, they did no manner of work. Early on Monday morning they all turned out, and after breakfast began work on their gear, continuing it steadily all day and all the day following. By Wednesday they had, for the most part, finished this work.

On Tuesday night we saw a light on shore and decided that it was Sambro Light, off Halifax. On Thursday morning, when I came on deck at half-past four, we had rounded Cape Canso and were standing toward Arichat. It was blowing strong and the air was full of mist, moreover it was very cold although it was the middle of summer, and I found heavy clothing and an "oil-skin" suit very comfortable. The treeless and barren hills seemed very inhospitable, and the few houses nestled under them here and there did not seem very cheerful to one who had but just come from the warm weather of New Jersey. A few miles off Arichat we put over a dory, and three or four men jumped into her and pulled ashore to visit their homes in the vicinity, for a day or two. With the rest of the crew we stood off for Guysborough, and, at about nine in the morning, dropped anchor off the village.

We staid at Guysborough until the 20th, thus giving the remainder of the crew, except two Massachusetts fellows, a chance to visit their homes. On that evening we dropped anchor off Arichat. In the morning of the next day we picked up the rest of the crew, took ice for our bait, and, at about 2 or 3 o'clock p. m., made sail for Cape Broyle, Newfoundland. The wind was fair and strong and we flew over the water at the rate of 10 or 11 knots per hour. When I went below for the night the land was no longer in sight and we were tearing through the water. All day Tuesday we had the same strong and fair breeze and sailing became really enjoyable. On

Wednesday morning the skipper judged from his log that we must be nearing Cape Broyle, but the land was wrapped in a thick fog and he could not determine his position. In the middle of the forenoon the fog lifted and there lay Cape Broyle on our port quarter; we were just passing it. He at once put about and we were soon in the harbor, having made the run, something over 40 miles, in forty hours.

We remained at Cape Broyle till the 25th, during which time we filled the water barrels and purchased the first baiting of squid, then made sail for the Grand Bank to try our luck with the codfish. During this, the "first baiting," the skipper kept continually on the move, making a new berth every day. The catch of fish was not large at any place and grew smaller every day as the bait became more and more injured by keeping. The latitudes and longitudes given in the following table of fish taken are those received from the skipper:

Table of fish taken.

FIRST BAITING.

Station.	Date.	Latitude.	Longitude.	Night set.	Day set.
		° ′	° ′	*Tubs.*	*Tubs.*
1	July 27	46 39	50 37	9	.....
1	July 27	46 39	50 37	.....	3
2	July 28	46 43	50 34	7	.....
3	July 31	46 47	51 30	7	.....
4	Aug. 1	46 46	50 07	9	.....
5	Aug. 2	47 02	49 53	8	.....
6	Aug. 3	47 06	49 49	8	.....
7	Aug. 4	46 50	49 33	8	.....
8	Aug. 5	46 49	49 37	1	.....
9	Aug. 6	46 51	49 49	2	.....
10	Aug. 7	46 43	50 13	5	.....

The weather during the first baiting was extremely unpleasant. At the very start the fishing was interrupted by a storm of wind that lasted three days and made the sea too rough to allow of the dories venturing out. After this the sea became more quiet; but the noted Newfoundland fogs came down and were scarcely absent during the remainder of the baiting. The temperature was very agreeable. The thermometer did not at any time fall below 50°, averaged about 56°, and at times rose above 60°. The water did not vary much in temperature from the temperature of the air, averaging one or two degrees lower. A record of temperatures and the weather was kept; the observations are tabulated at the close of this introduction.

After making 11 sets and capturing 67 tubs, or about 23,000 pounds of split fish, the bait became exhausted, and we returned to the land for a fresh supply. We headed the vessel for Cape Spear, near Saint John's, and "came to an anchor" in Freshwater Cove on August 9, a little after midday. This cove is just round South Head, the left promontory as one is entering Saint John's harbor, and is so convenient to the city that the skippers often avoid the high harbor fees by anchoring in it and rowing into the city for business. A heavy "easterly" was blowing, but the skipper determined to row into the city in spite of the heavy sea and attend to his business. From Saint John's we went to Tor Bay, Carbonear, and King's Cove in succession, in search of bait, but could not find any. At last we made our way into Open Hall, a very small fishing hamlet in Bonavista Bay, and, after lying there nearly a week, picked up a few squid and with them returned to the Banks.

The second baiting was used in a single berth, latitude 45° 4′, longitude 50° 33′. At this place the fish bit well so long as our bait remained fresh. On the 30th of August a "breeze of wind" broke us adrift from our moorings and favored our immediate departure for land to obtain

a third supply of bait. Our luck during this baiting was fair; we captured 85 tubs of fish, or more than 28,000 pounds of dressed fish. The numbers taken on each day are shown in the following table:

SECOND BAITING.

Station.	Date.	Latitude.	Longitude.	Night set.	Day set.
		° ′	° ′	*Tubs.*	*Tubs.*
11	Aug. 22	45 4	50 33	15	.....
11	Aug. 23	45 4	50 33	12	.....
11	Aug. 24	45 4	50 33	11	.....
11	Aug. 25	45 4	50 33	13	.....
11	Aug. 26	45 4	50 33	14	.....
11	Aug. 27	45 4	50 33	12	.....
11	Aug. 28	45 4	50 33	6	.....
11	Aug. 29	45 4	50 33	.....	.....
11	Aug. 30	45 4	50 33	2	.....

The gale which had driven us from our moorings on the Bank, and with which we ran to Cape Broyle, raged over the Bank for five days in so bad a storm that, as we afterward learned, it was impossible to do any fishing. We rode through this storm safely, anchored in Cape Broyle harbor, and on the 6th of September, finding no bait there, sailed for Bay of Bulls, hoping for better success in that place. None were to be had there, nor in the adjoining harbor of Witless Bay, though we staid three days. On Sunday and Monday nights the men varied the monotony of existence on a fishing schooner by attending a native dance. It was the most remarkable hop I ever attended, and is more fully described in another part of this report. From Bay of Bulls we coasted alongshore, putting in at Tor Bay, and, on finding no bait there, we stood out again, and finally, at nine in the evening, came to anchor in Portugal Cove, Conception Bay. Though it was dark when we anchored, the instinct of the Newfoundlander sent numbers of the natives on board at once, almost before our anchor had dropped, and we had purchased a good many squid before all hands turned in for the night.

We remained at "Portugee Cove" until the 11th, then sailed away for the Bank again. On this, our third baiting, we did finely at first, and we were jubilant when seventeen tubs came on board on the first morning. During this baiting we made fifteen sets in twelve different berths, and captured in all one hundred and three tubs of fish. Our positions during this time and the catch from each set are given in the following table.

THIRD BAITING.

Station.	Date.	Latitude.	Longitude.	Night set.	Day set.
		° ′	° ′	*Tubs.*	*Tubs.*
12	Sept. 15	45 12	51 00	17	.....
12	Sept. 16	.....	.....	6	2
13	Sept. 17	45 12	50 44	12	.....
14	Sept. 18	45 12	50 42	11	.....
14	Sept. 19	45 12	50 42	10	.....
15	Sept. 20	45 12	50 40	8	.....
16	Sept. 21	45 12	50 38	7½	.....
17	Sept. 22	45 10	50 36	8	.....
18	Sept. 23	45 10	50 10	5	.....
19	Sept. 24	45 18	50 25	.....	1
20	Sept. 25	45 10	50 25	7	.....
21	Sept. 27	45 07	50 00	4	.....
22	Sept. 28	45 03	50 05	1	.....
23	Sept. 29	.....	.....	2	.....

The weather during the second baiting was quiet until, toward the last of August, we had perpetual fog, hardly a day passing when the sky was clear in every direction. The thermometer marked on the average in the vicinity of 60°, with a little lower reading for the temperature of the surface of the ocean. During September the weather was perfect; not only was the average temperature warmer, but the air was clear from fog during a large part of the time. The sun shone brightly all day and set in splendor, and during the nights the moon shone in almost cloudless skies. Once during the third baiting the wind rose to a gale, and though the trawls were all out the skipper did not think it prudent to risk going after them. Late in the day the sea went down a little, and the dories ventured out. The trawls were very much injured from the rough usage they had passed through, and more than half were entirely lost. I made thermometric observations during this time, until a heavy lurch of the vessel threw down my thermometer and broke it, and during the third baiting barometric observations.

On the 29th of September the skipper gave the order to "give her the big mainsail." The dories were all cleaned out and fastened securely in their places, the vessel was thoroughly scrubbed, and the vestiges of two months' "gurry" removed in as many hours. Then the course was laid for Saint Pierre, and away we sailed. On the 2d of October we called at Saint Pierre. During the afternoon of that day we encountered a heavy gale between Saint Pierre and Scatari, the southeastern point of Cape Breton Island. At first we ran before the fierce gale, but finally were forced to "lie to;" we arrived at Arichat on the 4th. We ran to Guysborough the next morning for a short call, thence, on Monday, October 6, to Halifax. From Halifax we ran to Gloucester, and, delayed by dead calms when little more than 100 miles from home, finally worked in toward the land, made our way up the harbor, and anchored off the wharf belonging to the owners of the vessel on the morning of October 12. For convenience I have prepared the following condensed tabulated statement of the various movements of the vessels during the entire cruise:

CALENDAR OF THE CRUISE.

Date.	Movements of vessel.
July 12 to 17	From Gloucester, Mass., to Guysborough, Nova Scotia.
July 17 to 20	Stay at Guysborough.
July 20 to 21	To Arichat, Cape Breton Island, and stay.
July 21 to 23	Arichat to Cape Broyle, Newfoundland.
July 23 to 25	Stay at Cape Broyle.
July 25 to 26	Cape Broyle to Station 1, north 46° 30′, west 50° 37′.
July 26 to August 7	First baiting. Anchored in various places on Banks.
August 7 to 9	To Saint John's (Fresh-Water Cove), Newfoundland.
August 9 to 11	Saint John's to Tor Bay, Newfoundland.
August 11 to 13	Tor Bay to Carbonear, Newfoundland.
August 13 to 14	Carbonear to King's Cove, Newfoundland.
August 14 to 20	King's Cove to Open Hall, Newfoundland, and stay.
August 20 to 31	Open Hall to latitude 45° 4′, longitude 50° 33′, and stay. Second baiting.
August 31 to September 6	To Cape Broyle and stay.
September 6 to 9	Cape Broyle to Bay of Bulls, Newfoundland, and stay.
September 9 to 11	Bay of Bulls to Portugal Cove, Newfoundland, and stay.
September 11 to 13	Portugal Cove to Grand Banks, latitude 45° 12′, longitude 51°.
September 13 to 29	Third baiting.
September 29 to October 2	To Saint Pierre.
October 2 to 4	Saint Pierre to Arichat.
October 4 to 6	To Guysborough from Arichat, and stay.
October 6 to 8	Guysborough to Halifax.
October 9 to 12	Halifax to Gloucester; arriving at Gloucester at 3 a. m.

b. TABLE OF METEOROLOGICAL OBSERVATIONS MADE DURING THE CRUISE.

Date.	Latitude.	Longitude.	Time.	Temperature.		Meteorological remarks.
				Air.	Water.	
	° ′	° ′				
July 13	42 37	70 08	9.16 a. m.	65	64	Fine; moderate breeze.
14	42 53	67 30	4.30 p. m.	58	45	
15			12 m.	74	55	
22	46 06	56 41	12 m.	53	43	
23				56	51	
26			3.30 p. m.	55	50	
27	46 43	50 37	8 a. m.	50	50	
28	46 43	50 34	12 m.	55	50	
29	46 43	50 34	6 p. m.	53	51	
30	46 43	50 34	3 p. m.	56	54	
31	46 47	51 30	7 p. m.	55	53	Cloudy; fog in p. m.
August 1	46 46	50 07		54	52	
2	47 02	49 53	4 p. m.	59	53	
3	47 06	49 49	9 a. m.	59	53	Fog
3	47 06	49 49	3 p. m.	55.5	52	Do.
4	46 50	49 33	9 a. m.	57	52	Do.
4	46 50	49 33	3 p. m.	56	54	Thick fog.
5	46 49	49 37	9 a. m.	62.5	54	Fog.
5	46 49	49 37	3 p. m.	57	56	Do.
6	46 51	49 49	9 a. m.	63	60	
6	46 51	49 49	3 p. m.	63	57	
7	46 43	50 13	9 a. m.	60	60	Stiff breeze, cloudy.
7	46 43	50 13	3 p. m.	55	52	Rain; stiff breeze.
8			9 a. m.	56	54.5	Cloudy; stiff breeze.
8			3 p. m.			
23	45 04	50 33	3 p. m.	56		
24	45 04	50 33	9 a. m.	63	59	Fog; moderate breeze.
24	45 04	50 33	3 p. m.			Clear; light breeze, WSW.
25	45 04	50 33	9 a. m.	62	59	Fog; light breeze, SW.
25	45 04	50 33	3 p. m.			
26	45 04	50 33	9 a. m.		63	Fog.
26	45 04	50 33	3 p. m.		58	Cloudy.
27	45 04	50 33	9 a. m.	56	58	Clear; light breeze, NE.
27	45 04	50 33	3 p. m.	54	57	Clear; wind, NE.
28	45 04	50 33	9 a. m.	62	57	Clear and pleasant; light breeze, E. by N.
28	45 04	50 33	3 p. m.	65	59	Clear and pleasant; light breeze, E.
29	45 04	50 33	9 a. m.	55	57.5	Clear; stiff breeze, NE.
29	45 04	50 33	3 p. m.	57	59	Rain; rough sea; blowing SE.
30	45 04	50 33	9 a. m.	64	59	Clearing; fog; light breeze, SE.
30	45 04	50 33	3 p. m.	63	59.5	Thick fog; mist; wind, SW.
31			9 a. m.	56	55	Clear; light breeze, SW.

Date.	Latitude.	Longitude.	Time.	Temperature.		Barometer	Meteorological remarks.
				Air.	Water.		
	° ′	° ′					
September 13			9 a. m.	60	55	29.78	Fog; wind light, ESE.
13			3 p. m.	56.5	56.5		
14			9 a. m.	58	58	29.60	Fog; wind light, SE.
14			3 p. m.	60	60	29.60	Do.
15	45 12	51 00	9 a. m.	65	60.5	29.98	Light fog; wind light, SE.
15	45 12	51 00	3 p. m.	63	60	29.94	Do.
16	45 12	51 00	9 a. m.	64	60	29.95	Clear; wind stiff, W.
16	45 12	51 00	3 p. m.	65	63		Do.
17	45 12	50 44	9 a. m.	68	62.5	29.90	Cloudy; strong breeze, SW.
17	45 12	50 44	3 p. m.	68	61.5	29.90	Clear; strong breeze, SW.
18	45 12	50 42	9 a. m.	71	63	29.82	Clear; heavy breeze, SW.
19	45 12	50 42	3 p. m.	64	62	29.85	Clear; light breeze, W.

b. TABLE OF METEOROLOGICAL OBSERVATIONS MADE DURING THE CRUISE—Continued.

Date.	Latitude.	Longitude.	Time.	Temperature.		Barometer.	Meteorological remarks.
				Air.	Water.		
	° ′	° ′					
September 19	45 12	50 42	9 a. m.	64	61	29.96	Clear; light breeze, S.
19	45 12	50 42	3 p. m.	61	61	29.94	Fog; light breeze, S.
20	45 12	50 40	9 a. m.	62	62	29.92	Fog and rain; light breeze, S.
20	45 12	50 40	3 p. m.	64	62	29.86	Cloudy; light breeze, ESE.
21	45 12	50 38	9 a. m.	63.5	61.5	29.85	Thin fog; strong breeze, NW.
21	45 12	50 38	3 p. m.	60	62	29.96	Clear; moderate breeze, NW.
22	45 10	50 36	9 a. m.	60+	.....	29.96	Clear; stiff breeze, NE.
22	45 10	50 36	3 p. m.	.....	.....	29.96	Do.
23	45 10	50 10	9 a. m.	.....	.....	29.96	Do.
23	45 10	50 10	3 p. m.	60+?	.....	29.94	Cloudy; stiff breeze, SE.
24	45 18	50 25	9 a. m.	55+?	.....	29.86	Fog; moderate breeze, SE.
24	45 18	50 25	3 p. m.	60+?	.....	29.80	Fog; light breeze, S.
25	45 10	50 25	9 a. m.	60?	.....	29.68	Fog; light breeze, W.
25	45 10	50 25	3 p. m.	60?	.....	29.64	Clear; stiff breeze, SW.
26	45 11	50 25	9 a. m.	55+?	.....	29.86	Cloudy; heavy gale, N.
26	45 10	50 25	3 p. m.	60+?	.....	29.90	Cloudy; heavy blow, N. by E.
27	45 07	50 00	9 a. m.	55+?	.....	29.98	*Charming weather; light breeze, SE.*
27	45 07	50 00	3 p. m.	60+?	.....	30.18	Do.
28	45 03	50 05	9 a. m.	65+?	.....	30.18	Do.
28	45 03	50 05	3 p. m.	70+?	.....	30.06	Do.
29	.....	.....	9 a. m.	65+?	.....	30.00	Fine; moderate breeze, N.

c. NATURAL HISTORY OF THE FISH.

GENERAL APPEARANCE.—I did not notice that the Grand Bank cod presented any peculiarities in appearance. In point of size they averaged larger than specimens I saw taken inshore by the people in the various harbors of Newfoundland. I had no means of determining the weight of fresh specimens, but took numerous measurements of specimens brought on board the vessel. A few of these maximum, minimum, and average sizes are as follows:

Table of measurements (in inches).

Tip of snout to end of middle caudal rays.	Tip of snout to posterior end of supra-occipital.	Greatest girth.	Tip of snout to vent.
31	7.	14⅜	14¼
25⅜	6.	12⅜	11
24	.6	12⅛	12
41	.10	21	20
63	.16	35	28

The average length of the fish brought on board the vessel was 45 inches; some were caught and rejected because too small to be worth bothering with. These were in some cases not much over one foot in length. In the various harbors of Newfoundland I saw the people curing fish not over a foot long, and they never caught any as large as the average Grand Bank fish.

MIGRATION.—It is the opinion of the fishermen that the fish migrate at regular seasons. During October and later the catch of fish is very small. In December and January none are taken. Toward March those who go thus early to the Banks begin to take a few, and as the year advances the fishing steadily improves. Those who fish early in the year anchor their vessels on the most southern and eastern edge of the Banks. Later, as the year advances, the fishing fleet move further north and west, till finally in July most of the vessels are anchored in the neighbor-

hood of the Virgin Rocks, latitude 46° 27′, longitude 51° 6′. After this, as the year progresses, the vessels begin a movement back again towards the south and east, until at last those who have remained till November are again fishing on the very outer edge of the Bank.

This movement of the vessels and the facts regarding the fish were furnished me by the skipper. I believe they are correct. It is perfectly plain that, if they are true, there is a definite migration among the cod of the Grand Bank. Early in the year, during the first of March or a little later, a large school of fish moves in from the deep ocean waters and comes over the southern edge of the Banks. This large school is followed by others which drive the first comers further to the north and west until the season reaches its height. These fish move over the Banks, feeding on the places that are rich in the proper forms of life to suit the conditions of their existence. Later in the year a movement toward the deep water is initiated and continues until finally the large schools disappear.

To prove that the fish do migrate in this or in any other manner would require more observations than I could make. The men believe that they migrate in this manner, and on it base their own movements.

SCHOOL AND GURRY FISH.—The fishermen make a division among the fish, separating them into two groups called "school fish" and "gurry fish." The school fish are supposed to move over the bottom in large schools seeking fresh feeding grounds as fast as food became scarce in any of the regions where they have been fishing. The fish we captured during the first and second baitings were of this sort. They presented a plump appearance, looking very vigorous and healthy. They were, moreover, in large numbers in any one spot, and could not all be "fished out" in a single haul. The term gurry fish, on the other hand, seemed to be applied to the few stragglers who remained on the Bank after the larger schools had migrated. These had a thin and hungry look; their flesh was almost flabby. Nor did they kick about in such a lively manner when brought on board. It is supposed also that these fish will bite readily on gurry, or bait made from the "pea" and other intestines of the fish, and from this fact they have derived their name, while it is averred that the school fish will not take any bait save the very best. These gurry fish are thought by the men to be a body of stragglers which never leaves the Banks, but, instead of partaking in the usual migration, remain in small and scattered numbers, picking up a scanty living on whatever they can obtain.

As I have mentioned, in the paragraphs referring to bait, it is at present the habit to use only fresh bait until late in the year, when salt bait or gurry is used with some success. I saw this illustrated during our trip. In places where the fish had been biting well they fell off suddenly on the introduction of salt bait and gurry. During the second baiting, fishing had been excellent. We had been taking daily an average of 12 tubs when our bait became greatly deteriorated. The skipper then thought to try salt bait and gurry, and on the 30th day of August took only two tubs of fish. The same thing happened during the third baiting. These facts show that during the early season the fish are rather fastidious. I was told that later in the year, during October, they caught a few fish with gurry, and the skipper had with him 10,000 salted squid to be used at that time if he should remain so late.

SPAWNING.—The fish did not appear to be spawning during any of the time of my visit to the Grand Bank. The ovaries were usually quite small, having a length of not more than 5 or 6 inches, as a rule, and, indeed, to find them so large as that was rare. The eggs were very immature indeed. In one case did an ovary appear that was large and more natural than any of the others, but in this one case only were the fish anywhere near the time of spawning. That spawning at that time is infrequent I remember the better from the remarks of the men. When I inquired

for eggs in order to try eating some of them fried they replied *that they never found the pea so late in the year*.

FOOD.—The food of the cod is extremely various, and on account of this fact collectors have always paid much attention to an examination of their stomachs and been richly rewarded. The fish is liable to swallow almost anything that comes in its way, so that stories are by no means uncommon of jack-knives lost overboard returning to their owners again when the day's catch of fish was dressed. Invertebrates of many sorts are a favorite food, and other species of fish are often eaten. Of fish I noted only two species among stomach contents; the lant, *Ammodytes americanus*, was very often found and seemed to be very much liked by the fish. One specimen of *Cottus spinosus* was also observed. Among the invertebrates *Hyas araneus* was found in enormous numbers, from fifty to one hundred specimens being obtainable from almost every haul. Curiously the more common species of the genus *H. coarctatus* was not observed on the Bank by any of the crew. Numerous other crustaceans were also found. Among mollusks two or three species of *Buccinum* were found, *Fusus ventricosus*, *Pecten islandicus*, *Siliqua costata*, and sundry other species. Large numbers of *Thyone elongata*, sea urchins, and sea anemones also occurred frequently.

KINDS OF BOTTOM.—The habit among the fish of frequenting certain kinds of bottom and keeping away from others seems quite well recognized among the fishermen. The fact is always kept in view by a skipper when he is about to anchor, and when he does not know from his chart or by experience the character of the bottom, he makes a sounding, and from the greased end of the lead draws his own conclusions. Should this lead him to infer a bottom of bright sand, and one almost destitute of invertebrate life, he would not come to anchor. If the indications led him to expect hard rocks or shells, and hence the presence of "curios," he would regard it as a likely place for fish, and bring the vessel "to an anchor." The charts are usually constructed so as to show the character of the bottom at any part of the Grand Bank, and to the knowledge that he may gain in this way the skipper adds the knowledge of places that were good in former trips. He never anchored in a place blindly, in total disregard of the character of the bottom, and informed me of it in every station in which we fished.

THROWING GURRY OVERBOARD.—It has often been affirmed that the practice of throwing the gurry overboard had the effect of diminishing the daily catch. I did not observe that it had any effect whatever. By a reference to the tabulated statements of the catch made by the Victor it can be seen just how many fish were taken in each haul. It will be noticed at once, by a glance at this table, that the vessel, during the second baiting, remained in Station 11 from August 22 till August 30, making eight successive sets in the same berth. It is true that toward the end of this time the catch fell off. The same thing occurred in the first and third baitings, when the vessel made a berth every day, and is to be accounted for by the poor bait. After having remained several days in the bait-pen, the lower layers become so much deteriorated as to be almost worthless, and fail utterly of attracting the fish. In the second baiting, so long as the bait held out, the fish were captured, and the table shows a fair average haul each day, with such fluctuations as show that the gurry thrown overboard in the operation of dressing could not have made much difference in the numbers of fish taken.

FRESH VERSUS SALT BAIT.—I have elsewhere alluded to the relative efficiency of fresh and salt bait. I presume that it is not so much for me to say what are the tastes of the fish regarding bait as what usages I observed among the men. It is a very well known fact that the practice of using fresh bait is only a recent one among the Grand Bank fishermen. In former times salt clams and salt herring were used, and with good effect. To-day, however, the practice is almost,

if not quite, universal, of buying fresh bait where it can be most conveniently obtained and using it fresh. It is the unanimous belief of the men that the fish won't bite on salt bait during the summer and early fall. It is, hence, only fair to suppose that the fish at such times find so much invertebrate life on the bottom that only a tempting morsel attracts them, and they refuse salt bait because they are not hungry. That they do refuse the salt bait is an unquestionable fact. On our second baiting, we averaged thirteen tubs of fish daily, until the number suddenly fell. We tried salt bait, and, in place of thirteen tubs, took two. The same thing happened in one or two other instances. As soon as the fresh bait was replaced by the salt, there was no decent catch, even when, from past success, it was but fair to expect the ordinary success. Every fisherman to whom I spoke upon the subject gave it as his opinion that no fish could be caught on salt bait until the very last thing in the fall, and that it was useless to try it.

As to the question, "Do the fish prefer one kind of fresh bait to another, as, for example, squid to capelin," I cannot say very much. I did not have any opportunity of observing the use of any bait except the squid during my trips. Of the fact of the use of the different kinds of bait I have spoken under the subject of bait. What might be the result if one vessel continued using herring in August, when vessels anchored on every side were fishing with squid, I cannot say; from what I know of fishermen I don't believe that many would care to try the experiment, provided they could have either kind of bait at the same expense and trouble.

d. THE VESSEL AND OUTFIT.

FORECASTLE.—The vessel was a schooner, built at Essex in 1874. Her dimensions were as follows: Length, 76 feet 8 inches; width, 21 feet 8 inches; depth, 8 feet. Her tonnage was 70.91 tons, and she cost, when built, $8,000, but the owner says she could be built to-day probably for $6,000. In the extreme forward part of the vessel was the forecastle or living room of the greater part of the crew. Its shape was that of a triangle with two sides curved, and was the same as the shape of the bow of the vessel. On the sides of the forecastle were berths placed in two tiers, and six in number on the port side. On the starboard side were four, the place of the two farthest aft being used for an upright locker or dish-closet, and for some open shelves. On the inner sides of the bunks ran a board about one foot wide. This, on each side of the apartment, was pierced by a sort of trap-door, which, on being removed, allowed one to see quite an extensive store-room or locker, used for potatoes and other stores of that sort. The ledge forming the top of the locker was at such a height from the forecastle floor as to form a convenient seat, and, indeed was built, I suppose, to serve just that purpose. Passing up through the apartment from the floor through the deck above were the pawl-post and the foremast. Between these was placed a table so devised as to furnish the greatest surface possible, when open, and to occupy the smallest space when closed. In order to accomplish these ends it was made in two parts, the former of these, extending from the pawl-post half-way to the foremast, was fastened securely, and was immovable; the other filled the remaining space from the forward half to the mast. When not in use it was thrown up out of the way and folded around the foremast. The side of the table reached out toward the berths, and parallel to them so far as to allow one sitting upon the lockers to eat from it conveniently; and to prevent dishes from sliding off in a rough sea its edge was protected by a ledge extending all the way around it. The escape of dishes toward the table's center in rough weather was further prevented by a piece fastened along the table parallel to the edge and leaving the dishes in a sort of trough just wide enough to accommodate them.

These three concentric triangles—the berths, the lockers, and the table—occupy the largest part of the forecastle; some other points are, however, worth noticing. The after end of the room

is formed by the bulwark cutting it off from the forehold. Before the center of this stands the companion ladder, which leads to the deck. On the right of the companion the stove was placed; an ordinary large-sized stove, peculiar only in having a low railing placed around its top to prevent pots and kettles from sliding about in a heavy seaway. To the left of the companion was a passage-way into the fore-hold. A sliding door was placed at this gangway, but it was never used, so that I was ignorant of its existence until I had spent two months in the vessel.

For storage room in the forecastle the locker just aft the starboard bunks is used for dishes, knives, forks, spoons, &c. Between this and the fore-hold bulkhead were some open shelves, on which some of the provisions, as beans, peas, tea, and coffee, were kept. The horizontal locker spoken of as passing around inside the bunks was used for vegetables, as potatoes, turnips, &c. On the starboard side aft this ran only as far as the upright locker, and before the shelves was replaced by a low shelf pierced with holes, on which tea and coffee kettles were stood. Finally, one more locker was placed upon the horizontal locker against the bulkhead and beside the doorway into the fore-hold. This rose as high as the deck above, and was used for the temporary storage of the food that had not been eaten at the regular meal. It was usually kept well supplied with bread, cake, or pie, and meat, so as to furnish a lunch to any one who might be hungry between meals.

FORE HOLD.—The gangway from the forecastle passed into the fore-hold. It was not a separate part of the hold, but merely a small space divided from the hold by a tier of barrels reaching one above another nearly to the deck. This little barrier of barrels, containing water, meat, flour, kerosene, &c., left a sort of space clear for the storage of other supplies and for some of the operations of the steward. The right side of this space was occupied by a bin containing coal for the galley stove. Against the port side of the vessel, were shelves for lard and butter tubs and sundry other smaller stores, while barrels of pork, beef, and knuckles stood beneath the shelf. Just in front of one as he passed through the gangway from the forecastle stood a barrel of flour and sugar. A large bread-board placed across the top of one of these furnished him a table for making bread or cake.

MAIN AND AFTER HOLD.—I have spoken of the fore-hold as if it were a distinct part of the vessel. In one sense it is, though its separation from the other parts of the hold is not by any such clear boundary as a bulkhead, but by a mere tier of barrels. The remaining space of the hold was divided into the "main" and "after" hold by an imaginary line, which was not, so far as I ever learned, generally agreed upon, but which practically cut the center of the mainmast. The main-hold, entered from the deck by the main-hatch, was a large space, not subdivided by partitions into compartments, and extending aft from the fore-hold as far as the mainmast or thereabouts. The remaining space of the hold formed the after-hold. In its afterpart this hold was divided up into pens for storage of bait and ice. A few partitions also extended from the sides toward the vessel's center in the remaining part of this hold. These made very convenient little compartments for the storage of salt during the outward voyage and later in the season were filled with fish. These holds in the vessel, as in all the fishing schooners, occupy the largest available space possible, and encroach so much upon the forecastle and cabin as to make them very much cramped up. The hold of our little schooner—one of only 70 tons—could carry with ease one hundred and forty or even one hundred and fifty thousand pounds of fish.

CABIN.—The extreme afterpart of the vessel was occupied by the cabin, an apartment 9 or 10 feet long by about 7 wide. The entrance to the cabin was by a companion ladder in the center of the after end of the room. In the center stood a stove; directly in front of this and against the bulkhead was a locker, used as a receptacle for tools and nails, and its top provided with a leaf

that could be made to serve as a table. On the top of this tool-locker stood the medicine-chest. On each side of the cabin were two bunks, and around the cabin in front of these bunks ran a low locker seat, the interior of which was used as a receptacle for leads, hooks, and other fishing gear. Under the two forward bunks was also a space devoted to the storage of rigging and fishing gear, and still more room was obtained in a small space aft of the cabin, under the vessel's stern. In order to make the cabin higher than would be possible otherwise, its ceiling is a sort of box placed on the quarter-deck, called the house, and too well known in sailing vessels of every description to need further notice. Under the cabin floor was a small coal bin, reached by a hatchway.

The furniture of the cabin was not extensive. Upon the forward bulkhead, in the center, hung an octagonal eight-day clock, and to starboard of this an aneroid barometer. Below the clock was a kerosene lamp depending from a nail, but so contrived that when set upon a table it would swing upon pivots and maintain a vertical position despite the rolling of the vessel. On a couple of hooks above the aneroid usually hung the charts. On either side of the companion way was a large mariner's compass, so placed as to be visible to the man at the wheel through a hole cut in the after-side of the house. One of these was less sensitive than the other and intended for use in heavy weather. The starboard binnacle was the one most commonly used. This was illuminated at night by a lamp, arranged for universal motion by swinging on gimbals.

Four men slept in the cabin, selected by lot. The captain gave up his bunk for my accommodation, and "turned in" in the port bunk with one of the men, while the two after bunks were occupied each by one man. To sleep in the cabin was not regarded as any sign of rank, and, indeed, some even preferred to sleep in the forecastle. The cabin folks went forward to their meals, and those from the forecastle came aft to chat when there was no work to be done and when they couldn't sleep, and the greatest harmony prevailed at all times between the forecastle and the cabin.

THE DECK.—In the extreme forward parts of the vessel's deck are placed the anchors, cables, and windlass. Aft the foremast is the little house that covers the companion-way into the forecastle. On the starboard side of this is the funnel from the galley stove, while on the port side 200 fathoms of the strongest hawser are coiled. Placed on edge on the main deck are thick planks, fencing off shallow compartments, and called "checker-boards." These serve to keep the fish, when thrown on deck, from sliding back and forth with the rolling of the vessel and becoming bruised. Two hatches pierce this deck: one just aft the forecastle companion leads into the fore-hold, and in fine weather is always covered with a grating of wooden bars; the other, the main hatch, leads into the main-hold. These hatches are usually open in order to furnish ventilation, but in wet weather or heavy sea they are closed and made water-tight by tarpaulins fastened securely over them. In the waist of the vessel, on either side, are piled the dories, one inside the other, and the lower one always held in place by lashings fore and aft. Besides these belongings to the main deck, several barrels, containing water or provisions, were placed between the fore and main hatches and securely lashed. A small gun, called by the fishermen a "swivel," was also placed between the main hatch and the starboard dories, and was used in foggy weather to signal to the dories the position of the schooner.

On the quarter-deck was a row of large butts (ordinary molasses hogsheads), called "gurry-butts," fastened in front of the house. These, three in number, were used for storing the fish livers. The center of the quarter deck is taken up with the house, with a narrow space left on each side for a gangway. On the house a very characteristic structure was observable. A thick plank ran around the sides and after ends as far as the companion, scarred as if by innumerable choppings with a knife. It was on this plank that the bait was cut into pieces of the proper size.

On either quarter-rail, just aft the main shrouds, two pieces of joist were fastened. These were supports for the splitting tables. The steering apparatus was a wheel, which, with its box, was placed exactly opposite the cabin companion-way.

ORDINARY FORM OF RIGGING.—In her rigging the vessel did not vary much from other fore- and aft schooners. She carried fore and main sails, one jib, gaff-topsail, and staysail. Besides these sails of ordinary type was a sail devised for keeping the vessel's head to the sea when riding at anchor on the Banks, and hence called a "riding-sail." This riding-sail is triangular in shape, and of the pattern known in some places as a "shoulder-of-mutton-sail." At all times, save when the vessel is fishing, this sail is stowed in the hold. When the vessel is at anchor on the Banks this sail is set in its place. The mainsail is furled in the ordinary manner, and the head of the riding-sail is hoisted to the head of the mainmast. The luff is secured by ropes passing around the mast.

To the fisherman this sail is invaluable. Lying at anchor, as the vessel does, she must have her head brought to the sea and wind in some way or the rolling is extremely inconvenient. While on the Bank the riding-sail was not usually taken down, and, in case the skipper desired to shift a berth, this sail, with the foresail and jib, were enough to give the vessel proper steerage way, and, indeed, a respectable speed. When the mainsail was needed for any long passage the riding-sail was taken down, unbent, folded up, and stowed away. When the vessel is anchored on the Banks with her riding-sail set, she is sometimes said to "have gone to housekeeping."

SEAWORTHINESS AND SPEED.—Builders manage to make their models not slow and sure, but often very fast. The secret of their speed lies in the enormous surface of sail they spread out to the wind. Knowing how stiff a boat he has, the skipper is not afraid to carry sail in a strong breeze, and often can make a record of which no yachting man would feel ashamed. Our sailing last summer was often very exciting. The run from Arichat to Cape Broyle we made in forty hours, and we logged 11 knots an hour during part of the first night; nor was this a very unusual rate of speed, for we attained it on several other passages. I was told, also, of one vessel, which, during the fall of 1877, in a run from Canso home, logged 13 knots an hour during seven consecutive hours. Nor is this high speed unusual among the fishing smacks, so that often they overtake merchant vessels that happen to be running the same course, and leave them to drop out of sight astern. Their best point of sailing, however, is generally by the wind, as they lay very close.

The navigating of the vessel is part of the skipper's duty, and is sometimes a very crude sort of navigation. He has with him one or two charts, a pair of parallel rulers, a log, and sometimes a quadrant. The chart covers the region from Cape Cod to longitude 40° or thereabouts, and, after the plan of the best charts, is spotted with compasses on which the variation of the needle is allowed for. By referring to these, in laying out his course, the skipper is saved all mathematical computation by doing all his reckoning by reference to the magnetic meridian. Our log was a patent one and gave very good results. The skipper always used this in reckoning his distances from land, and made occasional quadrant observations also for determining his position, but these latter did not succeed as well as the log. One cause of the mal-success was, perhaps, that he referred to almanacs, distributed gratis, for his declination.

Yet the skippers, though they run a good deal by guess, have coasted along shore and over the Banks so much that they seem to find their way with comparatively little trouble. As we ran in to Saint Pierre I saw an illustration of this. I was on deck at midnight, and the skipper said the red light of Saint Pierre ought soon to appear. We kept on NW. some time longer, but the light did not heave in sight. Finally, some two or three hours later, since the light did not yet

come in sight, the skipper changed the course to north. In an hour or two after this the light appeared on our starboard bow. A very little longer to NW. and we should have missed it entirely.

DESCRIPTION OF DORY.—The dory may fairly be said to be one of the safest forms of small boats. It is a flat-bottomed boat, sharp at the bow, but with the sharp point of the stern truncated, and with very flaring sides. In cross-section it is a flat-bottomed letter V. In longitudinal section it is elliptical, sharp pointed in the bow, and cut square across astern.

They are a lap-streak boat, provided usually with three seats, and having thole-pins in place of stationary row-locks. To the bow and stern are fastened painters, to be used in retaining the dories by the vessel's side or in securing them on deck. The seats are not fastened in, but are merely laid upon ribbands running round inside the dory and nailed to the ribs, in order that they can be easily removed when the dories are to be placed on deck "spoon-fashion." In the bottom of the dory is a plug, kept in the dory by a rope. This rope passes through the plug, and is held from slipping by a large bight in its end. It is manifest that this bight is far more than is necessary to keep the rope from slipping through the plug. It has another and more important purpose than that. When the dory is overturned in the sea and her bottom lies upward, the smooth surface presents nothing to which the struggling fishermen can cling. This bight is the only thing projecting through the bottom of the boat, and while not a very firm support, has doubtless formed the sole dependence of more than one poor fellow. I heard of a narrow escape before this bight was thought of. One dory was overturned in a hard storm; one of the occupants was at once washed away and drowned; the other managed to force the plug out of the hole, and then continued to hang on all night by putting his fingers into the hole. In the morning he was rescued, his fingers worn to the bone from the chafing.

SHIP-CHANDLERY.—In preparing for a voyage every want must be anticipated and prepared for. Although the fishermen are not very distant from land, yet that land is not the place in which to procure supplies at low cost, or, indeed, at times at any cost. All needs of rigging must be supplied. The halyards and sheets must be strong, the sails looked to and their weak spots examined. Spare anchors, cable, extra blocks, ropes of various sizes, bolts, chains, and all the other hundred things that belong to a vessel must be placed on board. The tool-chest must be looked over, and a good supply of nails, screws, &c., taken on board. The medicine-chest must also be overhauled and the medicines ascertained to be present in the proper quantity.

GEAR FOR FISHING.—Besides providing a full set of the various ship-chandlery, all the lines, hooks, and other material necessary for constructing trawls must be taken, and a supply of the implements used in trawling and in dressing fish. Three kinds of line were used in the construction of the trawl; also hooks, small iron anchors, and buoys for indicating the end of the trawls. Dories, wood for dory plugs, thole pins, thwarts, and spare oars to supply broken ones, hooks and lines of proper size for catching bait if a chance were offered, knives for bait-cutting, dory knives, splitting knives, and throating knives, gaffs, gob-sticks and pews, tubs for trawls, dressing tubs, splitting tables, nippers, rollers, powder for the swivel, a horn and a bell for fog, are among the thousand things to be looked to before the vessel's departure.

SALT AND ICE.—For the preservation of the fish a large amount of salt was carried—in our case 160 hogsheads—stowed away in the hold, and there being very useful as ballast. This was coarse salt, of the kind known as Trapani salt. This salt, the skipper explained, was of a better quality than Cadiz salt, which is used somewhat, for he claimed it was coarser and stronger.

Besides salt, the vessel's outfit also included ice. This is purchased at home by vessels fishing near Gloucester, but the Grand Bankers generally expect to obtain the ice that they will need either at Nova Scotia or Newfoundland. In the former place we obtained a supply at the rate of $2.50

per ton, but were forced to pay for what we had in Newfoundland at the rate of $4 per ton. The "baiting up" of fishermen has grown into such an enterprise, that in nearly every hamlet some one, or often two, preserve ice to sell during the fishing season. As to the amount of ice used, 4 tons is enough to preserve 40 barrels of bait during a period of from fourteen to eighteen days. The melting of the ice is much hastened by the salt atmosphere in which it is kept, so that it would seem that, were the ice-pen made tighter and so as to allow less ventilation from the hold, the ice, and bait too, could be preserved much longer.

PROVISIONS.—In addition to these supplies were also the provisions, which must last the crew during their entire stay. For, although it would be possible to purchase in Newfoundland any provisions, they would be obtainable only at very great disadvantage. I append a list of the *stores furnished to the vessel as it was given to me by the steward:*

Articles.	Quantity.	Articles.	Quantity.	Articles.	Quantity.
Beef ..... *barrels*	5	*Baking powder*.. *dozen packages*	4	*Dried peas* ..... *bushel*	1
Pork ..... barrel	1	Hops ..... pound	1	Essence lemon .... dozen bottles	2
Pigs' knuckles ..... do	1	Brown sugar ..... pounds	350	Raisins ..... boxes	4
Butter ..... pounds	200	Molasses ..... barrel	1	Pepper ..... ponnds	2
Lard ..... do	150	Tea ..... pounds	20	Salt ..... bags	3
Flour ..... *barrels*	5	*Coffee* ..... *do*	15	*Mustard* ..... *pounds*	2
Rice ..... bushel	1	Condensed milk ..... dozen cans	4	Cloves ..... pound	1
Oatmeal ..... do	½	Onions ..... bushel	1	Ginger ..... pounds	2
Indian meal ..... pounds	20	Potatoes ..... bushels	10	Cassia ..... pound	1
Hardtack crackers ..... barrel	½	Beans ..... barrel	1	Sage ..... boxes	4
Corn starch ..... papers	12	Dried apples ..... do	1	Nutmegs ..... pound	½
Saleratus ..... pounds	5				

From a glance at this list one can see that a good cook could prepare excellent fare for our men. Their fare was very good indeed, far better than I ever saw among the Newfoundlanders, or even the Nova Scotians. Some fresh provisions were, of course, wanting, that landsmen could have, but our bread and butter, and, indeed all our fare, was very much better than that of the folks ashore. I was surprised to find our men living so well and spoke of it, asking if all the fishermen *fared as well as they. In answer to this I was assured that in our vessel the living was only* average, and that some lived even far better, because, being more inshore, they had more frequent chances to obtain fresh provisions.

In addition to having the care of providing these provisions, the cook was also responsible for securing an abundant supply of wood and coal and the further light stores included in the following list, viz: Kerosene, 1 barrel; burners for lamps, ½ dozen; burners for lamps to be used without chimneys, ½ dozen; wicks, 2 bunches; stove-polish; matches.

WATER.—By far the most important store carried in the vessel is water. This is usually carried in barrels stowed about the deck and in the hold, though in some cases a tank is built in the vessel for its reception. On departing from home a vessel takes on board a supply large enough to last *several days, relying on Newfoundland for a general filling up. In Gloucester the water is purchased* from an *aquarius*, who plies about the harbor in a boat called the *Aqua pura*. The hold of this boat is one immense tank, filled from the city hydrants, and from it the water is pumped into the barrels of the schooner. Judging from the taste of the water and the untidy appearance of the *Aqua pura*, one might think that the waterman was not quite as neat about his water-tanks as could be desired. In fact, to a landsman the water he supplied was absolutely disgusting, so that the thought occurred to me that some arrangement in Gloucester for supplying that enormous fleet of fishermen with good, pure, fresh water, and that, too, conveniently, was an imperative demand.

In Newfoundland the water is obtained directly from mountain streams that everywhere run down over the rocks into the sea. The process of filling, which is somewhat interesting, is described elsewhere.

c. APPARATUS AND MODE OF USE.

GANGING HOOKS.—In the early days of this fishery, and down to quite recent times, the modes of fishing were very different from those in vogue at present. Trawling, the method now most universally followed, was not till recently introduced, and the old fashion of hand-lining prevailed. Of late, however, the idea of connecting a large number of hooks into one string and letting these all fish at once has superseded the old method of one line, or at most two, to each man, and with the best results. In preparing the trawl the crew usually worked together, sitting on the deck in any convenient place during our beautiful July days in the Gulf of Maine. The helmsman at such times lolled on the wheelbox and watched the busy fellows, lending a voice now and then to the small talk and often spinning a yarn for the others' benefit. The first operation in trawl-making was "ganging hooks." The day after our departure was Sunday, and the men abstained from work, but early on Monday morning they brought out the "gear" and prepared for work. The "ganging line" was first cut into pieces 3 feet in length. Provided with a supply of these gangings, and with a stock of No. 14 cod hooks, each man began fastening a hook to the end of the line.*

The hooks, after being ganged, are "moused," to prevent them from catching into one another, and then laid in a pile until the pile contains 300 hooks. They are then fastened in a bunch and another pile is commenced. By mousing the hooks is meant winding the ganging line two or three times round the hook toward its point.

FASTENING GANGINGS TO THE GROUND-LINE.—The share of each man in the ganging of hooks was 750 hooks. This number most of the crew finished in a single day. On the following day, which was Tuesday, the work of the crew consisted in fastening the ganged hooks to the ground-line. This was strong tarred cotton line. At intervals of every fathom the free end of a ganging was joined to this ground-line. They parted the strands with a sort of small marline-spike, called a "pricker," passed the ganging through the hole and then made the knot.

Though this method of attaching the gangings to the ground-line was used altogether by our crew, they told me of another knot not unknown among cod-fishermen, but in common use among "haddockers." In making this a bight is first formed in the end of the ganging and laid upon the ground-line. The short end is then wound two or three times around both ganging and ground-line and passed through the bight. Finally, a heavy pull on the long end of the ganging draws the bight tightly over the short end and keeps the whole knot firmly in position. I was told that the knot first mentioned was usually preferred, because it was impossible for this to slip along the ground-line, while the latter knot at times gave trouble in that manner.

The ground-line was in sections, each three hundred fathoms in length, and each dory was expected to prepare as its equipment five of these "strings." For convenience, each one of these sections was kept in a tub, made by sawing off a barrel at the first hoops above the middle. In some cases two tubs were made from one barrel, when barrels were scarce, but it is the fashion to make only one good, "high-toned" one from one barrel. From the fact of one section being always coiled away in one tub, the terms "tub-o'-trawl" and "three hundred fathoms of trawl" mean the same thing. Very often the fishermen used the term "tub-o'-trawl" as a unit of linear measurement, estimating objects as distant "six tubs o'-trawl," &c.

* The method of ganging hooks for cod trawls is described in the chapter on Apparatus.

ANCHORS, BUOYS, &C.—In order to make the trawl complete it was now provided with an anchor for each end, with a line running from the anchor to the surface, and with a buoy to float there and mark the position of this line. The anchor was of iron one inch in diameter, and provided with two flukes and the ordinary stock of iron belonging to small anchors. The buoy-line, of strong tarred manila, was usually 10 or 20 fathoms longer than the depth of water in which they were fishing, or from 40 to 50 fathoms in length. The buoys, of which there was one for each end of the trawl, were kegs made for the purpose, of small size, and pierced by a staff that extended two or three feet beyond the buoy on each side. To one end of the staff was usually attached either a small flag of canvas or a "black ball," made of a circular hoop of iron or wood, covered with canvas and painted black. Each trawl had one buoy thus marked with a black ball, and this was called the outside buoy. The other, furnished with a flag, was called the inside buoy. Of this trawl the crew, by industriously working, prepared in two or three days 7,500 fathoms, or over 8 miles of trawl-lines.

MODE OF SETTING TRAWL.—The trawls were set in the evening, provided the sea was not excessively rough, and left during the night to catch what fish they could. In addition to the night set, the fishermen, when fish are plenty and the supply of bait good, often make a set during the day-time, or some times, too, by a process called underrunning. In our case, however, lack of bait and scarcity of fish prevented day sets from being feasible oftener than on one or two occasions.

Every night, immediately after all hands had finished their suppers, the dories were loosed from the davits, whence they had been towing astern, and hauled alongside. They were held there by the cook and skipper, while the two men belonging to each dory put into it the five tubs of trawl, the anchors, buoys, and buoy-lines. Then, watching their chance, for the schooner and dory both rock, and in opposite directions—one rising as the other falls—they tumbled into the dory and grasped their oars. They now pulled straight away from the vessel, each one in a given "berth," which he draws by lot. These berths were in lines running from the vessel as a center in five different directions. When they had pulled a certain distance, far enough, they said, so that their buoy-line wouldn't get "afoul of the cable," one man, the one in the after part of the dory, shipped in his oars and fastened the line of the inside buoy to its buoy, then threw the buoy overboard into the sea. The bowman rowed steadily away from the vessel, directing his course by the direction of the wind or sun if it were clear, or in a fog by an instinct, or a knowledge gained by long experience, which seems to guide the fishermen on the sea as a hunter is guided on the prairie. The buoy-line is now thrown over as fast as possible, but at the same time carefully overhauled to guard against any "snarls" that might be in it. The end of this line was fastened to an anchor, and the end of one tub of trawl was at the same time "bent on" the anchor. The anchor was now thrown over and the trawl overhauled hook by hook and thrown after it. No two hooks were allowed to "foul" or to catch into one another, and if they did they were hauled aboard and separated. I was told that this was to prevent the ground-line from being parted. Two hooks so caught must lie against the ground-line, and any shark or other animal in biting at the hooks would be almost certain of snapping the trawl in two. At the end of each tub another tub was bent on and finally the anchor and buoy-line. Last of all the black ball was fastened to the staff of the outside buoy and then the buoy thrown over to mark the outer end of the trawl.

By the time all this had been done the dory was about two miles distant from the vessel. If the night were a clear one the vessel could be seen low down in the horizon, her hull almost out of sight. In this case the row would be a delightful one. Very often I used to lie in the dory's stern and watch the tossing blue water, and the play of colors reflected from the sunset on the

spray from our oars, for it was my habit to go out with the dories nearly always in order to watch the men, to hear their talk, and to enjoy the excitement of a row in the little dory so far from any vessel and from land. In case of fog, however, and this was very often the case, the prospect was vastly different. At that distance nothing could be seen and nothing could be heard, but the men seemed to know just where they were, *and, in the most perfect confidence, pulled lustily into* the thick fog-bank. During this time the skipper, on board, has been ringing a huge fog-bell. As the dory drew near the vessel, within a distance of one or two tubs of trawl, this was heard as a dull and very distant muffled sound; by degrees, as they drew nearer, the sound became better defined, and finally the outlines of the vessel loomed dimly upward. At the first hearing of the fog-bell the men were much puzzled to know from what point the sound proceeded, but by listening intently they were finally able to guess nearly, and by further rowing to take the right direction. When once alongside, the dory was hauled on board by tackles, hooked at each end, and deposited in its place for the night. After this had been done the men took the bearing of the outside buoy, not by seeing where it was, for at that distance the black ball was absolutely invisible, but by an inference from the direction in which they had returned to the vessel. The necessity of this is apparent, as during the night, with changes of wind and tide, the vessel may alter her position and by morning point to some other quarter. Then he, who on the evening previous pulled away from the bow to set his trawl, may in the morning have to pull out from the stern in order to find it.

The time spent in setting the trawl and getting back to the schooner was usually one hour, and on clear nights the dories came in and were hauled on board just as the sun was dropping out of sight in the western ocean.

METHOD OF UNDERRUNNING.—In the Report of the U. S. Fish Commission for 1871–'72 a method of trawling is described which is not the one ordinarily followed on the Grand Bank, but a variation from it used because of its convenience in certain cases. This method is termed "*under-running*," and its advantage is that it permits the removal of the fish from the hooks and the baiting up of the hooks in a single operation, thus saving a good deal of labor. But a very slight change in the form of the apparatus is necessary for use in underrunning, and the set is made in the same way as the set for hauling. Instead of fastening the ground-line to the anchor-ring the fisherman fastens it to a stone and this stone to a line running some distance and then joined to the buoy-line. In hauling, the buoy-line is pulled up until this line running to the stone is reached. This is then pulled and the anchor is not disturbed. Finally, when the trawl begins to come in *it is hauled over the side of the dory by* one man who removes the fish and the hooks baited up and thrown over by the other man. In this way they haul, bait up, and set the trawl in one single operation. Underrunning is used when the fish are abundant, but as this was not the case during any part of the trip last summer, I never saw it employed and describe it only from hearsay.

MODE OF HAULING THE TRAWL.—At an early hour in the morning the men turned out to their breakfast and at sunrise hoisted their dories over the side and prepared for hauling. The thwarts were fixed and the oars laid across them, the five empty tubs were *placed in the stern, the* dory-knife and the roller and the nippers were looked to, also the gaff, the gob-stick, and the bailer, and when all these were found to be present the men tumbled into their dories and pulled away in various directions, according to the bearings of their outer buoys. After pulling about one mile they usually began to look for the black ball, on a clear day, yet, even if it did not appear, they continued to row in the same direction until it came in sight. Having reached the buoy the bowman hauled it in, and, catching the buoy-line, allowed the buoy to tow alongside. Throwing the

buoy-line over the roller, a large wooden spool, that allowed the trawl to be rolled over it with very little friction, it is hauled in steadily hand-over-hand and coiled up by the dorymate. During this and all his other hauling the fishermen protected their hands by nippers, a sort of woolen ring, covering the palm of the hand and creased in the center to allow a firm grip on the line. The anchor finally came up, was unbent, and then the trawl began to come in. This was now coiled away in the tubs as fast as it was hauled and the fish taken off at the same time by the dorymate. As fast as the fish came in they were disengaged from the hooks and taken into the dory. The manner of loosing them from the hooks was very simple and easy enough for the fishermen, though somewhat uncomfortable for the captives, I should imagine. The fish was dropped into the boat and brought up short with a sudden jerk, which in most cases tore the hook out of the mouth. In some cases, however, the hook was swallowed and caught so that no amount of pulling loosened it. In this case a "gob-stick" was brought into service. The cut in the end of the stick was placed over the hook and the hook pressed downward and easily withdrawn. In some cases fish were so loosely hooked that they escaped as they were drawn up to the surface. At such times the fishermen seized the gaff in great haste and often succeeded in hooking it into the fish's body and drawing him on board before he had escaped.

Of useful fish, the catch of the trawls was mainly cod, though haddock and halibut were occasionally taken. The haddock were sometimes made into a chowder, but save in this manner no use was made of them. The halibut were usually salted down with the other fish, and of the small ones some were cooked for our meals. I know scarcely any fish more delicious than a chicken-halibut fresh from the water, and when we were fishing I consumed a couple of fine steaks every morning for my breakfast. In addition to useful fish we caught also large numbers of skates and "sand-stars." All these were objects of execration as often as they appeared on the hooks, and were usually unceremoniously loosened from the hook by an angry slat against the dory's gunwale.

Besides the fish observed, numerous invertebrates were also brought up from the bottom upon the hooks. Of all these I made collections, which have since been studied, and the results will be published in another place.

In case the fishing was good the dory would not be able to carry in at a single trip all the fish that her trawls had captured. At such times of good fortune an anchor buoy-line and buoy were bent on when the dory was loaded and left to mark the trawl, while the dory returned to the vessel to unload.

When finally the dory had taken in her last fish and hauled in the inside anchor and buoy she was pulled alongside the vessel. The cry of "Dory!" summoned the cook and skipper on deck, one to hold each painter while the fish were thrown on deck. The men first unloaded their tubs and other trawl gear, handing them aboard to the skipper at the stern, who slides them down the quarter in a row against the rail. The men then pitch the fish on board with a "pew," a sort of one-tined pitch-fork. This was stabbed into the body of the fish, which were pitched on board much as a farmer would toss hay, and with fully as much unconcern on the part of the fisherman. After the fish were thrown on deck the dory was fastened astern, or, in rough weather, hauled on board, to prevent its getting adrift.

It was the rule to haul from the outer buoy inward toward the vessel, and this rule was followed when possible. The reason for this is evident. In some instances, however, the men failed to find their outside buoy in the dense fog. These rowed back to the vessel and then began to haul from their inside buoy. It was not often that this occurred—a really surprising thing when one recalls how very small an object the black ball is to row for and how very easily missed in a dense fog.

After the evening set the dories were invariably hoisted on board and stowed in nests, one inside the other. The dories were hoisted on board by tackles, the hook at one end being caught into the bow-painter of the dory, while at the other end it was hooked into the stern becket. During the daytime, in fine weather, the dories were allowed to tow astern, in order to save the trouble of hoisting them aboard twice during the day.

ACCIDENTS TO THE TRAWL.—There are several ways whereby the trawl may receive injury, and sometimes injury severe enough to compel the owner of it to make a new string. Of these accidents one of the most common is to get the trawl "hung up." During a rough and stormy night the trawl may be swayed about enough to entangle itself in the rocks on the bottom and to resist all attempts at tearing it loose. In this case, the most common practice is to begin hauling from the other end, in the hope that from the opposite side the trawl may be pulled clear from its obstruction. This is occasionally successful. Sometimes, however, the trawl is caught in two places, and when this occurs the part between the obstructions cannot be easily reached. When the trawl is thus hung up the fisherman is compelled to part it, which is done by pulling until it parts or by a hack with the dory-knife.

If the trawl be out during a heavy storm, so that it is dragged about by the roughness of the sea, it is frequently chafed badly, and in some cases actually broken, by the grinding upon the sharp rocks. This happened to our trawls during our last baiting. The trawls were left out all one stormy night and day. The sea was very rough, so that the trawls were washed about very badly, and when they were finally hauled every dory found the trawls parted, and some had lost two or three tubs.

Besides being cut up in these ways, the trawls also sometimes suffer from the attacks of sharks or dogfish, which snap it in two with a bite of their sharp-teeth. To guard against any temptation to this, the men never allow the hooks to go down fouled so as to lie upon the ground-line, lest the fish, in taking the bait, cut the ground-line. Sometimes, where several vessels are fishing near one another, one trawl will happen to lie directly across one from another vessel. If then the owner of the under one should haul first he would bring up the upper trawl lying across his own. When this happens he is very liable to take his knife and cut his neighbor's ground-line, unless he be an extremely kind-natured fisherman.

Sometimes the vessel, in swinging around, gets the cable around the buoy-line. As she farther swings around something must give, and if the trawl be fast on the bottom in any way the buoy-line is broken in two. To avoid this, the trawls are seldom set close to the vessel, the inner buoys not being dropped till the dory is well clear of any place the cable can reach.

The men would always venture out in worse weather to haul their trawls than to set them, for they feared in bad weather that the vessel might get adrift in some way, and then they might lose the trawls entirely. I remember of one case where a vessel broke her cable and drifted some distance before the crew became aware of it. These men tried to find their old anchorage, but, though they spent several days in cruising over the spot, they lost the whole of their gear.

f. THE CARE OF THE FISH.

UNLOADING THE DORIES.—Usually between 8 and 9 o'clock in the morning the loud cry of "Dory!" brought the skipper and the crew from the interior of the vessel, often interrupting a pleasant morning snooze. The dory from which this cry had proceeded was pulled alongside the vessel amidships, and there kept in place by the cook's hold upon the forward painter and the skipper's on the stern painter. Meanwhile the fish were thrown upon the vessel's deck by the two men in the dories; pitched up heartlessly over the side by a pew, and often falling heavily

upon the upturned edge of the plank forming the checker-boards. As a rule, most of the dories reached the vessel at about the same time, and unloaded their cargoes as fast as there was a place for them to haul alongside. In some instances, however, one dory, or two, might be unusually delayed by a larger haul, or missing the buoy, or various other causes of detention. When a dory was unloaded it was allowed to float astern, being made fast by a hitch of the painter around the davit.

APPARATUS.—The operation of dressing began after all the men had returned to the vessel, excepting, occasionally, when one dory might be unusually delayed. In dressing the fish the crew were divided into two parts, each of which performed similar operations. Their apparatus was extremely simple, consisting of a large tub and a table; also the requisite supply of knives to be used in cutting up the fish. The tub was a large hogshead sawed off somewhat above the middle. The table, which was capable of being removed at any time, was composed of several boards held together by cleats upon the lower side. This table, as well as the tub, was placed by the vessel's side. At one end it was supported by the rail of the vessel, confined there by a piece of joist nailed to the rail and fitting between two flat pieces of board securely fastened to the table, and separated from one another by the width of the joist. The inner end of this table was supported by a board which ran from its under side to the angle of the deck and the vessel's bulwark. On the side of the table on which the tub was placed was a cleat, standing two inches high, which served to prevent the fish and the viscera from falling while the dressing was being performed, and in the center, toward the inner end, was a second cleat used to hold the fish during the work of the splitter.

In order to escape the inconvenience of left-handed movements the relative positions of the tub and table, and positions of the men in splitting, were on one side the reverse of those on the other. On the starboard side the two stood between the house and the bulwarks, the table just aft the main rigging. On the port side the table occupied the same position, and the tub stood just under the main rigging.

Two kinds of knives were used for the different operations. The throater was provided with a sharp-pointed and strong keen-edged knife of fine steel. The splitter had a knife rounded on the end with curved blade and of very fine steel. These knives were different from the bait-knives, the latter being of more varying kinds.

THE PROCESS OF SPLITTING.—When all hands are in readiness to dress the fish, the splitting tables are taken from their perch on the liver-butts and fastened up in their places. The tub is also put in its place ready for the header. One man, called the "idler," now fills the tubs, and then active work begins. The "throater," standing by the side of the tub farthest from the table, now takes a cod from the tub, seizing the fish's jaw in his left hand. He lifts the fish up to the edge of the tub and poises him there, belly upward, on the supra-occipital bone. With the well sharpened and pointed knife in his right hand, he makes a transverse cut across the throat, just behind the gills. Introducing the knife at this opening he cuts down the belly, laying open the abdominal cavity, and making also one cut on each side downward he separates the head from the sides, and, with another, separates all the viscera of the belly from those of the head. Finally, still holding the fish thus poised, he presses with his right hand upon the fish's belly, and breaks off the body from the head at the first vertebra. The fish then falls into the tub, and the fisherman cuts the skin of the head through, when it does not break off of itself, and then throws it into the sea. The first is followed by a second and a third, till all the fish in the tub have been beheaded and opened.

On the opposite side of the tub, between it and the table and close to the vessel's side, stands the "gutter." He, taking the headless fish from the tub, hauls them upon the splitting-table. With his left hand he opens the abdominal cavity and with the other tears loose all the organs contained

therein. The livers he throws into a basket placed to catch them and the stomach and reproductive organs quickly find their way into the ocean.

The fish is next pushed across the table and laid hold of by the splitter. He is armed with a very sharp and somewhat peculiar shaped knife. The blade, which is of very well tempered steel, is somewhat curved flatwise. With the back of the fish braced *against the cleat in the center of* the table he makes a long incision down the ventral surface, continuing the opening made by the throater, and splitting the flesh close by the side of the backbone almost to the tail. The fish is then opened as the leaves of a book, and the tail allowed to hang over the inner edge of the table; *with a sharp stroke he* then cuts under the backbone and loosens it so that he can catch the end in his fingers. Seizing this with his left hand he cuts under it toward the head of the fish, and with a few strokes separates the backbone from the body, allowing the latter to drop to the deck and throwing the former into a pile that is collecting for the cook.

SALTING DOWN.—When the idlers have collected a couple of dozen of dressed fish in the checker-boards they wash them thoroughly by sousing pails of sea-water over them, and when they have finished this heave them with their pews into the hold. Here they are seized by the salter, who, grasping a fish by the tail, *throws it dexterously upon the pile or kench flesh side uppermost*, and then sprinkles over it a layer of salt from a scoop in his other hand. The fish are built up in very regular kenches, laid head to tail, always with the skin down and spread out flat. In our vessel two men were in charge of salting—the skipper and one of the crew. Their business requires considerable skill, for many a cargo has rotted from insufficient salting, and by too much salting the flesh deteriorates greatly in flavor.

FURTHER CARE OF THE FISH.—Thus split and salted, the fish lie *spread in kenches in* the hold until the vessel reaches home. While there they must be carefully guarded lest any water should get upon them and injure them. The utmost caution was always used to shut the hatch when any danger of rain menaced, and during a heavy sea, too, because the sea-water was not brine *enough to prevent injury*. During the time the fish remain in the hold they are constantly drying, the moisture being driven from those in the middle and lower part of the kenches by the pressure from those above. The water thus pressed out ran down into the hold in such large quantities that when the fish were being taken in any numbers it was necessary that the vessel be often pumped out. It was for this reason that every man was expected, at the end of his watch, to pump out the vessel.

The work of splitting kept the men busy until nearly eleven o'clock. The talk then was of the number of tubs split that day, *which was added to the count kept by some member of the crew*. The amount of fish on board at any given time was reckoned in units of tubs. Three tubs held about 1,000 pounds of dressed fish, and thus our cargo, which by count contained 255 tubs, weighed off at Gloucester 78,000 pounds. By induction they could tell how large their cargo was at any time, *though* they did not often reduce it, since by long use the amount in tubs has as definite a meaning as the amount in pounds.

COD LIVERS.—Of the various viscera of the cod that are saved and preserved for sale at home the livers are perhaps the most important. These are separated by the gutter from the *intestines*, and while the latter are cast overboard, these are collected and placed in the liver-butts. These liver-butts are characteristic of a fishing vessel engaged in this branch of the fisheries. They are huge casks mounted on skids, lashed down by strong ropes, and always placed in front of the house. They are open at the top by a large square opening, covered usually with a piece of tarpaulin a little larger than the hole, and fastened down securely at one end. After a time these butts become filled with livers, and the livers by this time, through their constant churnings with the vessel's

rolling, have partially "tried out" their oil. To make more room in the cask the oil is partially drawn off and stowed in barrels. If the skipper finds that he can get a good price for his oil at Newfoundland or Saint Pierre, he will turn it into money at those places; otherwise it is carried home and disposed of there. Oil from the "bankers" is not pure enough to be used as the great "lung-strengthener," inasmuch as it is not nicely taken care of on board the vessel. It is made into what is known as "tanner's oil," and is sold at the average rate of 38 cents per gallon.

SOUNDS.—*The sounds of the fish are, on many vessels, regarded as one of the cook's perquisites.* These, the swim-bladders, lying just under the backbone and in the roof of the general cavity of the body, are of large size in the cod and well stocked with gelatine, though by no means approaching the value of the sounds of the hake (*Phycis*) in this particular. The cook, who was not expected to take part in the operations of dressing fish, usually spent the time when the crew were occupied in that work in cutting the sounds out from the backbones. As fast as he obtained these he threw them into a pail of salt water, where they might soak until he was ready for the further operation of scraping them. This he did most frequently at evening, when the dories were distant from the vessel setting their trawls. In scraping sounds a bait-knife is used, and blood and other dirty matters are scraped off, and the sounds are then put to soak in strong brine for a few days. From the brine they are transferred to a barrel for permanent stowage, and then they *are heavily salted. At the time of final packing the sounds look white and clean, quite unlike the* bloody mass they were at first. On his reaching port the cook sells the sounds, commanding for *them a price varying from 2 to 6 cents per pound. Like the Grand Bank livers, Grand Bank* sounds are not regarded as first class; they are made very largely into a preparation called ribbon isinglass, used chiefly for settling beer. The best sounds, obtained from the off-shore fisheries and the fresh fishermen, are made into the better grades of isinglass for refining and sizing purposes, and are also used for food.

COD TONGUES.—In addition to livers and sounds the tongues of the cod are also often cut out and saved by the fishermen, these being likewise the normal perquisite of the cook. On the Victor no tongues were saved, but I was informed that they are often taken and preserved in salt. They are sold at home, and find their way into the market as a great delicacy.

OTHER VISCERA.—*I am not aware that any other viscera of the cod are saved for sale,* though in the halibut the fins are often saved, but the pea and the stomach, too, sometimes are saved to be used as bait when other sorts of bait are scarce. This sort of bait was formerly very extensively used in cod fishing, but of late years the fishermen believe they must have fresh bait, and, to obtain it, will sacrifice a great deal. On the subject of "gurry fishing" I have spoken at greater length in other places.

g. BAIT AND BAITING.

VARYING KINDS WITH SUCCESSIVE SEASONS.—During recent years a practice has been in vogue among most of the Grand Bankers, and, in fact, among all other cod-fishing vessels, of using fresh bait. Until the past decade, at most, fish were often captured with bait which had been brought *from home preserved by salt, or with the entrails and flesh of the cod itself, called in fisherman* phraseology "gurry." It seems, however, now to be the a common opinion that during the summer months the fish will not bite at all at salt bait or gurry, and it is a very general practice to use some form of fresh bait. This bait is obtained from the land most conveniently accessible, which, in the case of Grand Bankers, is Newfoundland. This baiting business has come to be at that island a very important trade, and in the smaller hamlets, which are scattered along

the entire coast, forms almost the sole occupation of nearly all the male inhabitants. When her supply of bait is exhausted, the vessel, anchored on the Grand Bank 100 or 200 miles from the land, runs for the nearest harbor for a replenishing. Should bait be wanting there at that time the vessel would probably run to some other harbor, selecting one from which rumors of plenty were gone out. In this way the bankers visit the island in large numbers, and bring into it a by no means small amount of business. A vessel may take several baitings. If she has good fortune two baitings will be enough to fill her, but she may have to take three, or even four or five. The stay on the Bank during which a vessel is using up her bait is known as a baiting. Thus the question is very often heard, "Where did you use up your second baiting? How much did you get on your second baiting?" The word is also very often used for a supply of bait, a sense in which I have employed it just above.

FROZEN HERRING.—The kind of bait does not remain the same throughout the year. As the year opens, one kind is employed; this is later followed by bait of another sort, and finally, at the close of the season, still others are used. Those vessels which seek the Banks very early in the year, or as late as the latter part of March or first of April, take for their first baiting the herring (*Clupea harengus*, Lin.). These they can obtain in Fortune Bay during the early part of the year more readily than at any other portion of Newfoundland. The herring are taken in seines. The natives ("liviers," as they are called) watch for a school to make its appearance in their harbor. When seen they put out in their punts and surround the school with a net, and then take them out with dip-nets. The herring are then sold to the bankers at a price varying from twenty-five to sixty cents per hundred. While the weather is very cold the bait may be preserved fresh a long while. This is done by freezing the herring and then keeping them in a vessel's hold, from exposure to the air, so that they cannot thaw. In this way they are kept for three or four weeks, until the weather has grown so warm that this method of preservation is no longer practicable. From the fact that the herring are thus preserved frozen, this baiting is always known among fishermen as a "baitin' o' frozen herrin'." I have spoken as though it was common for such a baiting to be used on the Grand Bank. Such, however, is by no means the case. As a rule, very few vessels visit the Bank during the early part of the year, but make their first inroad upon the codfish on the Western Bank or on Banquereau. In that case they quite as frequently obtain their bait in some Nova Scotia harbor in the Bay of Fundy as in Fortune Bay, Newfoundland.

ICED HERRING.—As the season advances, however, a large fleet of cod-fishermen from all the various fishing ports of our coast run for the Grand Bank. These are very likely to visit Fortune Bay or some harbor along the southern coast of Newfoundland for their baiting. This is composed again of herring, but preserved differently, owing to the increased temperature on the Bank during April and the succeeding months. The herring are now kept in ice in the bait-pens. Ice bought at some harbor on the way from home, or obtained in the harbor where the bait is bought, is cracked up quite small in the huge splitting tubs. A layer of the fine ice is then spread over the floor of the bait-pen. Over this layer is spread a layer of fish; then a layer of ice follows, and a second layer of fish. In this way the fish and the ice are sandwiched in until the pen is filled. This, which is termed "a baiting of herring," will in this way be preserved from fifteen to eighteen days. For the baiting, the skipper pays about $25 or $30 and receives 40 barrels of the herring.

CAPELIN.—By the time two baitings are consumed, or by about the middle of June, the next kind of bait begins to appear on the coast of Newfoundland. This is the capelin, a small boreal fish (*Mallotus villosus* Cuv.), and quite closely resembling our well-known smelt (*Osmerus mordax*

Gill). The method of their capture I had no opportunity of observing.* They are taken in immense numbers by the "liviers" and furnished to the bankers. They are generally sold at a certain price for the baiting, and for $16, 10 to 20 or 25 barrels are supplied. They are stowed away in the bait-pens in the same manner as the herring, and can generally be preserved about the same length of time.

SQUID.—Of all the different forms of bait that are sought by the American bankers none are so popular as the squid (*Ommastrephes illecebrosa*), and none so interesting in its capture. Their first approach is watched by thousands of anxious "liviers," and news of the first capture is heralded in a way that makes the man who sees the first one in any season quite a public character, and confers considerable renown upon the hamlet where they are first captured. It is usually during the latter part of July that the excitement begins, and from that time till their disappearance in October they form the principal topic of conversation in many a hamlet on the coast. Armed with his squid jig the native fisherman leaves his home in the "wee sma' hours" of the morning and putting out in his punt into the harbor stealthily lets his jig descend into the silent water and dreamily awaits a bite. The squid jig is so entirely unlike any other form of hook that I will briefly describe it: To one end of a cylinder of lead, 3 inches long, are fastened pins bent upward. No bait is used with it, but it is simply let down among the squid, and kept in constant motion to imitate the movements of a small fish and thus attract the squid. When one grasps it with its long tentacular arms the jig is quickly pulled in, and the squid thus entangled in the pins is secured. When they are in the humor, or, in Newfoundland dialect, when the squid have "struck," they can be caught very fast indeed. When once the squid strike in a harbor, if the punts are not all out, anchored side by side, the news is communicated to those ashore by the sight of activity among those in the punts. In an instant the word, "the squid's struck," flies through the village like wild-fire, and in an incredibly short time all the men folks of the village are anxiously waiting for a bite. During our second baiting, while we were anchored at Open Hall, a very amusing instance of this sort of thing occurred. As a rule all the punts in the village are anchored in the harbor during the whole day, but on this occasion the day was exceedingly blowy, and, the squid not biting, the "liviers" had all sought their own warm firesides. During the early part of the afternoon one man on board one vessel, in sheer lack of any better occupation, threw a jig over the side and had a bite instantly. He hauled up and threw in again and found that the "squid had struck solid." "Then there was mounting in hot haste," and in less than a minute every man on board was actively running a squid jig and pulling the squid in in a very lively manner. Hardly two minutes had passed when we saw a boat put out from the shore. This was instantly followed by four, and in less than ten minutes twenty-eight punts were strung along from us as a center, and all hands excitedly "jigging squid." Like all other things, squid-jigging is by no means all sunshine. The squid has one or two confirmed habits which often lead to remarkably unpleasant consequences. As it is drawn from the water the squid first discharges from his siphon a jet of salt water, which is very likely to strike the fisherman in the face. Almost instantly the squid follows this by a second jet of dirty black ink. Unless he be very quick and gets the squid off the jig and safely lodged among others of his kind this second less pleasant stream will strike the fisherman. I had, during the summer, the opportunity of seeing men served in that way, and judge from hearsay that it is not at all delightful.

Squid are taken in enormous numbers in all the harbors of the island. During the first few days they seem to abound most plentifully in the more southern harbors, while during the

* They are taken in small drag-seines, made specially for the purpose, and called "capelin seines." The fish are inclosed in a semicircle of netting and drawn to the shore, where they are bailed into boats with a dip-net.—J. W. C.

last of the season they are generally sought in the northern ports. Often so many are caught in a single day that a vessel can secure an entire baiting of 30,000 or 40,000 squid without even stopping in the harbor long enough to make it necessary to haul down her sails. They are generally sold by the natives at prices varying between 15 and 40 cents per 100, and when possible 30,000 or 40,000 are purchased. They are preserved in ice in the same manner as the capelin and the herring, and may be kept fit for use during a period of from 18 to 25 days.

In former years, I am told, squid have been captured on the Banks by the vessel's side, and made use of as bait. The giant squid of this same species, of which an arm or a beak are now and then found, were also reported to me by one of the men to have been seen by him in previous years; and he further states that from the body of such a one his own vessel and another had been fully supplied with bait.

SALT BAIT AND GURRY.—After the disappearance of the squid, which occurs during October, most of the fishermen leave the Banks and start for home. The few that remain use for bait salt squid or other forms of salt bait, as menhaden slivers. These are brought, pickled, from home. Besides these, gurry, or the viscera are also used for bait. Of these viscera the reproductive organs appear to furnish the best forms of bait. In former times it is known that salt bait and gurry were alone used. From experiments made repeatedly in these present years, such bait will not catch fish till very late in the season. The cause of this change I cannot tell.

BAITING THE TRAWLS.—In regard to the manner of using the bait, very little need be said. When the time for baiting up the trawls arrives the men, with baskets in hand, go down into the hold and bring up from the bait-pen such an amount of bait as they think sufficient. This is thrown on the roof of the "house." The men then stand in a row around the house, and with knives made for the purpose cut up the bait into pieces that are about 2 inches square. The trawl is then turned out of the tub on the house, and hook after hook is baited and coiled back again with the ground-line into the tub. When salt bait is being used, as happens during the latter part of the season, it is soaked for a time in water in order to remove the salt somewhat.

METHODS OF OBTAINING AND PRESERVING BAIT.—One thing of which my summer's experience among the codmen most strongly convinced me was the enormous waste of time necessitated by the present method of procuring bait and the loss from the present mode of preservation. From the rugged condition of the island of Newfoundland and the primitive habits of the people, any communication between hamlets not immediately contiguous is excessively difficult. It must be for the most part extremely uncertain, because depending on chance vessels which may have visited other ports. Owing to this fact, the banker is compelled to visit harbor after harbor in search of bait, learning for himself where a supply may be had and not in any way being able to know if bait is abundant at any place. The result of this is that of the hundreds of bankers which annually visit Newfoundland for bait, each one of them spends from six days to three weeks in entire idleness while on the lookout for herring or squid. At each place they visit they may hear that the bait has been more or less abundant a few days before, but no vessels were in then, and now the school cannot be seen. As may be seen by reference to the "Calendar of the Cruise," our vessel spent thirty days in Newfoundland harbors, an arrangement which to me personally was extremely grateful, but which, as any one can see, does not pay owners or men financially.

This waste time could be almost or entirely saved by either of two plans—a telegraphic communication between the harbors, or some central office run by enterprising men as storehouse for the bait and centers of purchase for the fishermen. In the former case the "banker" could learn where to direct his course with certainty of success; in the latter case he could at once seek the central office and there purchase his supply. But giving the island and its people, as they are at pres-

ent, the thought of their forming any such scheme seems useless, for the people are, as a rule, too conservative to improve any on their present system. The only possible hope of improvement is from some enterprising American. I feel confident that, with ice for the trawlers in the winter and labor cheap, a person could preserve and sell in a single season enough bait to pay for his buildings, and that he could after that make money rapidly. If he had such a depot, the fishing vessels would soon learn where bait could be procured, natives would also know where they could have a steady cash market for their catches, and the owner would doubtless both obtain and dispose of all the bait he was able to handle. To me it seems remarkable that the Gloucester fishermen have not long ago provided some better method of bait procuring, or that the vessel owners have not themselves instituted improved methods.

But not only do the fishermen lose a vast amount of time in bait-hunting, they also lose a good deal of their bait from defective methods of preserving it. I have elsewhere described the present method of preserving the bait in ice. Under this treatment the result is the almost utter worthlessness of the two or three bottom layers and the greatly deteriorated quality of much more. The weight of ice and squid from above pressing down the lower layers and the melting of the substratum of ice, with also the water and filth from the upper layers added to the lower ones, make in the course of ten or twelve days the undermost bait utterly unallaring to the fish. As a result of this the vessel can not take a large supply of bait and then remain fishing on the Banks, but must after a brief interval seek the land for *fresh* bait.

Now it seems to me that this defect could be profitably remedied by the introduction of some inexpensive refrigerators in which forty or fifty thousand squid could be kept frozen during one whole month or more if necessary. Such refrigerators, built into the places now occupied by the bait-pens, would undoubtedly save enough in the time of the crew and in the waste of bait to pay for themselves in a single year, or two at furthest. In our cruise we made three trips for bait, spent thirty days, and obtained in total about 70,000 squid; by having refrigerators and arrangements for preserving nearly this entire number at one time the vessel could have been saved at least twenty-five days on her trip and several thousands of ruined squid.*

One of the most unpleasant and often most disastrous hindrances in the way of the fishermen, when they are in search of bait, arises from the hostile feelings often entertained by the bait-catchers. These, instigated by jealousy or by fears lest their own rights are to be infringed on, have at many different times come to blows with the American fishermen, and by mere force of numbers overcome them and driven them away from their shores.

The Fortune Bay people, during 1876, made an attack upon the American fishermen so violent as to draw considerable attention to the incidents in the newspapers at that time. In 1878 the schooner Concord, from Gloucester, entered Tor Bay in search of bait. She had scarcely come to anchor when a squad of shoresmen boarded her, and threatened if she did not leave at once to cut her cables. The captain, who was a man of considerable pluck, told the men that he had no intention of quitting the harbor with his vessel until he was ready. He then left the vessel with the angry

* Several years ago the question of freezing bait on fishing-vessels by such a system of refrigeration as that suggested by Mr. Osborn, was pretty thoroughly tested on the Gloucester schooners It was found impracticable, even for the vessels fishing on George's, and was abandoned by the fishermen, who, in many cases, had expended considerable sums of money to try the experiment. One of the chief difficulties in the way of using such a system on board of a cod-fishing vessel on the Grand Bank is the fact that the refrigerator, if large enough to hold and preserve 70 or 80 barrels of bait, would occupy so much room that there would be insufficient space left for fish and the requisite salt to put on them. Then, too, the experiments tried by the Gloucester fishermen convinced them that bait frozen on board of the vessels by refrigeration was not nearly so attractive to the cod as that iced in the ordinary manner—a result which must always be a serious objection to the introduction of a method that otherwise might seem to have many advantages, particularly to one not very familiar with the fishery and its varied requirements.—J. W. Collins.

natives still on board, and hastened to Saint John's for officers of the law. Saint John's is 6 miles distant from Tor Bay. When the skipper finally reached his vessel with officers the invaders were forced to go ashore. Beyond binding them to promises of no further violence their action was not noticed by the Newfoundland authorities. The skipper could not obtain his bait from the people of that harbor, but he had escaped without any further injuries. This man I met, and heard his story from his own lips.

Nor is the feeling of malice and hostility ended yet, for even this present year of 1880 has furnished new instances. On August 4 the schooner and many of the crew with whom I had passed the previous summer entered Conception Bay in search of bait. In the harbor 200(?) natives boarded the vessel, prevented by violence their taking squid, and finally compelled them to get under way and leave the cove where they had anchored.

I will not say that the fishermen are not in part responsible for the temper of mind of the natives toward them. Some of the more slippery fellows have, I doubt not, in past times dealt unfairly with the Newfoundlanders. I have heard of some who obtained unfair measure, or who slipped their cables before the bills had been settled. The younger men among the bait-catchers are also somewhat actuated by jealousy toward the fishermen, since the latter are great gallants ashore among the young women, and the latter turn from their native beaux to the Americans, to the infinite disgust and chagrin of the former and the ill-concealed and often unconcealed satisfaction of the latter.

A further discussion of the manner of obtaining and preserving bait is given by Mr. Osborn, in Section IV of this report, under the head of "Life of Fishermen on Shipboard."

4.—THE GEORGE'S BANK COD FISHERY.

By G. Brown Goode and J. W. Collins.

1. ORIGIN AND PRESENT IMPORTANCE.

The George's Bank cod fishery, or, as commonly called, the George's fishery, was carried on to some extent by vessels from Marblehead as early as the middle of the last century,* but there is no record to show that it was long continued, nor is there any one now living who remembers fishing vessels going there prior to about 1821.

This fishery is now carried on almost exclusively from Gloucester. Vessels from this port first visited George's Bank in search of halibut about the year 1830, and in connection with the halibut took considerable quantities of codfish. Since the decrease of halibut in that region there has been a constant fishery there for cod. The George's fishery has not yet shown a tendency to

* William Douglass, in Vol. I, page 302, of his History and Political Summary of British Settlements in North America, printed at London in 1760, says:

"Marblehead, in New England, ships off more dried cod than all the rest of New England besides; anno 1732, a good fish year, and in profound peace, Marblehead had about one hundred and twenty schooners of about 50 tons burthen; seven men aboard, and man ashore to make the fish, is about one thousand men employed from that town, besides the seamen who carry the fish to market; if they had all been well fished, that is, 200 quintals to a fare, would have made 120,000 quintals. At present, anno 1747, they have not exceeding seventy schooners, and make five fares yearly; first to the Isle of Sable; the codfish set in there early in the spring, and this fare is full of spawn: formerly, they fitted out in February, but by stormy weather having lost some vessels and many anchors, cables, and other gear, they do not fit out until March. Their second fare is in May to Brown's Bank and the other Banks near the Cape Sable coast; these are also called spring fish. Their third and fourth fares are to Saint George's Bank, called summer fish. Their fifth and last fare is in autumn to the Isle of Sables; these are called winter fish."

decline, being carried on quite as vigorously and as successfully at the present time as ever in its history. Although Gloucester is the only port which has extensively engaged in this fishery, a few vessels from other New England ports have from time to time participated in it. From 1859 to 1862 Southport sent several vessels; and Vinal Haven, Me., Marblehead, Rockport, and other Massachusetts ports have also had vessels engaged in it. Concerning the history of the George's fishery from Southport, Mr. R. E. Earll obtained the following information of Mr. D. Cameron and Mr. B. F. Jewett:

Hearing the favorable reports of the George's fishermen of Gloucester from time to time, the owners of vessels in Southport decided to send their vessels instead of keeping them so long idle. The first vessels started in February, 1859, and as there was some difficulty about finding men to go at that season of the year, the crews were picked up not wholly from the island, but from Westport and other towns in the vicinity. Schooner Mazeppa, Capt. W. E. Wells, was sent out by Cameron & Orne about the 1st of February, and two others, the Atlantic and S. H. Cameron, started shortly after. They provided themselves with ice for keeping their halibut fresh for the Portland market. The fish seemed very scarce and the weather very stormy, so that their trips were not profitable, but they continued in the business until about the 1st of July, and finally abandoned it. In 1861 or 1862 the schooner Humboldt went during the greater part of the year, but the rough weather and poor fishing caused them to discontinue. About this time William Decker sent two vessels, the Willie G. and Archer, one season with same results. They were the last.

In 1879 there were one hundred and four Gloucester vessels constantly employed in the George's fishery, many of them making over a dozen trips each, and forty-eight other Gloucester vessels followed the fishery a part of the season, the entire fleet aggregating one thousand trips and landing 23,144,000 pounds of codfish and 905,000 pounds of fresh halibut.

In 1880 the Gloucester George's fleet aggregated one hundred and sixty-three vessels, one hundred and seven of them engaging exclusively in that fishery, while the others were employed for a part of the year in other fisheries. The fleet made one thousand four hundred and thirty trips, and landed 27,000,511 pounds of codfish and 1,125,450 pounds of fresh halibut.

In 1881 the fleet was the same size as in 1880, the catch aggregating 22,510,000 pounds of cod and 1,087,400 pounds of fresh halibut.

The dangers and hardships of this fishery are so great that only the most daring and hardy of fishermen care to continue in its prosecution. The system of mutual insurance, which has been so successful in Gloucester, enables the owners to face the great risks of the George's fishery with less apprehension than can be done by those of any other ports.

Like the fresh-halibut fishery, the George's fishery is carried on throughout the entire year. Until within a few years it was the practice of the Gloucester vessels to "haul up" in harbor from November to the 1st of February, since they could not be insured until that date, but at present they can be insured at all seasons, and the competition which exists has now compelled almost all of them to keep at work twelve months in the year. The fresh-halibut, haddock, and the George's fisheries are the only fisheries carried on continuously winter and summer.*

The haddock fishery is carried on to a comparatively limited extent in summer, but it is prosecuted upon a large scale in winter.

The Gloucester Telegraph of January 4, 1859, contains the remark that "at one time the

*In 1874, at Christmas time, only four vessels were engaged in this fishery. The W. H. Raymond arrived December 22 with 30,000 pounds of fish—a good fare, though the weather was rough. (Cape Ann Advertiser, December 25, 1874.)

vessels were hauled up six months in the year, but that in 1859 some were not hauled up at all, except when repairs were required. There was one arrival, January 2, from George's, and several were at that time on the fishing grounds."

For twenty years or more it has been customary for the George's fleet to set out for the Banks as early as the 20th or 25th of January; at present many vessels go as early as the 15th. They start thus early with the idea of getting on the Banks before the first schools of codfish strike there. They very often have to return before getting a full fare on account of the bait giving out. Some seasons a single vessel will strike the fish early; the others then think they can do the same. Vessels very seldom start before the 15th of January, and many of the best skippers rarely go before February 1, by which date the main body of the fleet is usually prepared to sail.

In 1874 the early start of the fleet was delayed by the action of the Mutual Fishing Insurance Company, which refused to insure vessels leaving for the Banks before the middle of March. A new company was formed that year, which insured vessels wishing to go in February, and some forty sail started soon after the 1st of that month. The George's-men began to arrive from their first trip before the 27th of February, and by the middle of March were coming in from their second trip.

2. THE FISHING GROUNDS.

The George's fishery is carried on for the most part upon George's Bank, though in December and January a large part of the vessels fish upon Brown's Bank and La Have; a few, however, go to George's in January. The best time for fishing upon George's is in February, March, and April, when the spring spawning schools of codfish appear on the Bank. During these months the favorite fishing ground is upon that portion of the Bank which lies east of the shoals, at a depth of 25 to 35 fathoms, this being called the "winter fishing ground." At other seasons of the year the vessels resort to the western part, or what is called "Clark's Bank" and "South Channel," and also to the southeast part of George's Bank. In the fall they frequent the northern edge of the Bank. Many of the vessels in summer and fall fish on Brown's Bank, Seal Island Ground, and occasionally make trips to German Bank and other small grounds in the Bay of Fundy. Trips have sometimes, though rarely, been made in winter to Sable Island or Western Bank, and in summer to the south shoal of Nantucket and off No Man's Land.

After the spawning season of the cod, in February and early March, is fairly over there is a great breaking up of the schools of cod and a scattering of the fishing fleet on the middle part of George's Bank in 35 fathoms. Says Captain Martin: "You'll see 60 sail of vessels fishing on George's in February and catching 30,000, 40,000, 60,000, and sometimes as much as 100,000 weight of fish, and they'll go back in March; and it's like heaving your line into a well; there are no fish anywhere." The vessels then scatter over the Bank to the South Channel, to the southeastern or eastern parts of the Bank, or go off on Seal Island Ground or Brown's Bank.

In sailing from Gloucester for George's Bank vessels steer an east-southeast course, striking the edge of the Bank to the northeast of the "North Shoal." Many vessels fish in midsummer in 25 to 40 fathoms east of the main George's Shoal, gradually working out into deeper water.

3. THE FISHERMEN.

The crew of a George's-man consists of eight to twelve men. About twelve hundred fishermen of Gloucester are employed in this fishery. About one third of the men are British Provincials, one third Americans, and the other third about equally divided between Swedes and Portuguese, with a few Frenchmen and other nationalities.

In early days, when the George's vessels were smaller, the crew consisted of six to eight men. The vessels now in the fleet carry ten or twelve, occasionally thirteen, though not more than twelve or fifteen vessels carry so large a number as that last mentioned. In summer, when it is often *hard to obtain men, vessels sometimes go out with smaller crews.*

The successful result of a trip to George's Bank for codfish is largely dependent upon the exertions of each individual; men are, therefore, required for that fishery in whose natures is combined hardihood, doggedness of purpose, and bravery. Owing to the fact that each man's success depends in a great part on his individual efforts, the Portuguese and Irish have a special fondness for this fishery, though many others engage in it.

Many of the best fishermen and most capable skippers follow the George's fishery; but, as a rule, the crews are considered intellectually inferior to those employed in the mackerel and halibut fisheries. The results obtained depending so much on the individual efforts of the men, a vessel may make a successful trip under the control of a skipper who would be totally incapable of commanding a halibut schooner or one employed in the Grand Bank cod fisheries.

4. THE VESSELS.

The George's vessels, like those in the fresh-halibut fishery, are the stanchest and best of the Gloucester fleet.*

Their size is smaller, however, the average George's-man registering about 60 tons. In the fleet there are some vessels of 45 tons to 50 tons and a few of 80 tons and more. In the winter, as a rule, the George's-men carry no main-topmast and jib-boom, being rigged "snug." In summer the regular George's-men carry main-topmast and staysail, but rarely, if ever, a flying-jib.

Until within a few years a peculiarity of the vessels of this fleet was, that when riding at anchor they set a "balance-reefed mainsail" to steady the vessel and keep her as nearly head to the wind as the tide would permit. When the mainsail was "balance reefed" only a small portion—perhaps a fourth or fifth of its area—was exposed, and it then answered the same purpose as the riding-sail used at the present time.†

The average outfit of charts and instruments is less complete than on board of a halibut schooner.

The outfit of a George's schooner is in many respects very different from that of a halibut schooner. The cable is shorter, since the vessels fish in shallower water, its ordinary length being about 225 fathoms; the cable is generally also smaller, usually about 8¼ inches in circumference, though some are 7¾, 8, 8½, or even, though rarely, 9 inches. The cable is stowed in the same manner as on the halibut schooner, but of course occupies somewhat less space. The anchors, of which there are three, are of the same type, but usually lighter, weighing from 400 to 500 pounds.

There are no checker-boards on the deck, but instead two or three oblong bins, which are called gurry-pens. These are made of 1½-inch to 2-inch plank, and are about 3 feet in height. They are *divided by transverse partitions into* two or three compartments, and small sliding doors are placed

* No class of vessels are better calculated for a battle with the storm-king and no braver souls tread the deck, but the contest is an unequal one, and many a stanch craft and gallant crew go down in the conflict. In a single storm, on the night of February 24, 1862, 15 Gloucester vessels and 120 men were lost, leaving 70 widows and 140 fatherless children to mourn for the loved ones who would return no more. Last year 200 vessels were engaged in the George's fishery at some time during the year; a large fleet followed the business the greater part of the year, and a total of 1,348 fares were landed at Gloucester. (Gloucester and its Fisheries.)

† The peculiarity of a "balance reef" is this, that when the mainsail is "balance-reefed," the foot-stops are cast off and the foot of the sail raised from the boom, being attached to the boom only at the clew and tack, and by a reef-strap passing through the reef-crinkle. In other respects it is like a three-reefed mainsail.

in the corners of these, so that water can run from one to the other or out upon the deck. These gurry-pens are fastened to the deck by lashings, the surface of the deck forming the bottom.

The gurry-pen forward of the house is usually the largest. Another is placed between the main and fore hatches, while in the larger vessels a third is generally fastened forward of the break of the quarter and between that and the main hatch. Planks placed on their edges run between the gurry-pens, dividing that portion of the deck into little pens for the reception of fish.

Bait-boards are arranged on the side of the house as in the halibut schooner, also upon the ends of the gurry-pens.

The George's-men carry no dories upon the deck, but a single dory hoisted to the davits at the stern. Formerly they carried square-sterned yawl-boats, but this custom is no longer in vogue, though occasionally boats of this class are taken. The reefing-plank is arranged as on the halibut schooner.

These vessels also carry a peculiar arrangement upon their vessels by which they are distinguishable from other vessels. These are the fishing-rails, consisting of joists, 3 by 4, nailed upon the rail of the vessel, and extending from the fore rigging to the quarter-rail and from the after side of the main rigging to the davit on each side. Holes are bored at intervals of about 4 feet in the fishing-rails, and in these are set hard-wood pins three-quarters of an inch to an inch in diameter and 5 or 6 inches high, called "sogers," and used by the fishermen to prevent their lines from slipping on the rail when the tide is running strong.

The arrangement in the hold is as follows: The quantity of ballast carried is usually large, about 20 or 30 tons of stone or iron* for a vessel of 60 tons in burden. This ballast is planked over as on the halibut schooner. The forward part of the hold is occupied, as usual, by the store-room, and separated by a bulkhead from the ice-house. The ice-house is smaller than in the halibut schooners, generally consisting of two pens on each side and a double compartment in the "slaughter-house," which is in the middle, and arranged to carry 12 to 15 tons of ice, though vessels ordinarily carry only from 7 to 10 tons in the summer season and in winter not more than 3 or 4 tons. The ice-house is accessible from the main hatch. The after hold, which is reached through the after hatch, contains the salt-pen—a bin placed against the cabin bulkhead and extending from side to side the whole width of the vessel. This bin occupies about 4 or 5 feet of the length of the vessel and reaches nearly up to the deck. It is divided into two parts by longitudinal partitions in the middle, and is sometimes still further subdivided. Doors from the after hold upon either side of the center partition are closed by planks, which slide in grooves, and are removed as the supply of salt diminishes. The salt-bin will hold from 300 to 400 bushels of salt. The remainder of the after hold is left free for the packing of fish, which are also stowed in the compartments of the ice-house. The after hold is first partially filled, then fish are salted away in the ice-house to keep the vessel in trim, and as a last resort, if the catch is a large one, the salt-pen is also filled with salted fish.

5. APPARATUS AND METHODS OF FISHING.

FISHING GEAR.—The George's fishermen always fish with hand-lines from the vessel's deck, one line to each man. Consequently no boats are carried, except the dory at the stern, and no trawls are used.

The George's hand-line, with its appliances of sinkers and hooks, is peculiar to this fishery. It may be described as follows: The line is 900 feet in length, composed of six 25-fathom lines,

*But comparatively little iron is used, the ballast generally being cobble-stones and shingle.

which are spliced together. The lines are of steam-tarred cotton, and weigh 18 pounds to the dozen.*

The line is coiled in a tub, which is a flour-barrel sawed off an inch or two above the lower quarter hoops, having holes in the bottom to let the water out. It is called a line-tub. The end of the line is fastened through two of these holes to prevent its escape. The line-tub is about half filled by the line when it is coiled.

The hooks are fastened to the line by means of a peculiar contrivance, which, together with the lead, is called the "George's gear." This consists of (*a*) the "tail," which is an iron or brass rod 12 or 15 inches long or more, three-eighths to half an inch in diameter, with an eye in one end, to which the hauling-line is attached by a common hitch. Around the other end of the "tail" is cast (*b*) the "lead," a long conical plummet of lead weighing 8 pounds, about 2 inches in diameter at the bottom end, and about 8 inches in height, its apex embracing the lower end of the tail, the shank of which projects above it 8 or 10 inches. From the front lower end of the lead, which is obliquely truncated, emerges (*c*) the "horse," which is, in fact, sometimes a continuation of the tail. When of metal, the horse is of the same diameter as the tail and projects from the lead 10 or 12 inches, at an angle of 110 degrees with its axis. The horse is sometimes made of wood or, according to a custom formerly universal, of several pieces of line tightly wound with smaller line. An improved form of George's gear has lately been devised by L. D. Lothrop, of Gloucester, which is very popular among the fishermen. It is in the main precisely like the one here described, except that it is more neatly made and the lead has a rounded base and an attachment of brass on its lower end to prevent it from being bruised by the bottom. In the end of the horse just mentioned is an eye, to which is usually attached (*d*) a swivel of brass; to the swivel is fastened either (*e*) the "sling-ding gear" or (*f*) the "spreader gear." The sling-ding (*e*) consists of a galvanized-iron rod about three-eighths of an inch in diameter and from 15 to 20 inches in length, with an eye at each end. The "sling-ding gear," when properly rigged, is provided with a piece of line, generally the same size as the fishing-line, and about twice the length of the sling-ding, the two ends of which are fastened to the eyes in the end of the sling-ding, and the bight is made fast to the swivel in the horse. The sling-ding gear is then an almost equilateral triangle, two sides of which are composed of the line and the base of the sling-ding, the object of which is to separate the snoods and prevent them from fouling. The ends of this line, which forms the two sides of the triangle, are provided with eye-splices or attached to swivels into which the snoods are bent. The spreader gear (*f*), the office of which is the same as the sling-ding gear, consists of a flexible rod of metal, bow-shaped, and about 15 or 18 inches long, the center of which is fastened to the swivel in the end of the horse, the ends being provided, like those of the sling-ding gear, with eyes for the reception of the snoods. Until within the past 10 or 15 years these spreaders were often made of two to four parts of cod-line tightly wound around with stout salmon twine. The snoods (*g*), of which there are two, are pieces of line smaller than the hauling-line,† one of them about 9 feet, the other about 10 feet long. These are bent in the eyes of the sling-ding gear, and at the lower end are spliced into swivels (*h*), which may be called "snood swivels." These are patented, and are made by L. D. Lothrop, of Gloucester. These swivels are so contrived, by means of a slot with a large opening at one end, that the gangings of the hooks may be slipped into them and held in place by means of a simple knot at the end. The gangings (*h*) are usually made of hemp line, though sometimes of cotton line, varying in size from that of the snood to that of the hauling-line. They are about a foot in length, and at one end have a simple wall-knot, by which they are held in the snood swivel; at the other

* A dozen of these lines fastened together and sold in a bunch. The weight designates the size.

† A dozen of these snood-lines, each 25 fathoms long, will weigh from 10 to 14 pounds.

end the hook is made fast, or ganged, in a very peculiar manner, which cannot well be described except in technical phrase.* The hooks (*i*) are No. 10 center-draft hooks.

The object of the snood swivels, in which the gangings are so easily adjustable, is to save time in removing the fish and in baiting the hooks. When a line with one or more fish has been brought on deck the gangings are slipped from their swivels and are replaced by a pair of new gangings with fresh-baited hooks. While the lead is going to the bottom the hooks are taken from the fish, and are rebaited and ready for use the next time.

Each vessel usually carries a considerable amount of spare gear, and especially a large supply of gangings.

BAIT.—The bait used by the George's fishermen is, in winter time, frozen herring, and in spring, summer, and autumn, fresh herring, mackerel, alewives, and menhaden. In former days these fishermen were accustomed to catch their bait upon the Banks by setting gill-nets from the stern as the vessel rode at anchor, or from the side when the vessel was lying to or drifting.† At present this custom is abandoned, and supplies of bait are taken from Gloucester when frozen herring can be obtained, and at other times it is sought here and there along the coast wherever there are weir or net fishermen, from Greenport, L. I., to Eastport, Me., and even, in exceptional instances, as far east as Western Nova Scotia.‡ When frozen herring were first brought from Newfoundland, in 1854, 500 to 1,000 of these fish were considered an ample supply of bait for a trip to George's, but the custom of carrying a far more liberal supply is now in vogue. Longer trips are also made, and the amount carried has increased, until now many of the vessels take on board 18,000 or 20,000 for a trip of two or three weeks. A somewhat smaller number of menhaden or fresh herring is carried in summer, it being impossible to keep fresh so large a quantity as that until it is used. From 15 to 25 barrels of fresh bait are usually iced in summer; these are placed in the ice-houses. The price of herring varies from 75 cents to $1.25 per barrel. Twenty-one days is considered the outside limit for which iced bait is available, though the vessels of the New York fleet, by a more careful system of cleaning and packing the fish, are able to keep a supply for thirty days or more. There was formerly a difference of opinion between the Gloucester and New York fishermen as to the value of the bait preserved by the New York method, the former claiming that it is comparatively worthless. This claim has been practically conceded by the New York fishermen, who have adopted New England methods.

In baiting the hooks the fish are slivered, steaks being cut from each side of the backbone; these are cut into three-cornered or square pieces, eight or ten to a fish, and are strung upon the hooks. Six to eight of these are put upon each hook.

Many halibut are caught by the George's men, and in fishing for these "gurry-bait" is used, this being the flesh of haddock or sometimes codfish. In baiting for halibut a long piece of the side of the haddock is put on the hook, the end of it being usually split into two flaps, which flutter in the current. On the top of these the ordinary bait of herring is placed.

METHOD OF FISHING.—Fishing on George's is carried on principally in the daytime, but on some occasions both night and day. The custom of night fishing has been introduced within the last

* Take one strand of the line and hitch the bight of it round the shank of the hook; then lay the two parts together, taking a wall-knot in the end.

† The vessels that now sail for George's are supplied with nets for the purpose of catching their own bait. (Cape Ann Advertiser, April 1, 1859.)

‡ The scarcity of bait has been a great drawback to the success of the George's fleet, a large part of the fleet having been detained a fortnight at Cape Cod waiting for a supply, thus losing a trip in the best season. The weather has been unfavorable for curing most of the season, and the last few pleasant days have given an impetus to the business, and large quantities have been shipped. The market continues firm at $6 per quintal, with an active market. (Cape Ann Light and Gloucester Telegraph, April 25, 1873.)

ten years. When fish are plenty the hardiest of the crew will fish night and day for three and four days, being ambitious to be "high line," or to catch more than any of their mates; and when fish will bite freely the men on watch at night usually pass their time in fishing. The greater part of the work is, however, done in the day-time. The day's labor begins at daylight and lasts until dark, the fish usually being dressed in the evening. When the tides run too strong for fishing the fish are dressed in the day-time. The monotony of fishing is broken by breakfast at daylight, dinner at 9.30 to 11 a. m., supper at 3 to 4 p. m., and a lunch in the evening.

The strong tides which prevail upon George's Bank and other grounds visited by these vessels have necessitated the adoption of peculiar methods, such as are not practiced in any other fishery. It is only by the use of extremely heavy leads that it is possible to keep the hooks near the bottom. Fishing with these leads and the long lines is extremely laborious. As the vessel rides at anchor the helm is put down and she sheers across the tide, so that the lines stray out from the side at a considerable angle with the rail. The men take their position at the rail all upon the side opposite to that upon which the tide current strikes. When the tide is running dead to leeward, or in the same direction with the wind, it is impossible to sheer the vessel, and then the lines all stray out directly astern. While they are fishing the course of the tide is constantly changing and the vessel is veering in every direction, and it is frequently necessary to change from one side of the vessel to the other in order to keep the lines clear from the side.

The best opportunity for fishing is on the slack tides. While the tides are running at the greatest speed, or at the rate of about two miles or more an hour, the lines with their heavy weights are carried out so that it is impossible to keep the hooks on the bottom. When fishing at slack-water only a small portion of the line is used, while on the strength of the tide it is sometimes necessary to use the whole 900 feet of the line. The fishing is then carried on by "sounding." The line is slacked out as rapidly as possible until the lead touches the bottom; it is then held for a few minutes until the force of the current has raised it, and then it is again slacked out and allowed to touch, and this operation is continued until a bite is felt. This is called "tending the bottom." When the tide is flowing at a moderate rate, and there is no reason to believe that the bait has been lost, the whole length of the line is let out before being pulled in on deck; and when the tide is running moderately sometimes from seven to ten "sounds" are made. When the fish are not biting and the tide is at half slack or running at a comparatively moderate rate, as happens in the low course of tides, fishing in water 30 to 35 fathoms deep, it takes about twenty to thirty minutes to run out the whole line, and fifteen or twenty minutes to haul it in if there is no fish on it. Pulling up a pair of cod at the end of a whole line takes five or ten minutes longer, while to pull up a halibut usually takes much longer still. In fishing with the tide running at a rapid rate, making one or two sounds, the line will run out in ten or fifteen minutes.

When fish are very plenty it is a common occurrence to catch a pair, one on each hook, and the men will catch from one hundred to one hundred and fifty, and sometimes nearly two hundred cod, in a day; at other times a man may fish all day long and only get three or four. When fish are plenty a man may throw out and haul his line over the side seventy-five or one hundred times in the course of the day; when scarce, not nearly so often, perhaps not more than ten or twelve times.

The bite of the fish is quickly detected by the practiced hand of the fishermen, and he, when hauling in, can usually tell whether he has hooked one or a pair. Expert fishermen often know when they begin to haul in that there is only one, and they haul slowly, in order to give another a chance to bite at the free hook. When the heads of the fish appear at the surface, if they are not well hooked or are too large to lift over the rail with the ganging, the gaff is used; when brought on

the deck the gangings are detached, as previously described, and their place is supplied by a new pair, the line being immediately thrown over again. The fish are then unhooked, the hooks rebaited for future use, and the tongues are cut out and thrown into a compartment in the line tub; in this manner the number of fish caught by each man is recorded; the tongues are counted out at night, and the captain notes the record of each man's count on a slate or in a book, as will be explained elsewhere. Each man marks the halibut he catches with some peculiar mark of his own. The proceeds for each man depends upon the number of fish he catches. The George's fisherman, however, rarely speaks of the number of fish he catches, but the number of tongues he has caught. After the fish are unhooked they are thrown into the gurry-pens, where they remain until a strong tide or nightfall gives the men an opportunity to dress them. A skillful crew, when there is good fishing and other favoring circumstances, may catch from 20,000 to 30,000 pounds of round-fish in a day. Seventy-five thousand to ninety thousand pounds of round-fish is considered an excellent fare, while 40,000 to 60,000 pounds of split-fish is also a good fare.

A round-fish is one which has simply been eviscerated, while a split-fish has its head and backbone removed and is salted.

Larger fares of fish have been obtained. In one instance 124,000 pounds of round-fish were brought in by the schooner S. R. *Lane*. In the Fishermen's Memorial and Record Book and on the files of the Cape Ann Advertiser may be found instances of extremely large fares of fish, many of them, too, the result of only a few days' fishing.

6. CARE OF THE FISH.

At the present time the fish are usually brought in from George's split and salted, both in summer and winter. Before 1875 it was generally customary to bring in the fish round in the winter, splitting and salting them on the shore, but this custom has gradually been discontinued, and but few trips of round-fish are now landed. When brought in round the fish are gutted without splitting them, a handful of salt being put inside of each. A few of those last caught are iced.

The process of salting and dressing is precisely the same as that upon the Grand Bank, and is described in the chapter referring to that fishery. The George's-men use less salt in curing than the Grand Bankers, since it is necessary to keep the fish for a much less time on the vessel. The gurry is kept in the middle compartment of the gurry-kid. It is thrown overboard as soon as the vessel gets under way to shift her position or to leave the Bank.

The total amount of ice carried by fifty-eight schooners exclusively employed in the George's fishery in 1870 was 3,478 tons. This gives an average of about 60 tons for each vessel, and, assuming that the average number of trips would be ten, it would therefore appear that 6 tons of ice is carried to a trip. The amount varies greatly with the season; a vessel that would carry 3 or 4 tons in winter would require 10 or 12 tons, possibly more, in summer, since in the latter season the ice not only melts more rapidly, but is used for preserving bait as well as fish. As the total number of vessels engaged in the George's fishery was upwards of one hundred, it will be seen that 6,000 tons or more of ice were consumed in this fishery for the year named above.

The return to port and the disposition of the cargo is in every respect similar to that of the Grand Bankers. The vessels are in no special haste to gain the market, and consequently are not obliged to take such risks as the halibut schooners and haddock catchers. The peculiar dangers of this fishery have been described in the chapter on disasters. The lay in use in the George's fishery and the manner of fitting out the vessels will be described elsewhere. From nine to thirteen trips are usually made in the course of a year. The average number is perhaps eleven.

7. FINANCIAL PROFITS.

The George's cod fishery generally yields good returns to the fishermen and vessel owners, though terrible disasters sometimes result from the winter storms and eat up most of the profits. The most notable George's fare was 123,115 pounds round cod and 862 pounds halibut, by schooner S. R. Lane, Capt. Solomon Jacobs, in 1875. The vessel stocked on this trip $2,554, and the crew shared $90.81. Another large fare was brought home by the schooner Triton, aggregating 54,000 pounds split and 30,000 pounds round cod. On five George's trips in a recent year the crew of the schooner Procter Brothers took 21,544 codfish in number. Of her crew of eleven men Mr. George Williamson was "high line," taking 2,417 fish, while the "low line" caught 1,431. The schooner Montana a number of years ago landed 100,162 pounds cod from a fourteen days' *trip, and in two trips secured 183,362 pounds, making a gross stock of $3,417.32. One of the most* valuable single fares was by the schooner Madame Roland, in 1865, when $2,833.29 was stocked. Eight vessels owned by Mr. George Steele, between January 12 and March 24, 1863, stocked $17,237.17.

8. THE FITTING OUT OF THE GEORGE'S FLEET AT THE CLOSE OF THE WINTER.

The Cape Ann Weekly Advertiser, of January 29, 1875, gives this graphic sketch of the peculiar characteristics of the George's fishery on the occasion of the fitting out of the fleet at the beginning of the year:

"The season is again at hand when the fish are about schooling on George's Banks, and the fishermen are anxious to drop them a line and thereby obtain some returns which will relieve the pressing necessities of themselves and families.

"To this end some fifty sail are now fitting away, and in another fortnight another fifty, and perhaps more will follow. The crafts are being put in the best possible condition to stand the rough weather which is almost certain to be met with at this season on these perilous fishing grounds. Down on the wharves you will witness busy scenes. On board the stanch crafts the carpenters have put in the ice-houses and arranged the pens for the fish. The best suit of sails *have been bent; the rigging, cables, and anchors thoroughly overhauled and made as strong* as wood, iron, and rope can make them. The topmasts have been sent down, the vessels put in thorough order below and aloft for the important part they are to take in the work of prosecuting mid-winter fishing.

"The steward, who occupies a most responsible position, is getting his stores on board, not forgetting a goodly quantity of fuel, and he will see to it that the fishermen, after their daily toil in pulling cod and halibut from so many fathoms down, have plenty of well-cooked victuals to eat and a cup of hot coffee whenever they want it. They carry excellent provisions and live well on board the George's-men, and a first-class steward prides himself on having a good quantity of *'grub' on hand.*

"Now, all is ready. The good-byes have been said at home, the wife and little ones kissed, the 'God bless and return you safe,' whispered into ears which will remember it through the howling gale when danger is nigh, and the trim schooners, strong and saucy-looking, feel the northwest wind on their sails, and dashing boldly out by Eastern Point, the skippers shape their course ESE., and with a whole sail breeze they arrive on the Banks after a run of some twenty hours. Then they take their bearings, and choose what they think will be a good berth; down goes the anchor, everything is made snug, and as soon as possible they give the fish a try. The piercing cold and flying spray does not deter the fishermen; it is a matter of business with them.

They are used to exposure, and are warmly clad and well protected with their oil-clothes. A landsman would not like the position, with the vessel pitching up and down, and it would be difficult for him to keep on his legs; but the fishermen seem to take to it naturally. There they stand at the rail, hour after hour, pulling in the fish—halibut and cod—each anxious to do his best and to be the 'high-line' man.

"So long as the weather is pleasant they pursue the even tenor of their way, each day adding to the catch, and at night they are rocked to sleep in the cradle of the mighty deep. A feeling of uneasiness pervades their hearts if the fleet draws near; in the excitement of getting a trip they are apt to anchor near each other. There is danger in this, as the sad record of the past bears mournful evidence; or in case of a sudden storm, and the breaking adrift of one or more of the vessels, which may always be expected, these drifting vessels become terrible messengers of danger, coming in contact with others of the fleet, and they go crashing on their work of destruction in the darkness and the storm. This it is which has made the George's business so very disastrous, and now there has been awakened in the minds of the skippers a sense of the fearful risks they run by so many anchoring together, and they are more cautious concerning it. If they will remember this and continue to exercise prudence in this respect, the losses will be few in comparison with those of the years gone by. Last year not a vessel was lost in the George's fishery, and we hope that 1875 will result as fortunately.

"A week or ten days' fishing in the best of the season, when the fish bite sharp, will give them a trip, and then homeward they come, and the fruits of the fishermen's daring gives an impetus to business which is felt throughout the city. Coming as it does at a dull time, it is particularly welcome, and all with one accord unite in giving their best wishes to the George's fishermen for short trips and lucky ones."

9. HISTORY OF THE GEORGE'S FISHERY FROM GLOUCESTER.

Capt. Epes W. Merchant tells us that the first vessels went to George's after codfish in 1821; these were three pinkies, commanded by Elisha Oakes, Robert Marston, and Samuel Wonson. "Fish were very scarce that year. Several of the vessels went to the bay cod fishing. Some of the others left off entirely. These three pinkies ran off to George's in June. The fishermen were very timid about the trip, for they had an idea that there were very strong currents on the Bank, and that they would risk drawing their vessels under if they were to anchor. One very fine day the three vessels were alongside, and one of the skippers proposed: 'Let's anchor and try it.' They made up their minds to double the crew on one of the vessels, taking two or three men out of each of the others, and anchor. Well, after they had anchored and bit up, the tide commenced running and she began to go through the water. They didn't know how fast the current would go, got frightened, hove up, and came home without a fish. Nobody then went there after codfish until after the *halibut fishing* was tried. The halibut vessels were the first to anchor. Mackerel vessels began to go to George's in 1825 and have continued to cruise there ever since."

Capt. Chester Marr, one of the oldest skippers of Gloucester, claims to have been one of the first to make a trip to George's Bank after cod in the month of February; this was about 1835. Describing the abundance of cod, he remarks in his quaint way that they were "solid from top to *bottom*." In one night he caught 75 tubs of codfish and 15,000 pounds of halibut. This was on the south side of the Bank, south and east of the North Shoal, in 33 fathoms of water. It was a bright moonlight night, and the fish could be seen swimming along the side of the vessel "as thick as mackerel." Before that time the vessels had never succeeded in getting fares of cod, because the halibut were so thick. Some vessels had gone for halibut, but none for cod.

Capt. W. H. Oakes, of Gloucester, tells us that he made a trip to George's Bank for cod in 1835, in the schooner Accumulator. "This was one of the earliest trips for cod to those fishing grounds. If there was a previous trip it must have been made by Capt. George Watson, who entered the George's cod fishery at about the same time."

When Captain Oakes first went to George's Bank, in 1835, it was considered dangerous for vessels to lie at anchor. They were accustomed to heave up anchor with every fresh breeze.

As early as 1840, vessels went to George's for cod in January and February. They were laid up only between November and January.

As early as 1845 Captain Marr remembers to have seen one hundred and forty sail of vessels on George's at one time.

In good weather the vessels made a very quick trip. In or about the year 1860 the schooner Bounding Billow went and returned within four and one-half days, bringing 65,000 pounds of codfish and 5,000 pounds of halibut. In 1856 the George's fishery was very successful.

In 1861, states the Cape Ann Weekly Advertiser, from fifty to seventy-five vessels sailed for George's about the 20th of January.

In 1863, in February, according to the Gloucester Telegraph, about forty vessels were fitting for the George's fishery.

In 1873 a writer in the Fisherman's Memorial and Record Book wrote: "There are now two hundred and fifty sail engaged in the business, whose average valuation is $6,000. The trips brought in during the best part of the season will average $700, and stocks of from $1,500 to $2,000 are not infrequent; while the Grand Bank fishery, comparatively a new branch of the business, often discounts from $3,000 to $4,000 on a single trip; the result of the energy and pluck of our fishermen."

5.—THE COD FISHERY OF ALASKA.

By TARLETON H. BEAN.

1. NATURAL HISTORY OF THE PACIFIC COD.

THE SPECIES DISCUSSED.—The cod fishery of Alaska has nearly ended its second decade,* yet it was not until the summer of 1880 that we knew positively what species of *Gadus* is the object of the fishery. Most writers have referred to it under the name of *Gadus macrocephalus*, which was bestowed by Tilesius upon the Kamtchatkan cod, the figure of which suggests that it was based upon a deformed individual. Cope, in 1873, described the young of the common Alaska cod as a new species, *Gadus auratus*, from specimens collected by Prof. George Davidson, of the U. S. Coast Survey, at Unalashka. Steindachner, in the Proceedings (*Sitzungsberichte*) of the Vienna Academy, LXI, 1, 1870, adopts the name *G. macrocephalus* for a large cod taken in De Castries Bay (mouth of Amur River), Siberia. In this example the length of the head is contained exactly three times in the total length to the extreme end of the pointed caudal peduncle. The same proportion may, however, be found in any place where large numbers of *Gadus morrhua* are taken, and it can readily

*This was written in 1880.

be proven to be only a matter of individual variation. The U. S. Commissioner of Fish and Fisheries, Prof. Spencer F. Baird, with a view to investigating the fisheries and fish of Alaska, sent the writer to that Territory to collect specimens and statistics during the summer of 1880. In this way an opportunity was gained for comparing the Alaskan cod directly with that of New England and of Europe, and for determining beyond a doubt that the commercial cod of both oceans is the *Gadus morrhua* of Linnæus. I have not seen fresh specimens from the Okhotsk, but there is no probability that it is different from the Alaskan. It is a matter of daily experience to find long-headed and short-headed cod in the same school off the New England coast or wherever the species occurs, as the length of the head is one of the most variable characters. I have just read in the Zoological Record for 1879 (Vol. XVI, published in 1881) the following sentence: "Day records and notices a fish captured at the mouth of the Thames, and referred to *Gadus macrocephalus* Tilesius, probably Yarrell's 'Lord Fish,' and considered to be distinct from *G. vulgaris*." This agrees with my own idea of the *macrocephalus* form of cod. You can find it in almost any large school of the common species. A series of cod illustrating the great amount of variation in this respect has lately been received from Alaska by the U. S. National Museum.

Golden cod, red cod, and other algæ forms are as well known at Kodiak and the Shumagins as they are around Cape Cod and Cape Ann. Even the beautiful lemon-yellow fish, which occasionally are found in the Ipswich Bay schools, are duplicated in Alaskan waters. Nor does the similarity between the commercial cod of the two oceans end with external characters which are taken into account in determining specific relationship, for we find a wonderful resemblance in their habits and food. Thus, the shore fish about the islands make their appearance in schools similar to ours and similarly named: First, the "herring school;" next, the "lant school;" then the "capelin school," followed by the "squid school" and the "winter school." Besides these there is an abundance of Bank fish, which are larger than any of the schools here named. All of the food-fish of the cod here indicated are exceedingly abundant. The herring is not identical with the common sea herring of the Atlantic (*Clupea harengus*), but it is very closely related to it, and the differences which separate the two species are very slight. The commonest lant is the same as the most abundant one of our New England species, and the capelin is identical with our Eastern one. The squid or cuttle-fish is *Octopus punctatus* of Gabb—a species which reaches a large size and forms one of the preferred baits for cod.

The cod come on the rocks in 25 to 30 fathoms about Kodiak, to spawn, in November and December, just as they do in the Atlantic, and these spawning fish, like their Eastern relatives, will sometimes lie perfectly still on the bottom and refuse to take the hook though it hangs temptingly in front of their noses. Young cod swarm near the shores, precisely as they were observed to do in Gloucester Harbor after the experiments of the U. S. Fish Commission with artificial propagation. On the 13th of July, 1880, our seine took young cod at Saint Paul, Kodiak Island. We dredged numbers of them near our anchorage at Belkoffsky, on the peninsula of Aliaska, July 23, 1880, averaging 1½ inches in length. On the following day young cod of the same size were found in the stomach of a large one of the same species caught near Oleny Island in 7 fathoms of water. On the 1st of October, in the harbor of Chernoffsky, Unalashka Island, the cod fry were very abundant, and some of them had reached a length of 3 inches or more. At Iliuliuk, on the north end of the same island, young cod of the same length were seined at various times from October 6 to 18. They fairly swarmed around the wharves, eagerly biting at anything in the form of bait and readily fastening themselves on hooks intended for much larger fish.

The resemblance between the Atlantic and Pacific cod-fishing grounds is strengthened by the presence in Pacific waters of a genuine pollock—not the fierce, cod-devouring tyrant of the

Atlantic, but a prettier, weaker relative, greatly loved and grievously persecuted by the cod. No one has yet recorded the existence of a haddock (*Melanogrammus*), hake (*Phycis*), or of a cusk (*Brosmius*), in Alaskan waters. The only members of the cod family definitely known are the true cod (*Gadus morrhua*), the tom-cod (*Microgadus proximus*), the polar cod (*Boreogadus saida*), the "wachna" (*Tilesia gracilis*), and the pollock (*Pollachius chalcogrammus*). Wherever the true cod is found occurs also the halibut (*Hippoglossus vulgaris*), the same species as that of the Atlantic. These two prime fish are associated; they come almost to the doors of the fishermen, and are present now around the shores of Alaska in the profusion which attended the infancy of the Cape Cod fishery.

DISTRIBUTION.—The cod seems to be entirely unknown as far south as San Diego, Cal. A circular sent by the chief of the Bureau of Statistics to Mr. W. W. Bowers, collector of customs at San Diego, elicited the following response: "I referred the circular to Dr. G. W. Barnes, the president of a society of natural history, and to various fishermen, but cannot ascertain that the codfish is known to exist in any of the waters adjacent to this port."

J. L. McDonald, in a book entitled "Hidden Treasures, or Fisheries around the Northwest Coast," states that "cod are taken in very limited numbers off the Farallones; they are lean and very poor and resemble the jaundiced cod on the Grand Bank."

The same author writes: "On the Heceta bank, NNW. from Cape Orford, Oregon, cod are found. The Indians residing on that coast report this fish as quite abundant in the summer months, and (they) are said to be large, solid, and delicious."

James G. Swan, in a report on the food-fishes of Cape Flattery, Washington Territory, informs us that "the cod of the North Pacific is not found in abundance at Cape Flattery; occasionally it is brought in, but it is by no means common. It seems to inhabit the deep water of Fuca Strait, and for that reason is seldom fished for, except occasionally some of the older fishermen will try during very fine weather to take fish in 80 fathoms. Further up the sound and in Hood's Canal and a few other localities the *Gadus* is taken, but it is small, evidently a young fish. Although its existence is well known to residents on Puget Sound, it is not taken in sufficient quantities to be relied on as a food-fish." Professors Jordan and Gilbert brought from Puget Sound specimens of the species, some of which have recently been distributed by the U. S. National Museum.

Mr. H. A. Webster, collector of customs at Port Townsend, Washington Territory, communicates the following information: "The cod, I believe, is always present in the waters of Fuca Strait and Puget Sound, but in such limited quantities that catching has not been pursued as a business, and the knowledge of [its] habits is very limited. Young cod, about the size of shad, have been somewhat abundant in Puget Sound during the winter months; cod weighing from four to six pounds have been taken during the summer months by Indians at Nee-ah-Bay. * * * The presence of small cod in the winter months in Puget Sound and at the mouth of the Strait of Fuca is an indication that large quantities may be found in the neighborhood of Cape Flattery—say west of Tahosh light and south from Vancouver Island. * * * No efficient search has been made off the coast of Washington Territory for this valuable fish."

To the cod fleet of 1866 British Columbia added two or three small schooners which were fitted out at Victoria. These vessels fished on grounds immediately north of Naas River, where they reported numerous banks as well as farther to the northward. At the same time cod were caught in Barclay Sound and brought to the Victoria market.

At Sitka, Indians brought a few cod to our vessel in June, 1880. The cod were reported abundant and readily caught, but the halibut, the many fine "bass" (several species of *Sebastichthys*), and the "rockfish" (various species of *Hexagrammus*) seemed to have greater popularity. Mr. A.

T. Whitford told me that the cod spawn in the vicinity of Sitka in spring, and that they have a remarkable number of eggs.

At Port Mulgrave, Yakutat Bay, we took but one cod in the harbor during the day spent there, and this one was large but sick. Good fish are plentiful in the deeper water outside. Nothing but hand-lines were used from the vessel.

Capt. J. Haley reports cod very abundant on the Hoochenoo bank in Chatham Strait. The bank extends from Hoochenoo Point to Point Samuel. He also states that there is a bank off Point Gardiner, and that there are banks on the east shore of Baranoff Island near Poghibshi Strait. According to Captain Haley small cod are abundant in Prince Frederick Sound.

While on a visit to the Aleut village near Graham Harbor, Cook's Inlet, we were told by Mr. Cohen that cod are present in the inlet throughout the year. On the 6th of July in Refuge Cove, Port Chatham, Cook's Inlet, a great many fine young cod were seined. It was in Port Chatham that we first saw capelin schooling. Plenty of excellent cod were caught here with hand-lines from the vessel.

Around the island of Kodiak cod are very numerous. On the 9th of July, while the Yukon was lying at anchor in the harbor of Saint Paul, schools of these fish were seen swimming about her. These were fine, lively fish, evidently the first of the summer run, which Mr. B. G. McIntyre informed me had not yet fairly begun. Young cod were seined on Wooded Island July 13. Between Kodiak and Unalashka are the extensive and well-known banks, Portlock, Seminofisky, and the Shumagins, which have furnished the great bulk of the cod so far taken in Alaska.

There are cod banks in the vicinity of Unalashka. We had no difficulty in catching all we wanted with a small trawl-line or with hand-lines late in July and early in October. In July native fishermen at Iliuliuk were bringing in bidarka loads of beautiful fish, most of which were very large, to dry them for use in winter. The wonderful abundance of young cod 3 to 4 inches long was a feature here in October.

The species has been seen as far west as the island of Atka, of the Aleutian chain.

Cod have been reported abundant in Bristol Bay. They appear to be uncommon in Norton Sound, though occurring again more abundantly further north, as far as the ice-line. The eastern portion of Bering Sea may yet furnish important supplies of cod in suitable depths, since there is an abundance of its favorite food, notably sand-launce, capelin, smelt, herring, and pollock, which last is probably the "whiting" spoken of by Seemann as occurring abundantly in Hotham Inlet, Kotzebue Sound.

At the island of Saint Paul cod are taken rarely, the fur-seal having a monopoly of the catch.

At Saint Lawrence Island Messrs. Maynard and Elliott caught cod on the 22d of August, 1874.

The great fishing grounds of Kamtchatka are in the Okhotsk Sea and the sea of Kamtchatka.

We were informed by one of the whaling captains in Plover Bay, last September, that he has caught cod off the heads of Marcus Bay, East Siberia, in about latitude 64° north and about longitude 172° 40′ west. Off Indian Point (Cape Tchaplin), East Siberia, a little farther north than Marcus Bay, we were told by Eskimo who came aboard the vessel that they sometimes take cod at that point.

In the Arctic Ocean we saw no traces of the *Gadus morrhua*, its place being supplied to some extent by myriads of small polar cod (*Boreogadus saida*), which, like the pollock, has the lower jaw longer than the upper. On the 19th of August, 1880, in latitude 66° 45′ north, longitude 166° 35′ west, we saw great numbers of young *Boreogadus*, from an inch to an inch and a half long, swimming under the tentacles of a *Cyanea*-like jelly-fish.

In general terms we may say that cod are found around the whole southern shore of Alaska,

and as far south as Puget Sound, extending westward along the Aleutian chain as far as Atka, and not common on the western shore of the Territory much above Bristol Bay, though they have been observed as far north as Saint Lawrence Island. They are said to penetrate only a short distance into Cook's Inlet. We caught several large ones as far up the inlet as Chugachik Bay, but they were not healthy fish. In Port Chatham, which is near the entrance to the inlet, we found them common and good. Mr. Cohen told me that cod are present all the year near Fort Alexander.

In Refuge Cove, a small arm of Port Chatham, we took many young cod in brackish water. At Chernoffsky, also, on the island of Unalashka, we again found them abundant in brackish water, associated with young *Oncorhynchus*, *Salvelinus malma*, *Ammodytes personatus*, *Lumpenus anguillaris*, and a species of *Cottus*. Several small streams flow into Chernoffsky Bay at this point.

The young cod were taken in water varying from 3 feet to 1 fathom in depth, close to the shore. Fish of considerable size, weighing several pounds, were taken from the wharves at Iliuliuk during our stay. Cod are quite abundant close to the shores of the Kodiak group of islands, the Shumagins, and Unalashka Island. I have seen them taken in about 9 feet of water at Iliuliuk, and at a depth of at least 50 fathoms off Cape Cheerful. Mr. Devine, of Pirate Cove, says they are caught as far as 30 miles off Seminoffsky Island, at a maximum depth of 45 fathoms, and that on the middle ridge, in 60 to 70 fathoms, the best fish are taken with hand-lines.

Capt. H. R. Bowen states that cod are sometimes caught in 3 feet of water at the village of Saint Paul; but these are always sick fish. Wherever there are soundings, good fish may be caught. The cod of the Shumagins are generally taken at such short distances from the shores as may be readily reached with dories. The fishermen go out in dories from their vessels, or from the fishing station, in the morning, and return in time to dress the fish aboard or on shore in the evening.

COMMON NAMES.—J. G. Swan writes that the cod is called "kadatl" by the Makah Indians. The Sitkas call it "sacht." A Kodiak Eskimo, to whom I showed one of the fresh fish, told me that they knew it as "ah-mo-doc." The Russian name for the species is "treska," a name pretty widely known in the Territory. It is worthy of remark here that natives generally distinguish closely the "wachna" from the "treska." To the fishermen generally the fish is known as the cod. Men who have come to the Alaskan grounds from New England have brought with them the terms "rock-cod" and "kelp-bangers" for certain individual varieties. "Rock-cod" are the variously colored algæ fish, exactly similar to those known by the same name at Gloucester. "Kelp-bangers" are shore fish that frequent the kelp, as their name suggests. "Wachna" is a term applied to a species resembling the tom-cod, but very different structurally from this.

SIZE.—From all reports, none but small cod occur in Puget Sound and Hood's Canal. I measured several fresh ones at Sitka which were bought from Indians. One taken May 30 was 662 millimeters long; two others, secured June 12, were 435 and 542 millimeters, respectively. Capt. J. Haley informed me that the average weight, when dried, of 10,000 cod purchased by him on the Hoochenoo Bank was 3 pounds, which is quite as much as the average weight of the Shumagin fish. The largest one he saw weighed 30 pounds. He saw a few young fish.

A cod caught by us in the harbor of Port Mulgrave, Yakutat Bay, June 24, measured 870 millimeters. It was stout and heavy, but sick. In Port Chatham, Cook's Inlet, two healthy fish, among a lot taken July 5, measured 772 millimeters and 750 millimeters. One of these was a spent female. Off Marmot Island (Portlock Bank) on the 8th of July we caught with hand-lines, in a

very short time preceding dark, twenty-six cod, fine, plump, and healthy, averaging not less than 12 pounds.

Capt. D. C. Bowen gave me the following information about the shore fish around Kodiak: First comes the "herring school," consisting of medium-sized fish, continuing from May 1 to June or July; then the "lant school," short, thick, well-meated, but not so large as the herring school, occurring June to July. After this comes the "capelin school," of good-sized fish, about equal to Newfoundland cod, July to September. Last comes the "squid school," averaging 12 pounds each. All of these are shore fish. The bank fish are always larger.

Capt. J. C. Caton, who is well acquainted with the Shumagin fishery, says that in 1867 the Sanborn took 60,000 fish, averaging 2¼ pounds when cured and ready for the market. Now vessels will average 80 tons (60,000 fish) of 2½ pounds each. (The market returns show the average to be a little more than 3 pounds to the fish at present.) Captain Caton remarked that none of the fish are so large as the George's cod. Capt. Andrew Anderson informed me that when he was mate of the Wild Gazelle, in 1873, she took, on Seminoffsky Bank, 93,000 fish, averaging 2½ pounds each when dressed. In 1874 she caught 97,000 cod, averaging 3 pounds each. Capt. H. R. Bowen, of Saint Paul, Kodiak, gives the average of the shore fish there as 6 pounds round, and says that the largest weigh 14 pounds. Mr. Thomas Devine, in charge of McCollam & Co.'s fishing-station at Pirate Cove, Shumagins, gives me as an average of the fish taken there something between 8 and 12 pounds round, the largest weighing 50 pounds.

On the 19th of July I saw many fish brought into this station by dorymen. One of the men had 157 for his day's catch, none of them being less than 26 inches in length, and many of them weighing not less than 30 pounds. The smallest weighed about 8, according to my estimate. Prof. George Davidson, assistant to the U. S. Coast Survey, in his report on Alaska, states that in north latitude 53° 39′, west longitude 164° 10′, in 50 to 60 fathoms of water, many cod were caught from his vessel, the largest being 37 inches long; several reached 36 inches. The finest was 36 inches long, 23 inches girth, and weighed 27 pounds, was very fat, &c. In the New York Times of July 15, 1879, is found the following extract from the report of Captain White, of the United States Revenue Marine Service, who was on duty in the Alaska waters in 1878: "One day, when sounding south of Kodiak, wishing to lay in a stock of codfish, I ordered the sails set back, and prepared twenty lines, with four or five hooks to each line. Puget Sound clams were used as bait, and in two hours we caught 250 fish, weighing 30 to 40 pounds each."

From Dr. A. Kellogg, of San Francisco, surgeon and botanist of one of the Coast Survey expeditions, I have the following memorandum: "I copy from my diary verbatim the very brief note made on the spot relative to the cod caught on board the Lincoln, latitude 53° 30′ N., longitude 164° 30′ W.—cod 18 inches girth, 30½ inches length, 14½ pounds; 20¼ girth and 34 inches long, weight 20 to 22 pounds; 3 feet long and 23 inches girth, 27 pounds."

We were in the harbor of Iliuliuk, Unalashka, from the 27th of July to August 3, and from October 6 to 18, 1880. Between the first two dates we saw native fishermen daily bringing in cod for winter use. The fish were caught near the village, and were uniformly good-sized, many of them of 15 to 20 pounds in weight at least. Men were sent out from the vessel also to supply us with fresh fish. They generally fished on the ridge at the entrance to Port Levasheff, and never failed to secure a good supply of cod, averaging fully 12 pounds. In October there was no falling off in the supply, and the size was about the same. In deeper water, farther from the village, we took larger cod.

I find in the notes of Prof. D. S. Jordan the following comparison between the Okhotsk cod and that of the Shumagin Islands: "Okhotsk cod are larger and more numerous than Shumagin cod,

but they are thinner, less fat, and more pot-bellied, and weigh rather less when dressed—80,000 Shumagin fish, dressed, weigh 260,000 pounds; 80,000 Okhotsk fish, dressed, weigh 220,000 pounds. The latter are poorer, perhaps, because they are caught so early in the spring. They are fatter in July. Fishing, however, begins in June." For the dressed Shumagin fish this gives an average of 3¼ pounds each, and for the Okhotsk 2¾ pounds. The average for the Shumagin fish agrees substantially with that given by most persons who have furnished information about the Alaska cod. Professor Jordan's information was obtained from the foremost fish merchants in San Francisco, and mine from captains of fishing-vessels. The average size of the Shumagin fish is higher for 1880. There are many large fish averaging 6 to 8 pounds, or even more, when prepared for the *market.*

SHAPE AND COLOR.—With reference to the Shumagin cod, Capt. J. C. Caton informed me that most of them have black napes, but in some the nape (peritoneum) is white. Some of the fish which we caught on Portlock Bank July 8, 1880, had the nape black, and in others it was white. Mr. Devine, of Pirate Cove, Shumagin Islands, reports there black napes generally, with white or gray occasionally. Capt. H. R. Bowen, of Kodiak, says "they very seldom find cod with white napes—they are generally black." Capt. D. C. Bowen, of the same island, told me that white-nape and black-nape fish both are caught, black-napes being most plentiful. He says that young cod generally have white napes, and the big ones are almost always black-naped. Captain Haley informed me that the Hoochenoo cod have black napes. These statements coincide with my own observations at various points along the coast of Alaska, and it seems to be true that the peritoneum of the Alaskan cod is generally dark. The two large ones already referred to as having been caught in Port Chatham, July 5, 1880, had black napes.

The same variations in the external colors of the fish exist as are observed in the Atlantic. The shore fish are generally darker than the bank fish, and a reddish tinge is very common. Rock-cod are as well known as in the east. Mr. Devine states that very pretty yellow cod are sometimes taken. Capt. H. R. Bowen says that the deep-water fish are generally light in color. Mr. Devine informed me that the winter fish are whiter than those of any other season.

The same gentleman mentions peculiarities of shape among the cod, as, for example, "bull-eyed" fish, or those with very prominent eyes, probably due to their sudden removal from very deep water, and "seal-head" fish, distinguished by a short snout and wide space between the eyes.

The shore fish which were brought to us by Indians from Old Sitka were always dark colored, with long heads and eyes far apart, and with conspicuous blotches, in general appearance often resembling the small cod taken in shallow water off South Greenland—the *ogac* form of the common cod.

There are no differences as far as general appearances go between Alaskan and New England cod. It would be impossible to tell one from the other if they were mixed in a tank without tags or some other means of identification.

MIGRATIONS.—Mr. B. G. McIntyre, Mr. D. C. Bowen, and Capt. H. R. Bowen all agree in stating that cod remain throughout the year around the island of Kodiak. They were scarce last winter on account of the extreme cold, and up to the time of our arrival at Saint Paul (July 9, 1880) the customary summer run had not yet begun. Between that date and July 14, however, we saw schools of them around the vessel where she lay at anchor. According to Mr. Bowen, they made their first appearance at Saint Paul May 7, 1880. Captain Bowen states that they are always found in the same places. Mr. McIntyre informed me that they were so scarce about Saint Paul last winter that the natives could not catch enough of them for their own use—an illustration of the influence of temperature in determining the movement seaward of cod.

According to Capt. J. C. Caton, cod are present around the Shumagin Islands all the time, but at some seasons they are very scarce. The best fishing is in February, commencing about the 10th and lasting to March 10. At this time none of the vessels are engaged in the fishery; only the Pirate Cove Station is prepared to use the opportunity, and I infer, from remarks of the manager, that there is little activity in that quarter. Most of the vessels coming up to the islands get their best fish and best fare in July. Sometimes they do well in May. The fleet come up late in April or early in May and stay until the 10th or 15th of August.

Mr. Devine, who manages the permanent fishing station on Popoff Island (at Pirate Cove), also informed me that cod are to be found all the year round, but that they go off into deep water during cold snaps and toward evening. He stated that the school fish leave in August or September and return in January and February. They seem to move off to the southward and to return from the southward and westward.

With reference to the bank 20 miles east-northeast of Seminoffsky, Capt. Andrew Anderson told me that the fishing is best in August and September. The "yellow-fish" (*Pleurogrammus monopterygius*) school there abundantly about the middle of August, and will follow the bait up to the top of the water. Cod will bite at the yellow-fish in preference to anything else. A change is now being inaugurated in the distribution of the yellow-fish which may affect the movements of cod; the yellow-fish, which was a few years ago unknown or scarcely known about the Island of Unalashka, occurred both at the southern and the northern end, on the west side, during the summer of 1880. At Chernoffsky and Iliuliuk the species was observed in numbers, and if this habit becomes fixed we may expect an increase in the abundance of cod where this choice food may locate.

Mr. Marcus Baker has translated for me a note by Ivan Veniaminoff on the marine fishes of the Unalashka region, in which occurs the following sentence: "Some of these, and especially the cod, in the winter go off shore into deep water, but in summer time they are found along the shores of certain bays and in shoal water."

SCHOOLING.—Mr. D. C. Bowen, of Saint Paul, Kodiak, distinguishes various schools of cod about that island, which vary in size and other particulars and take their names from their favorite food during the time of their stay. He gives them in the following order: First, the "herring school," consisting of fish of medium size, which come about May 1 and stay until June, or even July; next, the "lant school," feeding on sand launce (*Ammodytes personatus*), and made up of short, thick, well-meated fish, not so large as those of the herring school, and appearing in June and July. Then follows the "capelin school," whose food is the *Mallotus villosus*, so well known on the Labrador coast, in July remaining until September. These are good-sized fish, about equal to the Newfoundland cod. The "squid school" comes on in August or September and remains until October. The fish of this school average 12 pounds in weight. The schools so far enumerated are all shore fish, and they are always smaller than bank fish. From October there are winter schools in some places. These are generally composed of short, thick fish.

Capt. J. C. Caton says that they catch males and females together in the spawning-season, and that they do not school when spawning.

Mr. William J. Fisher has furnished the following information concerning the schooling of cod around Kodiak, for which he acknowledges his indebtedness to Capt. H. R. Bowen: Cod associate in schools generally from May to the middle of September, and they live independently the rest of the year, the severity of the winter having much influence on their habits. At different seasons and in different places there are different schools. Males, females, and young are found in the

same schools. The movements of the schools are affected by the presence or absence of food and by the state of the tide, the fish taking the hook more readily at slackwater.

Mr. Devine, speaking about the Shumagin cod, told me on the 19th of July, 1880, that they found the fish both in schools and independent. They were "picking fish" at the time, and there had been "no great flush" of school fish this year. Different schools are found at different seasons and in different places, just as about Kodiak. Mr. Devine says that males, females, and young are not found associated in his vicinity. The males go together at certain times, and the females are associated. At the spawning-season there are more females than males. The movements of the schools are very much affected by sharks, and, to some extent, by dogfish. Dogfish are not abundant, but sharks are especially plentiful. The dogfish is identical with our Atlantic spined dogfish (*Squalus acanthias*). We did not get a specimen of the shark, but the National Museum has a couple of small ones from Sitka, which are very close to, if not identical with, the "tope" (*Galeorhinus galeus*). As for the influence of the tides, Mr. Devine says that fishing is best during the spring tides and poorest in slack tides.

Sometimes the cod have such a superabundance of food that they refuse to take the hook. This is, perhaps, of rare occurrence; generally it seems that the more a cod has in its stomach the more eagerly it bites, especially if the bait be something different from that previously eaten. One would suppose that a 12-pound cod, after eating forty capelin, would not take herring bait, and yet we had an illustration of that on Portlock Bank.

My own observations at various points along the Alaskan coast seemed to indicate that young cod from 2 to 4 inches in length prefer to school near the shores, in sheltered coves, where the water is shallow, and often where it receives a large admixture of fresh water. At Iliuliuk I found myriads of such young fish playing about the wharves, eagerly seizing the hooks baited for larger prey. Occasionally a larger cod, of about 16 or 18 inches in length, would be caught in the same vicinity, but almost invariably we found the small fry unmixed with older fish.

The supply of food forms a very important motive for the presence of cod in particular places at certain times. When we were in Port Chatham, for example, capelin were schooling there abundantly, and we caught fine cod freely. On Portlock Bank again capelin were plentiful, and nearly every cod examined had its stomach filled with them. At the Shumagins "England hake," or, more properly, pollock (*Pollachius chalcogrammus*), were abundant in July, and the cod were there feasting on them. The "yellow-fish" (*Pleurogrammus monopterygius*) is one of the finest of all baits *for cod and will play an important part in the future history of the fishery. This yellow-fish is* said by Capt. Andrew Anderson to be very abundant about the middle of August on the off-shore bank, 20 miles east-northeast of Seminoffsky Island, where it is found schooling like the mackerel, and will follow the bait up to the surface of the water. It is to be noted that August and September are the best months for cod on this bank. The herring (*Clupea mirabilis*) also has a great deal to do with a prosperous cod fishery. Capt. J. Haley told me that herring are wonderfully plentiful on the Hoochenoo Bank at the fishing-season and that there are enormous quantities of fine herring in Prince Frederick Sound, which serve to attract a great abundance of small cod thither. The vast shoals of herring which are found in various parts of the Gulf of Alaska are generally accompanied by hordes of cod. Elsewhere in this paper I have recorded the statement of Captain Bowen concerning the magnitude of a herring shoal seen by him; this will give a good idea of the amount of sustenance awaiting the pleasure of the cod around Kodiak. The same numbers are known to be present in many localities, and wherever found their influence on the prosperity of the fishery must be recognized.

ABUNDANCE.—Before entering into an examination of the influence of modes of fishing and

practices of the fishermen upon the abundance of fish, it will be well to review the actual numbers taken at different times and in various places. Captain Haley secured 10,000 fish in two weeks from Indians on the Hoochenoo Bank, and could have got many more. The Indians caught these cod with bark lines on barbless, bent-iron hooks, two of them going off in a canoe and bringing in from 25 to 50 fish, which were quite enough to satisfy their laziness. They would not allow any one else to fish, but if they had the number would have been readily quadrupled.

Mr. D. C. Bowen states that as many as 500 have been taken in a day by one hand-line fisherman on Portlock Bank, and that the average catch of the whole season per man is 75 per day.

Here may be repeated the statement of Captain White, of the United States Revenue Marine, who reported the capture, south of Kodiak, of 250 fish, weighing 30 to 40 pounds each, with twenty lines having four or five hooks each. This number was taken in two hours.

From the New York Times of July 15, 1879, I extract a sentence by William S. Dodge, formerly mayor of Sitka, to the effect that "at Kodiak Henry Richard and Thomas Bache, fishermen, caught alone, with hook and line, within the last six months, 22,000 cod."

Capt. Andrew Anderson told me at Saint Paul that with a crew of ten men, on Seminoffsky Bank, he has caught as many as 4,000 cod in a day, and that his average catch there was from 1,600 to 1,800 daily.

Mr. D. C. Bowen stated that John McCathrine and a man named Smith caught 1,700 cod in a day on one trawl (a 12-line trawl of 600 or 700 hooks) in Unga Straits. Their average catch was 1,200 fish.

A correspondent of the San Francisco Post, writing of the season of 1876, says: "One man on board the schooner Selma, which arrived the other day, had 13,000 fish to his credit," &c. These were caught during a season of four months.

Capt. J. C. Caton, who has been familiar with the Shumagin fishery ever since the second year of its existence, affirms that fish are plentiful enough to supply a large market when that is found. The evidence of all the fishermen goes to prove that the great want is not fish, but demand for fish. One such customer as Gloucester would whiten the Gulf of Alaska with hundreds of sails, where now there are less than a dozen, and there is every indication that full fares would repay the venture.

As for the influence of fishing and its accompanying practices, we have information from only two points, Kodiak and Pirate Cove. Capt. H. R. Bowen, of Saint Paul, Kodiak, says that cod are as abundant there now as they were when white men began fishing; that their haunts and habits have not been changed by the influence of man, and their numbers have not been diminished by over-fishing. Trawls have never been used in that vicinity. He regards the practice of throwing gurry overboard as injurious to the fishery; the cod, he says, will leave and their place will be taken by sculpins.

Mr. Thomas Devine, of Pirate Cove, said that cod are scarcer there now than they were five years ago. He accounts for their decrease by the increased fishing, especially with trawls, the injurious practice of throwing gurry overboard, and, to some extent, by the capture of the mother fish, which will sometimes take the hook freely. The loss of gear resulting from trawling has a bad effect upon the fishery.

FOOD.—The food of the cod in the Pacific is as plentiful and as varied as in the Atlantic. Most other fishes of suitable size are liable to suffer from its voracity, while certain species for which it has an especial liking are slaughtered in great numbers. There is a wonderful abundance of invertebrate animals, such as squid, shrimp, holothurians, crabs, marine worms, sea-fleas, and, in short, just such forms as are well known to every fisherman on the eastern grounds. The waters

of the Alaskan fishing grounds fairly swarm with this kind of life suitable to the wants of the cod. The fish which constitute in large measure the food of the cod are herring (*Clupea mirabilis*), capelin (*Mallotus villosus*), lant (*Ammodytes*), halibut (*Hippoglossus vulgaris*), whiting or England hake (*Pollachius chalcogrammus*), sculpins (*Hemilepidotus Jordani* and *trachurus*, also *Cottus polyacanthocephalus*), and yellow-fish or striped fish (*Pleurogrammus monopterygius*). Sometimes young cod are swallowed by older ones. I have seen a species of *Liparis* from a cod stomach on Portlock Bank. The yellow-fish is the best bait for cod, according to Captain Anderson and Captain Caton. Another food-fish of the cod is worthy of mention here, because of the interest which attaches to its common name of "cusk" (*Bathymaster signatus*), a species very different indeed from the cusk which is so much eaten for cod in the Eastern States.

Mr. Devine says that sick cod are sometimes seen feeding at the surface, and sometimes healthy fish will chase bait up. In this way yellow-fish will attract cod to the surface, and capelin will also. I have counted forty capelin in one cod taken on Portlock Bank, July 8, 1880.

REPRODUCTION.—According to Mr. D. C. Bowen, cod about Kodiak come on the rocks in 25 to 30 fathoms, spawning in November and December. Capt. H. R. Bowen, of the same island, states that cod, full of eggs, are caught in February. The eggs are very light straw color, and about as large as No. 12 shot. He says that eggs and milt sometimes run from the fish after they are caught.

Capt. J. C. Caton informed me that cod spawn around the Shumagins in February, on sandy bottom in shore, and that they will bite freely when spawning. Mr. D. C. Bowen says that at certain times spawning cod will lie perfectly still on the bottom and not take the hook.

Mr. Thomas Devine tells me that the Shumagin cod spawn in from 10 to 15 fathoms of water in January and February; the size and color of the eggs are the same as in the Eastern cod. The wharf at the Pirate Cove fishing-station is sometimes covered with spawn which has run from the fish after they were landed. He says that during the breeding season the males are long and slim and the females are short and deep. The smallest codfish he has recognized as such were 6 inches long, and they appeared in May or June. The smallest ones seen by Captain Bowen were, also, six inches long; they made their appearance about July, and were in company with the old fish.

On the 6th of July, 1880, we seined many young cod in Refuge Cove, Port Chatham, Cook's Inlet, where the water was less than a fathom in depth, and was largely diluted by fresh streams.

At Belkoffsky, on the peninsula of Aliaska, young cod about one and one-half inches long were dredged on the 23d of July. On the following day, while lying on the west side of Oleny Island, a cod 1½ inches long was found in the stomach of a large one.

On the 1st and 2d of October we seined many young cod at the head of Chernoffsky Bay, Unalashka; from the 6th to the 12th of the same month we saw them in great numbers swimming around the wharves at Illiuliuk, Unalashka, very active and wonderfully greedy. We may, therefore, say that from May to October, at least, young cod are found in shallow water near the shore, and that about the middle of the latter month they have reached an average length of 4 or 5 inches. At Illiuliuk, when a jig or a baited hook was let down into the water it would be at once surrounded by a throng of nibbling fry, not at all frightened by the presence and antics of numerous small boys. These small fish frequently succeeded in fastening themselves on the hooks, and were pulled out on the wharf, either to be eaten or used as bait or thrown away.

DISEASES, PARASITES, ENEMIES.—As a rule all large cod caught in harbors, in shoal water, are sick. On the 24th of June, 1880, one was taken in Port Mulgrave, Yakutat Bay, that measured 34½ inches in length, and was stout and heavy, but sick and unfit for food. The gills were not bright red as in a healthy fish, but dull and faded; the colors of the body were also dull.

Numerous parasites were present externally, and the abdominal viscera were infested with worms. A very unpleasant odor came from the belly when it was opened.

On the 2d of July, in Chugachick Bay, Cook's Inlet, three large cod were caught from the vessel, all of which were sick, their abdominal viscera being lined with worms and giving off a bad odor, yet the fish were quite heavy.

On the 5th of July a healthy cod 28⅝ inches long and blind in both eyes was caught on a hook in Port Chatham, near the entrance to Cook's Inlet. The fish was entirely free from parasites. Its stomach contained only the herring with which the hook was baited. Instead of the transparent aqueous humor in the anterior chamber of the eye, there was an opaque white substance, the result, doubtless, of an old injury. A second fish taken here (about an inch longer than the blind one) seemed to be perfectly healthy, but there were numerous small worms in the intestines. In its stomach were an *Ammodytes*, a little wad of kelp, and a pebble.

In examining a fresh fish caught near Sitka I found the inside of its mouth containing many lernæan parasites.

Capt. H. E. Bowen has never seen deformed cod in the vicinity of Kodiak, but diseased ones are common. He has frequently noticed ulcerated sores along the body, and especially on the head. Dead cod have never been seen to his knowledge.

Mr. Devine, of the Shumagins, has seen cod sometimes with their backbone broken, causing a deformity known as "rose bones," but he has never seen dead fish in any quantity at or near Pirate Cove. In earlier years, he says, you could heave up hundreds of sick cod at the wharf. Sometimes you would take cod long, thin, and gaunt, and after taking out the bone you might "read the Bulletin through them." Mr. Devine mentions, as external parasites found on Shumagin cod, "cuttle-fish, whelks, worms, and fish-lice." The commonest external parasites observed by me were small lernæans.

Around Kodiak seals and sea-lions prey upon cod, frequently taking them from the line, according to Captain Bowen.

Mr. Devine tells me that sharks are very abundant about the Shumagins and very destructive to cod. Dogfish (*Squalus acanthias*) also prey upon cod, but they are not abundant. We caught comparatively few dogfish during the summer—one at Port Althorp, one on Portlock Bank, and many at Sitka.

2. HISTORY OF THE FISHERY.

In the speech of Hon. Charles Sumner on the cession of Russian America to the United States (printed at the Congressional Globe office, Washington, 1867) is an abstract of the references made by early navigators and visitors in Alaska to the fishes of its waters. The cod is among those most frequently mentioned, appearing for the first time in the report of a Russian navigator in 1765. Mr. Sumner then quotes from Cook (1786), Portlock (1787), Meares, Billings (1792), Langsdorf (1804), Lütke, and Sir George Simpson (1841). All of these speak of the cod as being one of the commonest fish.

It appears that the first cod brought to San Francisco were taken by the brig Timandra off the island of Saghalien in 1863. I quote the account of it from the San Francisco Commercial Herald and Market Review of January 15, 1880: "The North Pacific cod-fishing grounds have been regularly prospected for fourteen years. The first fish ever brought to this market from that section was in 1863 or 1864, by the brig Timandra. While this vessel was lying becalmed off the island of Saghalien, the crew, for want of something better to do, commenced fishing. They were astonished at their success on their first day, and continued their pastime from day to day until

quite a quantity of fish had been caught. This was the origin of the business, which has since regularly employed from half a dozen to a score of vessels, and from forty to two hundred and fifty men during the season. * * * The North Pacific codfish fleet was organized in the spring of 1865."

The Gloucester Telegraph newspaper of October 11, 1865, has a paragraph which is believed to refer to the vessel above mentioned; it reads thus: "Two years ago a single vessel wandered off to the then unknown banks on an uncertain adventure and in three months brought in a cargo of codfish that astonished everybody. * * * The fishing grounds are in the Ochotsk Sea * * * ."

The San Francisco Commercial Herald and Market Review in its issue of January 15, 1880, tells us that "the North Pacific codfish fleet was organized in the spring of 1865," in which year seven vessels were engaged, and their combined catch was 469,400 fish. In 1866 eighteen vessels were employed and the catch was 724,000 fish. In 1868 the number of vessels was reduced to ten. The largest fleet in any year since the beginning of the fishery was that of 1870, when twenty-one vessels were engaged. Small fleets were out in 1872, 1873, 1874, and 1875, as will be seen by the accompanying table. The largest catch recorded is that of 1879, thirteen vessels having aggregated 1,499,000 fish. The average weight of the cured fish during the earlier years was from 2 to 3 pounds; but it ranges now between 3 and 4 pounds.

The total weight of the catch of 1879 is reported to have been 1,955 tons, or 4,379,200 pounds. The amount of cod brought into Gloucester during the same year was not far from 50,000,000 pounds, so that the whole cod fishery of the Pacific United States amounted to less than one-tenth of that of Gloucester alone, or less than one-twentieth of the entire catch of the Atlantic United States. This is by reason of the smaller demand for codfish on the Pacific slope, and not because of any scarcity of cod.

Table showing results of the North Pacific codfish fishery.

Year.	Vessels.	Fish.	Year.	Vessels.	Fish.
1865	7	469,400	1873	7	550,000
1866	18	724,000	1874	6	381,000
1867	19	943,400	1875	7	504,000
1868	10	608,000	1876	10	758,000
1869	19	1,032,000	1877	10	750,000
1870	21	1,265,500	1878	12	1,190,000
1871	11	772,000	1879	13	1,499,000
1872	5	300,000	1880	8	1,206,000

According to J. L. McDonald (Hidden Treasures, &c., p. 11) the Shumagin fishery dates from 1866: "In the spring of 1866 Captain Turner sailed from San Francisco in the schooner Porpoise; he pursued a northerly course, calling at Queen Charlotte's, Unga, and Shumagin Islands; around the latter-named group he found safe harbors, fuel, water, and other facilities for prosecuting his business; while on the grounds fringing those isles he found large, plump, healthy codfish in such numbers as to enable him to fill his vessel in a few weeks. After an absence of three months this 'hardy toiler on the sea' returned to the 'Bay City,' having performed a successful voyage, the honored pioneer of the northwestern salt fisheries."

I was informed by Capt. J. C. Caton, who has taken part in the Shumagin fishery since 1868, that the first fleet at the islands consisted, in 1867, of three schooners, the Sanborn, Captain Morse; the Porpoise, Captain Turner; and the Sarah Louise, Captain Holcomb. Captain Caton said that they caught most of their fish off Nagay; they came up to hunt fish and discovered these banks;

the Sanborn took 64,000 fish, the Porpoise 36,000, and the Sarah Louise 36,000; the trips sold for 12 to 13 cents per pound. Captain Caton came up in the Porpoise in 1868 and tried to make two trips, but got only half a fare on the second. In 1868 there were fourteen vessels at the Shumagins. The best fare was brought by the Mandiago (Captain Haines)—between 80,000 and 90,000 fish; the Sanborn took about 60,000; the Porpoise alone tried two trips and caught 63,000 fish. The prices were the same as in 1867.

The influence of the discovery of these extensive fishing banks in the waters of Alaska upon negotiations for the cession of Russian America to the United States has been declared considerable, as will appear from the following extracts from the work of Mr. McDonald, already quoted.

"In January, 1866, the author, while attending the session of the legislature at Olympia, the capital of Washington Territory, determined to make another bold push for Alaska, by soliciting the good offices of our Government for the purpose of obtaining a permanent foothold, and to open the prolific fishing grounds in those regions to our ambitious fishermen. To this end we penned the following memorial:

"*To His Excellency Andrew Johnson, President of the United States:*

"Your memorialists, the legislative assembly of Washington Territory, beg leave to show that vast quantities of cod, halibut, and salmon of excellent quality are found along the shores of Russian America. Your memorialists respectfully request your Excellency to obtain *such rights* and *privileges* of the Government of Russia as will enable our fishing vessels to visit the harbors and its possessions, to the end that fuel, water, and provisions may be obtained; that our sick and disabled fishermen may obtain sanitary assistance, together with the privilege of taking and curing fish and repairing vessels in need of repairs. Your memorialists further request that the Secretary of the Treasury be instructed to forward to the collector of customs of this, Puget Sound district, such fishing license, abstract journals, and log-books as will enable our hardy fishermen to obtain the bounties now paid to the fishermen in the Atlantic States. Your memorialists finally pray your Excellency to employ such ships as may be spared from the Pacific naval fleet in surveying the fishing banks known to navigators to exist from the Cortez Bank to Behring Strait.

"This memorial, written by a fisherman in behalf of the fishing industry on the northeast coast, passed both branches of our Territorial legislature with commendable unanimity and dispatch. In forwarding a copy of the above-named memorial to the Secretary of State we imparted such information touching the fisheries around the Russian possessions, and the impulse which the opening of those resources to our fishermen would impart to the commercial development on the northwest coast. In acknowledging our humble services the illustrious Secretary assured us that "in consummating the recent purchase, I was strongly fortified by the letters which you wrote to me touching the valuable fisheries in those waters." The New York Times of April 1, 1867 (the acknowledged organ of Secretary Seward), said "that a memorial from the Territorial legislature of Washington Territory, dated January, 1866, asking the President to obtain certain rights for the fishermen, was the foundation of the present treaty.

"On the 18th of October, 1867, the transfer of this vast territory from Russia to the United States was officially consummated by the respective commissioners of the two Governments, at Sitka, in the presence of the Russian population, who cheerfully welcomed the few Americans there also present. The union has been very cheerfully accepted by the people of the Territory. Our Government, on assuming possession, found numerous adventurers from the Pacific States domiciled in various parts of the Territory engaged in trade and in developing the resources in those regions; vessels laden with ware entered every harbor; stores were opened as by magic in every

acceptable roadstead along the southern and western coasts; an active competition for furs, oil, ivory, old copper, iron, and junk was earnestly inaugurated; commerce revived, the sails of our vessels whitened every creek, bay, and sound, and the staid Russians very soon obtained an insight into Yankee progress on the go-ahead principle."

3. THE FISHING GROUNDS.

The great bulk of the cod taken in Alaska are caught within easy reach of the shore, at such distances as may be traversed in canoes and dories. This is true for every part of the Territory in which the fish are found. While we were at Sitka (during part of May and June) Indians brought them down occasionally from Old Sitka, only a few miles away. Mr. A. T. Whitford, of Sitka, states that they are abundant in spring. "Lisiansky caught them with hook and line in Sitka Sound."* Capt. J. Haley informed me that small cod are abundant in Prince Frederick Sound Captain Haley gave me the limits of the Hoochenoo Bank as Hoochenoo Point and Point Samuel. As already stated, the fish brought to him here by Indians were caught from canoes; they were very abundant, and their average weight dried was 3 pounds, which is about the average of the Shumagin cod. According to the same authority, there is another bank off Point Gardiner, and there are banks on the east shore of Baranoff Island, near Poghibshi Strait. "Cod have been taken in abundance at Nootka, Sitka, Lituya Bay, Yakutat Bay, Chugach Gulf, Cook's Inlet, Bristol Bay, and throughout the Kodiak, Aleutian, and Pribyloff Islands."† Portlock found cod abundant at Port Etches, which is at the entrance to Chugach Gulf or Prince William Sound; Belcher took them near Cape Chiniak, Kodiak island. I am indebted to Mr. William J. Fisher for information about the shore fishing in the vicinity of Saint Paul, Kodiak. Mr. Fisher obtained this information from Capt. H. R. Bowen. Ten men are employed steadily from May to September, inclusive, and besides these the natives lay up their winter supplies whenever opportunity offers. The favorite grounds are on a pumpkin or clam bottom, in 15 to 20 fathoms of water. Dories and skiffs are principally used, and they carry from one to three men. The average daily catch per man is 200 fish. Within easy reach of Belkoffsky fine cod are taken freely. The fishing around the Shumagins is done at short distances from the shore. The fishing station of McCollam & Co. at Pirate Cove employs eight men, all of whom go out in their dories during the day and dress their fish on shore in the evening. Those who come up in the vessels from San Francisco are generally within easy reach of North Harbor, Unga Island. Thus we have traced the cod along the whole south coast of Alaska and found them abundant near the shore. The same is true of the Aleutian Islands. Near Iliuliuk, at the entrance to Captain's Harbor, and on the ridge at the entrance to Port Levasheff, cod are plentiful. I have been thus explicit in my details of the shore fishing to give an idea of the large proportion it furnishes of the entire catch, and to supply the opportunity of noting the great contrast with the New England cod fishery.

Extended areas of soundings on which cod assemble in great masses are present in the Gulf of Alaska, but they have been little investigated, and their limits and characteristics are imperfectly known. I have already referred to the Hoochenoo Bank in Chatham Strait, the bank off Point Gardiner, and those off the east shore of Baranoff Island, near Poghibshi Strait. These grounds are scarcely known, except to Indians, and to some extent to Captain Haley. It is unlikely that large vessels will seek cod there, because of the difficulties of navigation, but the time will come when great stores will be secured by small craft, the quality of the fish taken there being excellent and the size equal to the average of the Shumagin fish.

PORTLOCK BANK.—This is the most northerly of a series of banks extending along the Kodiak, Shumagin, and Fox groups of islands, at varying distances from the shore. A series of soundings

* Dall in Report Comm. Agric., 1870, p. 377. † Dall, *op. cit.*, p. 378.

made by the U. S. Coast Survey to the eastward of Kodiak and Afognak Islands shows the following depths in fathoms: 52, 52, 95 (no bottom), 90, 90, 55, 70, 45, 63, 75, 80. In the evening of July 8 we were becalmed on this bank, off Marmot Island, and caught very fine cod in 35 fathoms, soon shoaling it to 30. The bottom is said to be sand and gravel, as a rule; one of the soundings indicated mud. A sounding 20 miles to the eastward of Marmot Island, in 42 fathoms, showed a rocky bottom.* Concerning this bank Davidson gives the following information: "The soundings of Portlock, of Vancouver, and of this expedition prove the existence of a comparatively shoal bank, extending along the southeastern coast of Afognak and Kadiak, with a deep pocket of 90 fathoms, no bottom, 25 miles east of Saint Paul. The shoalest water obtained on this bank by this expedition was 45 fathoms, in latitude 58° 16′, longitude 149° 42′. It is fair to assume that this bank extends along the southeast shore of Kadiak, as incidental and unconnected observations indicate."†

BANK SOUTHEAST OF KODIAK.—I am indebted to Mr. W. H. Dall, of the U. S. Coast Survey, for information drawn from the records of the office concerning this and all the banks which follow. A sounding in north latitude 56° 13′ and west longitude 153° 39′ showed 22½ fathoms. The bank seems to extend in a southwesterly direction; 22 to 38 fathoms were the limits of soundings over an extensive area.

SIMEONOFF OR SEMINOFFSKY BANK.—Mr. Dall states that this ground was discovered by the Minnie G. Atkins in 1867. Soundings have been taken in north latitude 54° 45′, west longitude 158°, and in latitude 54° 38′, longitude 158° 30′. In the latter place Davidson records 40 fathoms. His description runs as follows: "Thirty-five miles east from the south end of the island of Niuniak, the southernmost of the Shumagin Islands, we obtained coral and sand bottom in 40 fathoms of water. * * * Ten miles farther westward the depth of water was 50 fathoms."

Capt. Andrew Anderson informed me that Seminoffsky Bank was visited by the schooner Shooting Star, formerly of Fox Island, Vinal Haven, Me., in 1870, and next by the Scotland and Amanda Ager. He and Capt. J. C. Caton locate the bank at 20 miles east-northeast of Simeonoff Island. They have found from 26 to 40 fathoms with smooth sand bottom on the inner shoal part, and big rocks outside. On the rocky portion many dory and schooner anchors have been lost. The shoal water part is about 2 miles long and one-half mile wide. The whole bank is said to be 10 miles long and from a mile and a half to 2 miles wide. There is deep water on the land side and seaward. These areas are from Captain Anderson. Captain Caton thinks the bank about 40 miles long and 10 or 15 miles wide; and he supposes the 26-fathom ridge to be 2 miles wide and 20 miles long. The fact is, the limits of none of the grounds are definitely known and they will not be until accurate surveys are completed.

It is on this bank that the "yellow-fish" (*Pleurogrammus monopterygius*) is so abundant in August and September and proves so attractive to the cod.

BANK OFF SANAK.—We have two positions for this bank: North latitude 54° 17, west longitude 161° 55′; latitude 54° 20′, longitude 162° 30′. Davidson gives the latter position as about 9 miles southeast from the Sanak Reef, where, he says, "we got bottom in 35 fathoms, rock and barnacles being brought up by the lead."

BANK OFF AKUTAN PASS.—Mr. Dall gives one position in north latitude 53° 20′, west longitude 164° 30′.

---

*The series of soundings is from a Coast Survey chart, entitled "U. S. Coast Survey | Benjamin Peirce, Supt. | Alaska | and adjoining territory | 1869. | The Yukon River, Ranges of Mountains, Shores of Norton Sound | and many Features of the Interior, from a Reconnaissance by W. H. Dall, | Director of the Scientific Corps, of the W. U. Tel. Expedition, 1865–1868."

†Alaska Coast Pilot, 1867, p. 44.

Davidson has the following description of the bank in the Alaska Coast Pilot, 1869:

"The bank where trial was first made for fish was found on the 15th of September, during a prevalence of thick weather. We fortunately seized an opening and obtained good observations for longitude, with an approximate latitude; the position is in latitude 53° 35′, and longitude 164° 10′, and near it soundings were obtained in 50 fathoms of water, the lead bringing up sand and a small starfish. With thick, drizzly weather the vessel drifted to the northwest by compass, until 60 fathoms were struck, with sandy, pebbly bottom. Here the lead-line was baited, and while on the bottom the first cod took the hook. The fish proved very plenty, fat, and bit eagerly; frequently two were brought up on a double-hooked line, and sometimes three were brought up on a line with three hooks. The largest measured 37 inches in length, and several reached 36 inches. The finest was 36 inches long, 23 inches girth, and weighed 27 pounds; was very fat, and certainly of as fine, if not finer flavor than cod we had eaten eleven months before, freshly caught on the south coast of Newfoundland.

"The vessel drifted all the afternoon over this bank, with the same depth of water, and fish biting well, although all appeared in capital condition and their maws full of food, such as squid, halibut-head, fish the size of a herring, sea-lice, &c. We got no observations that noon or afternoon, nor any all the next day, on account of thick, foggy, drizzling weather, but the vessel could not have been far from latitude 53° 40′, and longitude 164° 30′, lying 65 miles ESE. true from the middle of the Akoutan Pass, and 40 miles SSE. from the Unimak Pass. * * * The 50-fathom position is 40 miles broad off the nearest island of the Kriniatzin group, lying between Unimak and Unalashka. Much deeper water, 104 fathoms, over a bottom of black sand, was subsequently found in latitude 53° 38′, longitude 165° 25′, 43 miles westward of the above cod bank, and 25 miles broad off the islands."

BANK OFF UNIMAK PASS.—This bank, for which we have a position in north latitude 54°, and west longitude 166° nearly, was first sounded on by the bark Golden Gate in 1865, then in the service of the Western Union Telegraph Expedition. Forty fathoms was found.

BANK OFF SOUTH END OF UMNAK.—In latitude 52° 30′ and longitude 168° 50′, 30 fathoms was recorded.

BANK SOUTH OF AMCHITKA.—We know nothing definite about this, but a bank is reported there.

BANKS NEAR ILIULIUK, UNALASHKA.—Cod are present here all the year, going off into deeper water in winter. They are most abundant on two banks—one a short distance inside of the entrance to Captain's Bay, and the other at the entrance to Port Levasheff. At the latter place there is a ridge on which the bottom is hard and rocky, rich in mollusks, crustaceans, worms, and small species of fish on which cod delight to feed. Here, in from 10 to 20 fathoms, we found plenty of cod associated with *Hippoglossoides elassodon*, *Bathymaster signatus*, *Gymnacanthus galeatus*, *Lepidopsetta bilineata*, *Hemilepidotus Jordani*, *Cottus polyacanthocephalus*, *Raia parmifera*, and the remarkable quill-fish (*Ptilichthys Goodei*).

COD IN BERING SEA.—The statement of Captain Bryant has been often quoted to the effect that: "Behring Sea is a mighty reservoir of cod and halibut, so that he never threw over his lines without bringing up fish in whatever part of the sea he might happen."

"The soundings of this sea," says Davidson, "and of the Arctic Ocean north of Behring's Strait, indicate it as the most remarkable submarine plateau of such great extent yet known. On the eastern half of this sea soundings of less than 50 fathoms are found over an extent of 18,000 square miles."

I quote from Davidson again concerning Cook: "In Behring Sea, in latitude 55° 48′, longitude

162° 42′, about 20 miles broad off the northwest shore of the Alaska peninsula, he 'caught a good number of fine codfish' in 30 fathoms. In Bristol Bay and River, emptying into the Behring Sea, where salmon were in great abundance, he found that fish 'in the maws of cod which he had caught.' In the same bay, southeast (of) Hagmeister Island, in water of 14 to 26 fathoms, he 'had tolerably successful fishing, catching cod and then a few flat-fish.' In latitude 61° 48′, longitude 180°, Saint Thadeus Nose bearing NNW. about 23 leagues distant, he caught 'abundance of fine cod' in 65 to 75 fathoms water. His successor, King, in September, 1779, in latitude 59° 38′, longitude 177°, about 150 miles west by south quarter-south from the island of Saint Mathew, 'got a great number of cod in 78 fathoms.'"

I have already mentioned the capture of cod recorded by Maynard and Elliott at Saint Lawrence Island.

There is, however, no important fishery for cod north of the Aleutian Islands; whether or not banks will be discovered and frequented in Bering Sea we are no better prepared to say than were the Cape Ann fishermen with reference to George's Bank half a century ago. It is highly probable that fishermen will avoid the dangerous lee of the Fox Islands at least until the Shumagins fail to reward their toil.

THE SHUMAGIN ISLANDS.—"These islands were discovered by Bering, in his second voyage, on the 29th of August, 1741, and were named after one of his crew who died and was buried upon one of them. They are situated in longitude 160° west and latitude 55° north, and comprise four large and about a dozen small islands, with a total area of about 1,000 square miles. They contain several Aleutian settlements, and Unga, the largest, has two fine ports, the north and south harbors, where wood, water, bait, and fish abound. The banks already discovered exceed in extent those of Newfoundland. * * * The voyage to the Shumagins and back occupies about one hundred and ten days, a saving of two months and 2,000 miles in time and distance [as compared with the Okhotsk fishery], in addition to the facilities for obtaining fresh provisions, wood and water, and the proximity of good harbors of refuge in bad weather."*

"The winds about the Shumagins * * * from June until the middle of August are from the southeast, with rain and fog; and from the middle of August to the middle of September from the northwest, with fine weather and smooth water; after which there are heavy southerly gales."†

The islands are generally high and to a great extent clothed with tall grass, scrub alder, and a kind of wild apple. The soil is soft and yielding, and walking is usually attended with great fatigue and vexation. The bluffs of Popoff Island show porphyritic rocks with varied hues—slate, gray, and purplish, and here and there is seen a reddish cliff colored by the oxidation of iron pyrites. Winds sweep down the slopes of these hills with great violence and caprice, sometimes capsizing vessels taken unawares. The Nagai, one of McCollam & Co.'s little schooners, formerly employed with the Unga in fishing for the Pirate Cove station, was lost through the winds or "woollies" in the summer of 1880.

One of the characteristic birds found about the shores of the islands in the fishing season is the pretty little paroquet auk (*Phaleris psittacula*). Great numbers of gulls, cormorants, auks, murres, guillemots, puffins, albatrosses, and jægers may be seen hovering over the water or afloat upon it where the surface schools of fish-food congregate.

In West Nagai Strait we saw the Page and the Wild Gazelle, which, besides the little Unga, composed the Shumagin's cod fleet for 1880. They were lying at anchor near Sanborn Harbor. Their dories were out, one man in each, hand-lining and trawling within easy reach of the vessels. Trawls were little used, the men depending almost wholly on the hand-lines.

*Dall in Rep. Comm. Agric. for 1870 (1871), p. 378.

†Davidson: Alaska Coast Pilot, 1869, p. 43.

The permanent fishing station on Popoff Island was established in 1876 at Pirate Cove by T. W. McCollam & Co. There are eight men engaged at the fishery, one of whom, Mr. Thomas Devine, is in charge. Fishing is continued all the year, except when interrupted by severe weather. When not fishing the men do nothing. Twelve dories are owned at the station. Both hand-lines and trawls are used. The men furnish their own gear, but receive their boarding, house, and fuel free. They are paid $27.50 per thousand for the cod, which must not be less than 26 inches long. The greatest distance from shore at which they fish is on Henderson's Island grounds, 4½ miles away. Besides the cod they catch plenty of halibut (*Hippoglossus vulgaris*), "cusk" (*Bathymaster signatus*), pollock or silver hake (*Pollachius chalcogrammus*), "greenfish" (*Hexagrammus*), yellow-fish or striped fish (*Pleurogrammus monopterygius*), "Irish lords" (*Cottus polyacanthocephalus*), common sculpins (*Hemilepidotus Jordani*), "Frenchmen" (*Hemilepidotus trachurus*), and arrow-toothed flounder (*Atheresthes stomias*). The average daily catch of cod per man with hand-line or trawl is about 100, and the catch for the year 20,000. The fish are dressed on shore by the men after their day's catch is landed. The small fish are then pickled and the large ones kenched. Mr. Devine uses about a ton of Carmen Island salt to 1,000 fish, and puts as many into a kench as he can get in to save room. The cod here, according to Mr. Devine, seem to be more watery than the eastern, some of them losing two-thirds in curing. I have observed the same thing occasionally, but the fish were always small shore-fish. Individuals differ in this respect just as they do in the consistency of their flesh. Mr. Devine notes a great difference in the ease of splitting fish, young school fish being readily split, while some others are hard and tough. Besides the men who fish from the station there is a schooner of 20 tons, the Unga, which carries five men, whose catch is brought to Pirate Cove. The men are all foreigners. They catch their fish in Nagai Strait, Coal Harbor Strait, Sanborn Harbor, Stepovakho Bay, and at the Pinnacle. They use hand lines and trawls. The gear of the Unga cost $362 in 1879. For bait they use halibut, sculpins, and cuttle-fish (*Octopus punctatus*, Gabb). Their season lasts from April to October, the catch averaging 35,000 fish, which are salted in bulk and then resalted at the station. The crew of the Unga receive $30 per thousand for their cod and the captain $35. They furnish their own gear. The salt used at the station costs $16 per ton there. The cost of bait is nothing. Besides the fish mentioned there is an abundance of fine clams. The sounds of the cod brought to Pirate Cove are said to be thin and tough. The heads are thrown away. Mr. Devine has a fine lot of pigs and chickens. While there is no lack of substantial fare at the station, the variety of the *menu* is enriched by the introduction of an *entre* called "Scotch dumplings," made by filling with chopped cod-livers and corn meal the pokes or stomachs of cod, which are then tied up and boiled. Mr. Devine told me that natives from Korovin Island come over to a cove near Pirate Cove to fish for salmon. In 1877 they brought to Pirate Cove a silver salmon (*Oncorhynchus chouicha*) 5 feet long. The largest cod taken by his men would probably have weighed 50 pounds. Halibut have been known to reach 300 pounds there.

The fishermen of Saint Paul, Kodiak, use No. 12 Shanghai hooks. Their boat-anchors weigh 13 pounds; the leads, for hand-lines, 5 pounds. The cost of bait is nothing; halibut, squid, and salmon, caught easily in the vicinity, being used. Six hundred fish in a day would be considered a large catch for one man now, 200 being the average. All the fishing for cod is done within easy reach of the shore or from the beach itself. The buyers of the fish furnish the lines and other gear and pay $20 per 1,000 for them dressed.

I have elsewhere given a table showing the number of vessels engaged in the Pacific cod fishery from 1865 to 1880, from which it will be seen that the fleet was at its minimum in 1872 when only five vessels were employed, and largest in 1870 in which year twenty-one were engaged.

The Shumagins fleet is made up of schooners, and these frequently of small tonnage, while the Okhotsk vessels are large schooners, barks, and barkentines. Fishing about the Shumagins is done in the narrow passages, and harbors are to be made through these straits; for this reason small fore-and-aft schooners are employed in preference to large vessels, and for this reason alone, it seems to me, the large craft go to the Okhotsk in spite of the established fact that the fish secured there are not so plump and tender as the Shumagins fish when fresh and are vastly inferior by reason of the treatment they receive on the vessels after being salted. Again, the round trip to the Okhotsk involves two months of time and 2,000 miles in distance more than the trip to the Shumagins. The Okhotsk fisherman is cut off from fresh provisions and good harbors; he rides out storms "hove to" or trusting to his anchors, and, in the end, brings back cod which ought not to command as high a price as the Shumagin fish. Why should vessels go to the Okhotsk at all? If the Shumagin cod are superior, which is admitted; if bait, provisions, fuel, and good harbors are present, and fish are plentiful, what is the motive for going farther? Small fore-and-aft schooners are required for the island fishing, and the larger vessels, if they fish at all, must hunt sea room. Is it because some men have formed the habit of going to the Okhotsk and simply keep on going from force of habit? There are certainly more than enough fish about the Shumagins to supply the wants of the San Francisco dealers for years to come. The fishermen agree that if the demand were larger plenty of fish could be found. Even with the large demand in Gloucester and Boston the famous George's Bank did not become a great resort until in 1850; and at the Shumagins we have fine fish and favorable conditions for their capture and preservation, so that when the call comes for increased and accessible supplies we shall find the industry active there.

4. THE VESSELS AND THE FISHERMEN.

THE FISHING FLEET.—The following tables show the name of each vessel, the rig, tonnage, and other details of the Pacific Ocean codfish fleet for the years 1878, 1879, and 1880:

San Francisco codfish fleet of 1878.

Name.	Rig.	Tonnage.	Built.	Place of building.	Crew.	Outfit.	Where fishing.	Sailed.	Returned.	Disposition of fish.	Number of fish.
Alaska	Sch	32	1870	Rogue River	7		Shumagins	Mar. 18	June 15	Lynde & Hough, San Francisco.	34,000
Alfred Adams*	Sch	64	1851	Essex, Mass.	7		do	Apr. 4	June 22	McCollam & Co., San Francisco.	148,000
Ariel†	Sch						do				45,000
General Miller	Sch	108	1875	San Francisco.	15		do	May 18	Sept. 25	N. Bichard, San Francisco.	23,000
J. H. Roscoe†	Sch	79.99	1851	Amesbury, Mass.	13		do	Apr. 9	Aug. 30	Johnston & Veasey, San Francisco.	20,000
May Queen	Sch						do	Apr. 3	Aug. 7		75,000
Sarah§	Sch	105	1867	Puget Sound	17		do	Mar. 29	Aug. 24	Lynde & Hough, San Francisco.	78,000
Three Sisters†	Sch	62.06					do				35,000
Wild Gazelle	Sch	114	1868	Kennebunk, Me.	16	Hand-lines	do	Apr. 6	Aug. 30	McCollam & Co., San Francisco.	66,000
Adelaide Cooper‖	Bark	300	About 1852	Pittston, Me.	32		Okhotsk	Apr. 16	Oct. 2	Lynde & Hough, San Francisco.	216,000
Constitution	Bktn	257	Rebuilt about 1870.	Philadelphia; rebuilt in San Francisco.	30		do	Apr. 11	Sept. 12	N. Bichard, San Francisco.	140,000
Fremont	Bktn	345	Rebuilt about 1870.	do	32		do	Apr. 20	Sept. 29	Lynde & Hough, San Francisco.	250,000
Page	Sch	125	1820; rebuilt several times.	East	15		do	Apr. 9	Sept. 10	N. Bichard, San Francisco.	60,000

* A tender for the fishing-station at the Shumagins.
† Bought fish caught by others.
‡ Quit the business in 1879.
§ Lost.
‖ Wrecked at Wilmington, Cal., winter 1879.

San Francisco codfish fleet of 1879.

Name.	Rig.	Tonnage.	Built.	Where built.	Crew.	Cost.	Outfit.	Where fishing.	Returned.	Disposition of fish.
Wild Gazelle	Sch	114	1868	Kennebunk, Me.	16	$8,000	$3,000	Shumagins	Sept. 20	McCollam & Co., San Francisco.
Alfred Adams*	Sch	64	1851	Essex, Mass	7	5,000	1,200	do	Apr. 25 Aug. 25 Oct. 13	Do.
Undaunted	Sch	68	About 1872	Monterey Bay	8†	8,000	3,000	do	June 21	Lynde & Hough, San Francisco.
Sarah	Sch	105	1867	Puget Sound	17	[5,000]	4,000	do	Aug. 4	Do.
H. L. Tierman	Sch	145	About 1868	San Francisco	19	[12,000]	5,000	do	Sept. 19	Do.
General Miller	Sch	108	1875	do	15	17,000	3,000	do	Sept. 21	N. Bichard, San Francisco.
Alaska	Sch	32	1870	Rogue River	7	8,000	1,200	do	Sept. 19	Lynde & Hough, San Francisco.
J. H. Roscoe	Sch	79.99	1851	Amesbury, Mass.	13	8,000	2,000	do	Aug. 1	Johnston & Veasey, San Francisco.
Adelaide Cooper	Bk	300	About 1852	Pittston, Me	32	[10,000]	6,000	Okhotsk	Sept. 28	Lynde & Hough, San Francisco.
Fremont	Bktn	345	Rebuilt about 1876.	Philadelphia; rebuilt in San Francisco.	32	25,000	6,000	do	Oct. 1	Do.
Constitution	Bktn	257	Rebuilt about 1870.	do	30	17,000	5,000	do	Sept. 21	N. Bichard, San Francisco.
Page	*Sch*	*125*	*1820; rebuilt* several times.	*East*	*15*	*5,000*	*3,000*	do	*Oct. 8*	*Do.*
Glencoe	Bg	180	About 1850	do	24†	[2,500]	5,000	do	Nov. 7	John Molloy, San Francisco.
Unga	Sch	20	1876		5‡	3,000	1,000	Shumagins		McCollam & Co., San Francisco.
Nagay	Sch	20	1876		5	3,000	1,000	do		Do.
Pirate Cove Station			Established 1876	Popoff Island, Shumagins.	8		1,000	do		Do.

* A tender for the Pirate Cove station. She brought its catch and that of the Unga and the Nagay. The Nagay was lost in the spring of 1880.

† Number estimated.

‡ All foreigners.

In Professor Jordan's notes the number of seamen engaged in 1879 is given as 247; of these about one-third are Americans, more than one-half are Danes, Swedes, and Norwegians, with a sprinkling of Irish, English, Germans, Russians, and Portuguese. The nationality varies with each vessel and cannot be more closely ascertained.

The number of dories per vessel varies from nine to twenty-five.

San Francisco codfish fleet of 1880.

Name.	Rig.	Tonnage.	When built.	Place of building.	Crew.	Where fishing.	Returned.	Disposition of fish.
Alfred Adams	Sch.	64.00	1851	Essex, Mass	7	Shumagins	May 6, June 25, Aug. 16.	McCollam & Co., San Francisco.
Wild Gazelle	Sch.	114.00	1868	Kennebunk, Me		do	Aug. 23, Oct. 22	Do.
Page	Sch.	125.00	1820; rebuilt several times.	East		do	Sept. 4	N. Bichard, San Francisco.
San Luis	Bktn.	290.07				Okhotsk	Oct. 4	Do.
Constitution	Bktn.	257.00	Rebuilt about 1870.	Philadelphia, and rebuilt at San Francisco.		do	Oct. 28	Do.
Glencoe	Bg.	180.00	About 1850	East		do	Oct. 27	John Molloy, San Francisco.
Arago	Sch.	185.76				do	Sept. 20	Lynde & Hough, San Francisco.
Fremont	Bktn.	345.00	Rebuilt about 1876.	Philadelphia, and rebuilt at San Francisco.		do	Oct. 19	Do.
Unga	Sch.	20.00	1876	San Francisco		Shumagins	Winters at the Shumagins.	McCollam & Co., San Francisco.

All of the above vessels are owned in San Francisco by a few men. The present value of the fleet of 1879 is $105,300. These vessels are fitted out by their owners; the outfit of 1879 having cost $49,400 exclusive of the fishing-station and the curing establishments in or near San Francisco.

The fleet, or some portion of it, is constantly employed in the cod-fishery from April 1 to November 1. During the interval between November and April some, at least, of these vessels are engaged in other pursuits. One small vessel is employed exclusively in the fishery and winters at the Shumagins.

The great bulk of the fishing is done by vessels owned in San Francisco, and we have little information of any others; but there have been, from time to time, small schooners from other ports. We have already referred to the voyage of Captain Haley to the Hoochenoo Bank in 1879. These fish were sold in Wrangell for $100 per ton. In the fleet of 1866 were two or three small schooners fitted out at Victoria, British Columbia; these vessels fished with very fair success on the grounds immediately north of Naas River, on the coast of Alaska, where, and somewhat farther to the northward, they reported numerous cod banks. There was, however, no home demand for the catch, as an inferior fish, caught in Barclay Sound, had possession of the Victoria market. A portion of it was sent to Portland, Oreg., and sold well.* I have just been informed by Major Morris, special agent of the Treasury Department, that no vessels are now engaged in the cod fishery except vessels owned in San Francisco.

THE FISHERMEN.—The captain of the vessel receives a fixed sum per thousand for the whole number of fish caught. Each of the crew receives a stated price per thousand for the fish he catches, the captain keeping each man's account separate. The Shumagin fleet of 1879, with a total tonnage of 756, carried one hundred and fourteen men. The smallest number on any one vessel was five, and the largest nineteen. There are no separate seamen—all take part in working the vessel. The Okhotsk fleet of 1879 employed one hundred and thirty-three men for an aggregate tonnage of 1,207. Of these two hundred and forty-seven men about one-third are Americans. More than one-half are Danes, Swedes, and Norwegians. The remainder is made up of Irish, English, Germans, Russians, and Portuguese. The proportions of nationalities vary with each vessel, and have not been more closely ascertained. On the large vessels they have, besides the fishermen proper, a dress-gang composed of headers, splitters, throaters, and salters. "The header removes the entrails and the head; the throater cuts the throat and rips the fish; the splitter splits the fish open, removing a portion of the backbone, while the salter salts them and piles them in the hold."† This dress-gang receives a fixed sum per month in an ascending ratio from the header to the splitter, and besides this they receive the regular price per thousand for any fish that they catch in their moments of leisure; the salter, however, has little time, and the splitter none at all for fishing. At the Pirate Cove fishing-station the fishermen furnish their own gear (not the dories, however) and receive their board, lodging, and fuel free. They are paid a fixed price per thousand for the cod, none of which must be under 26 inches long, and they dress their own fish on shore, four of them combining to dress their united catch in concert. The person in charge of the station keeps an account of each man's fish as he gaffs them onto the wharf. At Kodiak the same plan is followed with the exception that the buyers of the fish furnish all the gear; they, of course, pay a less price per thousand for the dressed fish. The rule is to make one voyage annually, although the vessels which go up to bring cod caught for them by others make two or three trips between San Francisco and the Shumagins. In 1868 the Porpoise attempted two trips to the Shumagins, but she took only half a fare on the second.

* Cutts: Fishing grounds of the North Pacific, p. 8.
† San Francisco Post, 1876.

Besides those professionally engaged in the cod fishery there are at least two thousand adult males in the Territory of Alaska who derive part of their subsistence from codfish either fresh or dried. These men are estimated only for the parishes of Unalashka, Belkofisky, and Kodiak, and the coast from Mount Saint Elias to Cape Fox, the number being based upon figures in Petroff's preliminary report to the Census Bureau. There is at present no means of knowing how many cod are consumed by natives of the regions in which they abound, but the number must be very great. The bidarkas at Iliuliuk, referred to previously, brought in daily from 15 to 25 cod each. Skulls of this fish have been picked up on the beaches by hundreds at a time. My own observation of the fish-drying frames was made in the height of the salmon fishing, and, of course, salmon predominated over everything else. Wherever we went in the limits of cod we saw more or less hanging up drying without salt. Wherever the native gear has not been superseded by that of the white fishermen lines of bark or of kelp are used. The Indians of the Hoochenoo region have barbless iron hooks and bark lines. Two of them go off in a canoe, each one having *for his portion all the fish he catches. The two will catch from 25 to 50 cod in the time spent in* fishing each day. So far as I know trawl-lines are not used by any one except the professional fishermen.

5. APPARATUS AND METHODS OF FISHING.

THE FISHING GEAR.—In the earlier years of the Shumagin fishery hand-lines alone were used for catching cod. The use of trawls, according to Capt. Andrew Anderson, began there in 1869. *In 1874 one vessel used trawls. In 1875 the Dashing Wave was the only one fishing with them.* Since that time they have been extensively employed, so much so that one correspondent declares that they have made the fish less plentiful than they were five years ago. The Wild Gazelle uses hand-lines altogether; the Unga, hand-lines and trawls. The gear of the Unga and the Nagay, 20-ton schooners, for the season of 1879 cost $362 each. This includes dories, hand-lines, hooks and leads, trawl-lines, hooks, buoy-lines, anchors, buoys, and tubs.

Some of the dories used in the cod-fishery were bought in the East; others are made in San Francisco. The Beckwith dories are essentially like those of Cape Ann in shape and structure, but the materials are different; sugar pine and fir are used, and the rails are oak. A 16-foot Beckwith dory costs $27.50 without the oars. The average cost of dories in San Francisco is $25. Hooks and all other outfit, except dories, hawsers, and food, come from the East.

BAIT.—The item of bait has never been an expensive one for the San Francisco fleet. In the earlier years of the fishery salted herrings were the principal dependence, and a vessel of 100 tons required about $100 worth of this kind of bait, according to Davidson. Cutts's estimate is $100 worth of herring for a vessel of 200 tons. As late as 1879 salt herring were still relied on to some extent, but most of the bait was obtained on the fishing-grounds. In 1876 the fleet used salted clams in part, the main supply coming from Puget Sound. Davidson, in the Coast Pilot of Alaska, 1869, says that his party "fished with clams, the *Schizotherus nuttallii*, obtained at Port Simpson on our way up; but there are plenty of small fish, herring, clams, &c., suitable for bait, in all the harbors along the coast. The clam hangs best to the hook." There is no lack of fresh bait *throughout the fishing-area. Fine clams are exceedingly abundant at the Shumagins and at Sitka* and Cook's Inlet. Herring (*Clupea mirabilis*) are found in great numbers on the whole coast of Alaska as far north as Hotham Inlet, being particularly abundant in Prince Frederick Sound, Cook's Inlet, around Kodiak Island, and generally in all cod-areas. Captain Bowen told me that on the 7th of July, 1880, off Ugak Bay, while sailing at the rate of about 4 knots per hour he passed through herring-schools for four hours in succession. "Lant" (*Ammodytes personatus*) are

exceedingly plentiful, and extend even as far north as Point Belcher. Capelin (*Mallotus villosus*), as already stated, abound; great quantities of their young were taken by us in Plover Bay and on the Alaskan coast north of the Arctic Circle; in July the adults were swarming in Cook's Inlet and in the vicinity of Kediak. Squid, or cuttle-fish (*Octopus punctatus*), form one of the commonest and best baits for cod. Young halibut (*Hippoglossus vulgaris*) are everywhere abundant and much used. Sculpins, too, are freely employed, the two species of *Hemilepidotus* being most used. At the Shumagins the pollock, or, as it is called there, "England hake" (*Pollachius chalcogrammus*), is a very taking bait in June and July. About this time also the "striped fish," or "yellow fish," (*Pleurogrammus monopterygius*), is the favorite with the fishermen. This species schools in large numbers, and will follow a baited hook up to the surface of the water; in itself an excellent table fish, it is at the same time unexcelled as a bait for cod. Salmon are extensively used in the cod-fishery, particularly around Kodiak, and I have been told that a kind of salmon trout is much employed in the Okhotsk. This trout may be *Salvelinus malma*, which I know to be abundant in Plover Bay, and which, on account of the large size frequently reached by it, must be very desirable for the purpose. The supply of bait comes, therefore, in small part, from San Francisco; but the greater portion of it is readily obtained on the fishing-grounds.

In 1878 the average length of a trip to the Shumagins was four months and three days; to the Okhotsk, five months and seven days. The average of 1879 was about the same.

6. CARE AND DISPOSITION OF THE CATCH.

FISH-CURING.—Ice is not at all used in the Pacific cod-fishery, except occasionally mingled with snow, by vessels for carrying fresh herring from Petropaulski to use them in the Okhotsk.

SALT.—All the fleet take as the greater portion of their outgoing cargo a supply of salt, allowing about 1 ton for 1,000 fish at the first salting on board the vessel. They require, therefore, from 30 to 200 tons each. The fish, after being split and washed on deck, are salted in bulk in the hold of the vessel and brought to San Francisco to be pickled in large butts and kept until wanted for the market, when they are taken out and dried half a day or so on flakes, and are then ready for sale. The resalting in San Francisco requires about 1 ton of salt for 5,000 fish. On their arrival from the fishing-grounds the fish are carefully washed, and the black peritoneum, or "nape," is removed before putting them into the butts. The vats or butts hold from 1 to 14 tons each. At the Pirate Cove station Mr. Devine uses about a ton of Carmen Island salt to 1,000 fish. The fish are kenched in a large warehouse, as many as possible being put into a bench in order to economize space. Some of the cod, according to Mr. Devine, seem to be more watery than the average of the Eastern, and lose two-thirds in curing. Only large fish are kenched here; small fish are pickled. There is at least one place in Alaska where codfish have been successfully "made"—that is, fully prepared to be put upon the market. The Western Fur and Trading Company of San Francisco had prepared for them by Capt. H. R. Bowen, at Saint Paul, Kodiak, in the summer of 1880, 30 100-pound boxes of dried cod and 350 boxes of boneless cod of 30 pounds each. This was done by way of experiment. In conversation with Captain Bowen and his father, D. R. Bowen, I was told that the cod can be made equal to the best Eastern fish if they are handled in the same way. Mr. D. R. Bowen has had twenty-five years experience in the Cape Ann fisheries, and his opinion is entitled to consideration. He says the cod dry better and more quickly at Saint Paul in a westerly wind than they will in San Francisco; they will dry without a bit of salt. Even the salmon will dry without salt there. "Take the season through," said Mr. Bowen, "I can take and make fish as well here as in Gloucester. They will dry the same as stock-fish in Norway." There are Norwegians aboard the vessel commanded by Captain Bowen who are thoroughly acquainted with the

stock-fish. I have tasted boneless cod from Gloucester side by side with a similar article prepared at Saint Paul, and I fully believe that the fish made at the latter place is equal in quality to the Gloucester fish in its prime condition.

Up to 1877 the salt used in the Pacific fishery was principally, if not entirely, what is known as bay salt, which was made by solar evaporation near Alvarado. From all that I can learn, bay salt is principally used now, but the quality has been vastly improved. There has been much complaint as to the presence of lime in the salt, which was believed to make the cod hard and brittle. A correspondent of the San Francisco Post, who made a trip to the Shumagins in the schooner Alaska in 1876, has this to say about the salt: "The cod brought into San Francisco for the last few seasons was notably hard, and did not command a fair price in the market. This hardness was given by the salt used in preserving them not having been properly refined. It contained a quantity of sulphate of lime and other impurities, which dried and burned up the fish. This season the fleet took out 1,200 tons of salt of a much superior character. That which we had on the Alaska was fine enough for table use, the crystals being large, translucent, and beautifully white." In 1879 about 800 tons of salt was used for 1,000 tons of fish, according to the San Francisco Alta (quoted in Sea World, August 4, 1879). I quote from the San Francisco Commercial Herald and Market Review of January 18, 1877, with reference to the preparation of cod: "Previously it was thought best to dry the fish for preservation, but it is now kept in pickle until the time for using it in market approaches, when it is dried in lots to suit. By this means a uniform article is offered from month to month, instead of the hard, dry, and tasteless stuff with which the seasons wound up. The plan of using brine a number of times has been given up, as it was found to cause the unpleasant odor peculiar to the poorly-cured codfish. Another cause of the success attending this interest is in the improved quality of the salt used. An analysis of the common bay-salt, that heretofore used, gave 40 per cent. of lime, soda, and magnesia, and these ingredients made the fish hard and brittle. The salt now in use is manufactured mostly by the Union Pacific Salt Company, and is guaranteed to contain 98 per cent. chloride of sodium and equal to the best imported from Liverpool. Under these favorable changes we are now producing an article equal to any the world can afford, and invoices of Eastern cod are falling off, only enough coming in to meet the wants of a few who still persist in using it."

The price of coarse salt is from $6.50 to $7 per ton. The salt used at the Pirate Cove station costs $16 delivered there.

I conclude my account of the methods of the fishery with a quotation from the article in the San Francisco Post, to which I have previously referred, which conveys a good idea of the manner of handling cod when they are transferred from the vessels to the curing establishments:

"Over at California City, Lynde & Hough have built a yard at an expense of $10,000, for curing and preserving fish. As the codfish arrive on the vessel they are packed as closely as possible, one over the other, in layers, with strata of salt between them. At the yard the first operation is to break cargo. The fish are then placed in a perforated wooden box, open on top, and let into the water by tackle from the ship. Across the top of the box boards are put for two men to sit on. They take the fish one by one, and by the aid of water and elbow-grease rub the black inner skin off. Their feet are in the water, and, although it is rather rough on the hands, especially to a beginner, we face it as Jeffrey faced the cat, and after a while one's hands get callous and as insensible to pain as the hide of the "armed rhinoceros." The next operation is to place the washed fish in pickle, for which purpose they are conveyed to the packing-house. In the packing-house a long series of barrels are arranged in rows sufficient in number to pickle 500 tons of fish. The pickle consists simply of a strong solution of salt, made with pure spring water,

conveyed from the heart of the cañon above, and in it the fish are allowed to soak for about ten days, when they are taken out and placed on the "flakes" to dry. The "flakes" consist of a frame, with a number of laths placed at intervals apart rising from each side of the frame and making an obtuse angle at the top. On these laths the codfish are spread to dry, and when night comes on taken under cover. A great deal of care has to be exercised in the drying process, as prolonged exposure to a very hot sun would result in the utter destruction of the fish. When properly dried the fish are ready for market, and command from 6 to 7 cents per pound."

Under the present arrangement, it will be remembered, the fish are kept in pickle until they are needed for the market, when they are dried on the flakes only half a day or so. The climate of San Francisco is said to be good for drying fish in summer, but not in winter.

7. CAPITAL INVESTED IN THE INDUSTRY.

CAPITAL IN VESSELS, APPARATUS, AND CURING ESTABLISHMENTS.—All the capital invested in the Pacific cod fishery is furnished in San Francisco. The parties who were engaged in the business in 1879 are the following—the names of their vessels being also given: Thomas W. McCollam & Co., 208 Clay street, the Wild Gazelle, Alfred Adams, Unga, Nagay,* Pirate Cove station. Lynde & Hough, 416 Davis street, the Undaunted, Sarah (now lost), H. L. Tiernan, Adelaide Cooper, Fremont. N. Bichard, 10 Howard street, the General Miller, Page, Constitution. James Laflin, 37 Vallejo street, the Alaska.† Johnston & Veasey, Davis street, near Washington, the J. H. Roscoe.‡ John Molloy, Clay street, the Glencoe.

The value of these vessels, as already stated, is $105,300.

Lynde & Hough have a warehouse 4 miles south of San Quentin, with wharf and tanks, which cost $35,000. McCollam & Co. and Bichard have warehouses opposite Saucelito. McCollam & Co. own the permanent fishing-station at Pirate Cove, Shumagins, where cod are kenched or pickled.

According to the information obtained in San Francisco from leading men in the cod trade, by Prof. D. S. Jordan, the capital invested in 1879 was as follows:

	Value.
Warehouses, wharves, &c	$70,000
Ships engaged	104,300
Outfit (including provisions)	48,200

The total expenses of all sorts were said to be about $225,000, and the total value of the product as sold delivered in San Francisco, $234,000.

Following is a copy of the returns of codfish-curing establishments in Saucelito Township California:

	T. W. McCollam & Co.	Lynde & Hough.
Capital	$6,000	$20,000
Maximum of hands	25	60
Males above 16 years	10	13
Hours in ordinary day of labor:		
May to November	10	10
November to May	9	9
Total wages during year	$2,500	$6,990
Months in operation on full time	12	12
Value of material (including mill-supplies and fuel)	$52,500	$25,100
Value of product	$82,500	$42,000
Average day's wages for skilled mechanic	.....	$1 50
Average day's wages for ordinary laborer	.....	$0 75

*Lost at the Shumagins in 1880. †Sold out and gone to Mexico. ‡Sold out.

8. FINANCIAL PROFITS OF FISHERMEN AND CURERS.

METHODS OF SHARING THE PROFITS.—The captain of the vessel receives about $8 per 1,000 for the entire catch. The dress-gang and salters get about $25 per month; good men, $30. As already explained, most of these men have a chance to catch some fish, for which they receive $25 per 1,000. The fishermen are paid $25 per 1,000 each for his own catch. The captain keeps each man's account separate.

In 1876 wages were much higher; headers received from $30 to $35 per month; throaters, $35 to $40; salters, $45; splitters, $65. The first two also had some time for fishing, and received $25 per 1,000 for the fish. In this year "one man on board the schooner Selma" had 13,000 fish to his credit, which, at $25 per 1,000, would give him $325, exclusive of any prize. As the Selma is a small schooner like the Alaska and does not carry a "dress-gang," the pay is more likely to be $30 per 1,000, which would give him $390, or over $97 a month—not bad pay for a sailor. In the schooners the captains usually split their own fish and the men do the dressing. The captain is sometimes paid by the month, receiving about $120, but more generally he has an interest in the quantity of fish taken, and receives from $8 to $10 per 1,000. Where the vessel is very small, it is usual to pay the captain by the month, because 28,000 or 30,000 would be a cargo, and at $10 a 1,000 that would bring him in only $280 or $300 for a cruise of four months.*

I believe the average pay of a fisherman in 1879 was small, judging from the table which follows:

Vessel.	Number of fish.	Price, per 1000.	Crew.	Cost of catching.	Average share per man.†
Wild Gazelle	85,000	$25	16	$2,125	$142
Undaunted	62,000	25	8*	1,575	.....
Sarah	71,000	25	17	1,775	111
H. L. Tiernan	97,000	25	19	2,425	135
General Miller	80,000	25	15	2,000	143
Alaska	10,000	25	7	250	42
J. H. Roscoe	52,000	25	13	1,300	108
Adelaide Cooper	225,000	25	32	5,625	181
Fremont	240,000	25	32	6,000	194
Constitution	205,000	25	30	5,125	177
Page	40,000	25	15	1,000	71
Glaucus	133,000	25	24*	3,325	.....
Unga	35,000	30	5	1,050	210
Nagay	35,000	30	5	1,050	210

*Number estimated.
†The captain, of course, is excluded, except in case of the last two.

Leaving out the exceptional cases of the Alaska and the Page, the average wages of the Okhotsk fishermen was $36 per month for the season of five months, and the average of the Shumagin men was $32 per month for a season of four months.

The average annual catch of cod at the Pirate Cove station is about 200,000 fish, of which, in 1879, the Unga and the Nagay together caught 70,000; the balance were caught by eight men, each of them averaging, therefore, about 16,250 fish. At $27.50 per 1,000 the gross earnings of each man were $446.87. Deducting all necessary expenses, each fisherman should have nearly $400 for his season's work, and his board, lodging, and fuel free. In 1880 the returns from the same station were 142,000 fish, of which the Unga took 35,000. Each man's share will therefore

*San Francisco Post.

be about $367.81, which will leave him perhaps $340, or an average of nearly $30 per month the year round, clear of necessary expenses.

At Saint Paul, Kodiak, the average daily catch per man is 200 fish, which are worth, dressed, $4. Very little cod is shipped to San Francisco from that point, the major portion being dried by the natives for their own use.

PRODUCTS OF THE FISHERY.—The greater portion of the Pacific cod are salted in the hold of the vessel and brought to San Francisco to be kept in pickle until they are wanted for the market, when they are "flaked" for a short time. The Pirate Cove fish are kenched in a building put up for the purpose, except the small ones, which are pickled. Kench-cured and pickle-cured cod are therefore the principal products of the fishery. Cod sounds at the Shumagins are said to be thin and tough and they are not put up. The heads are thrown away also. The Western Fur and Trading Company of San Francisco had put up for them, experimentally, by Capt. H. R. Bowen, at Saint Paul, 250 pounds of tongues in kits of 25 pounds each, 3,000 pounds of dried codfish in 100-pound boxes, and 10,500 pounds of boneless cod in 30-pound boxes.

Three sorts of codfish are usual in the market: Bundled, the common kind; boxed, the largest selected, in 100-pound boxes; boneless, the skin and vertebræ removed, in 12- and 30-pound boxes.

One of the San Francisco firms brand their best fish "Extra George's Codfish," anchor trade-mark.

In 1866 10,000 gallons of cod-liver oil were reported. In 1879 Lynde & Hough brought to the San Francisco market 3,000 gallons said to have been of superior quality.

The following table shows the quantity and value of cod taken in the Pacific Ocean fishery during the years 1865 to 1880:

Year.	Number of fish.	Average price per pound.	Weight, in pounds.	Value.
		Cents.		
1865	469,409	13	1,314,880	$170,934 40
1866	724,000	13	2,020,480	262,662 40
1867	943,400	12½	2,649,920	331,240 00
1868	668,000	12	1,684,480	202,157 60
1869	1,032,600	9	3,046,400	274,176 00
1870	1,265,500	6½	3,543,680	230,339 20
1871	772,000	7	2,213,120	154,918 40
1872	306,000	7	913,920	63,974 40
1873	556,000	6	1,632,960	97,977 60
1874	381,000	6	1,077,440	64,646 40
1875	504,000	7	1,429,120	100,038 40
1876	758,000	6	2,252,440	135,206 40
1877	750,000	5	2,027,520	131,376 00
1878	1,190,000	5	3,097,920	154,896 00
1879	1,499,000	4+	4,721,920	196,870 00
1880	1,200,000	5	3,618,000	180,900 00
Total			37,845,200	2,752,293 20

To this yield must be added the value of the cod-liver oil, of which 13,000 gallons are recorded, and of the tongues and dried and boneless fish prepared for the Western Fur and Trading Company at Kodiak. The figures given above relative to the number of fish taken each year are from the San Francisco Commercial Herald and Market Review. They agree in the main with numbers gleaned from other sources, but I have never seen any two statements that are exactly alike. The yield is put down at probably less than it really was, certainly not greater. The comparative results from the Okhotsk and the Shumagins for the years 1878, 1879, and 1880 appear in the following table:

Number of codfish taken 1878, 1879, and 1880.

	1878.	1879.	1880.
Okhotsk	666,000	803,000	917,000
Shumagins	524,000	696,000	289,000

It must not be supposed that the number of fish present at the Shumagins is decreasing; fish are plentiful enough there, but the greater part of the fleet in 1880 consisted of large vessels, which make it a rule to fish in the Okhotsk.

In 1879, according to one of the prominent men in the business, the total cost of producing cod ready for the salesroom in San Francisco was $63 per ton, or about 2¾ cents per pound. This dealer hoped to be able to reduce the cost for 1880 to $56 per ton, or 2½ cents per pound.

The selling price of cod in 1879 was lower than ever before, and the business was scarcely profitable. This depression was due in part to overstocking the market. A glance at the yield of the fishery will show that about 1,250,000 fish is the normal maximum demand, but in 1879 about 1,500,000 were brought in. Again, there was considerable rivalry between some of the dealers, which led to cutting under the rates. The consequence of this rivalry, combined with the depression from natural causes, appeared in the small fleet of 1880, most of the smaller speculators having given up the business.

In 1880 a combination was formed by the three principal houses, and prices are higher than they were in 1879. The rates are: Choice large in 100-pound boxes, $5.50 per box; medium in 50-pound bundles, 5 cents per pound; boneless in 30- and 50-pound boxes, 6½ cents per pound; in quantities less than 5 tons, 5 per cent. discount is allowed; and in lots of 5 tons and upwards, 7½ per cent.

6.—THE GILL-NET COD FISHERY.

By J. W. Collins.

1. INTRODUCTION.

Although gill-nets have long been used in Northern Europe, more especially in Norway, as an apparatus for the capture of cod, and are considered indispensable by the Norwegians, they have not until recently been introduced into the United States. It 1878 Prof. Spencer F. Baird, U. S. Commissioner of Fisheries, knowing how profitably these were employed by the Norwegian fishermen, decided to make experiments with them at Cape Ann, with a view to their introduction among the cod fishermen of this country. He accordingly secured a number of the Norwegian nets, which were sent to Gloucester and there tested by the employés of the Commission.

Experiments were made when the winter school of cod were on the shore grounds, but the results obtained were not satisfactory, owing chiefly to the fact that the nets were found far too frail for the large cod which frequent our coast in winter. This was apparent from the numerous holes in the nets, which indicated plainly that large fish had torn their way through, none being retained excepting those that had become completely rolled up in the twine. The current also swept them afoul of the rocky bottom, which injured them still more, so that they were soon rendered nearly unfit for use. The nets were invariably in bad order when hauled from the water, but even under such unfavorable circumstances nearly a thousand pounds of fish were

caught on one occasion. This seemed to indicate that nets of sufficient strength might be used to good advantage, at least on some of the smoother fishing grounds along the coast.

These preliminary trials, therefore, having demonstrated that nets could be employed advantageously in the American cod fisheries, Professor Baird availed himself of the first opportunity that offered for obtaining definite knowledge of the methods of netting cod in Norway, with the intention of disseminating this information among American cod fishermen.

The opening of the International Fishery Exhibition at Berlin, Germany, in the spring of 1880, presented a favorable opportunity for accomplishing this purpose. Professor Baird having appointed me as one of the commission to attend the exhibition on the staff of Prof. G. Brown Goode, desired that a careful study should be made of the foreign methods of the deep-sea fisheries as represented at the exhibition. The method of capturing cod with gill-nets, as practiced by the Norwegian fishermen, was mentioned as a subject which should receive especial consideration, and it was suggested that it might even be desirable to visit Norway, so that the practical operation of this fishery could be observed.

It was the original intention of Professor Baird that a report of the observations made at the Berlin exhibition should be published as soon after the return of the commissioners as possible, but circumstances delayed its preparation.

The use of gill-nets in the cod fisheries at Ipswich Bay during the winter of 1880–'81 resulted in such complete success that there is probability that they may be, at some future time, introduced into the bank fisheries, as well as those along the coast.

2. CONSTRUCTION AND RIG OF THE NETS.

NORWEGIAN METHODS.—The nets used in the Norwegian cod fisheries are usually made of hemp twine, of two, three, or four threads, but occasionally of flax or cotton. The three-layed hemp twine, which is the most common size, weighs a pound to 400 or 420 fathoms. It is made chiefly on spinning wheels by the fishermen's families, and the nets are constructed almost exclusively by the fishermen and their wives and children. Some of the hemp twine, however, is furnished by the factories of Norway and Great Britain, which also supply all of the cotton and linen twine.

The size of the mesh varies somewhat, according to the locality where the nets are to be used, as it is necessary to make the mesh correspond to the size of the fish that frequent different parts of the coast, or make their appearance at different seasons. The smallest mesh is about $5\frac{2}{8}$ inches ($2\frac{7}{16}$ inches square) and the largest 8 inches (4 inches square). Those exhibited at Berlin were 7 and 8 inch mesh.

The length of the nets varies from 10 to 20 fathoms, the average length of those used at the Lofoten Islands being $15\frac{1}{4}$ fathoms, when hung, and they are from twenty-five to sixty meshes deep. Nets about thirty meshes deep are generally used, while those of sixty meshes are employed only where there is little or no current. The nets are hung both to single and double lines, and these vary somewhat in size. Those exhibited were hung to double lines, each being $\frac{7}{16}$ of an inch in circumference, while Mr. Wallem says that 2-inch rope when single, and 1-inch rope when double, is the size commonly used at the Lofoten Islands. Some of the nets are hung to lines only at the top and bottom, having none across the ends, while others have them on the ends as elsewhere. This last method is said to have been recently introduced, and is considered an improvement when the line is a little short, so that the net will be a trifle slack or baggy. About one-third of the net is taken up in hanging; that is, if a net is 30 fathoms long, stretched out, before it is hung, it will

be about 20 fathoms long afterwards. They are hung with twine about the same size as that of which they are made. The end of the twine is first made fast to the hanging line, then hitched to the upper part of one of the meshes, the distance between the line and mesh being equal to one side of the mesh; then back to the line again, around which a clove-hitch is taken, thus forming one-half of a mesh. This method of hanging is thought by the Norwegian fishermen to be superior to any other for large-mesh nets. The nets are generally prepared for use in Norway by tanning, and will last, when so prepared, from one to five seasons.

The nets are supported upright in the water by floats of wood, cork, or hollow glass. At the Lofoten Islands, where nets are more extensively used than elsewhere, the glass floats are preferred, it being said that they replace to great advantage the old wooden ones, which failed to prevent the nets from settling on the bottom. The fishermen from Söndmör, however, who fish on banks where there is a strong current, prefer wooden to glass floats, since it is said that the latter are so much more easily carried away by the tide, causing the loss of many nets, while the principal objection to wooden floats is that they soon become waterlogged. But this is thought to be the lesser evil of the two, since they can, at the worst, only sink to the bottom with the nets, whence they may easily be recovered. From this experience of the Norwegian fishermen it may be inferred that while glass floats are preferable for general use, they are not so suitable as either wood or cork buoys where there is a strong tide. The glass floats are about 5 inches in diameter, with a covering of tarred marlin or spun-yarn hitched over them, to which is attached an eye. In this eye is bent the small rope that holds them to the net. When so prepared for use, these floats are very strong, and break far less frequently than might be supposed. They withstand the pressure of water when submerged better than anything else that has been tried, but are sometimes filled with water—"drunken" it is called—when set in 70 or 80 fathoms. The small ropes with which these are held to the nets vary in length from 1½ to 6 feet.

Oblong-shaped stones from 3 to 5 inches in length are used for sinkers. By experience the fishermen learn how large these should be to sink the nets to the desired depth. From ten to twelve are fastened to the bottom of the net at equal distances apart, being held in a double string.

Large stones are used instead of anchors to hold the nets to the bottom. These weigh from 72 to 144 pounds, the heavier one heading the current, and the smaller being on the other end of the gang, containing twenty to thirty-five nets. Besides these "mooring rocks" there are others of smaller size, which are held to the nets by a foot-line, one end being fastened to the stone which lies on the bottom, and the other to the rope that connects the lower part of the nets together. The larger stones are generally slung with rope, but sometimes with a band of iron around them, with an eye or ring to which the foot-line can be fastened. Iron anchors are not used, as the nets are liable to be torn on them should they settle on the bottom.

Buoys of different kinds are used by the Norwegian fishermen, but, according to Mr. Wallem, at the Lofoten Islands glass buoys, having a capacity of about three to five gallons, are the most common. These are generally egg-shape and are covered in the same manner as the glass floats. Sometimes a buoy is made by fastening several of the latter around a staff. The glass buoys of both kinds are employed in the trawl as well as the net fishery; they will rise to the surface again after having been under water for several days—an advantage not possessed by other kinds—and it seems that buoys of this description might be profitably used by our bank fishermen, who frequently lose large quantities of gear on account of the wooden ones bursting and filling with water when they are submerged to any considerable depth. Hard-wood iron-bound kegs are used by some of the Norwegian net fishermen. From two to four glass floats, such as are on the nets, are fastened to the bight of the buoy-line at different distances from the buoy, for the purpose of keep-

ing the slack or scope from going on the bottom when there is no current. Where there is a strong tide, and a probability of the large buoy being drawn under the surface of the water, a number of the glass balls are attached to it with a line, these serving as "watch-buoys" for the other.

NEWFOUNDLAND METHODS.—The nets employed in the Newfoundland cod fishery are usually made of hemp twine one size smaller than salmon-twine, which is also occasionally used. The size of the mesh is generally about 6 inches (3 inches square), a large mesh not being required for the small fish that frequent that coast. The nets vary in length from 50 to 80 fathoms and in depth from 3 to 4 fathoms. They are hung to the lines in the same way that the Norwegian nets are, the foot-line being 1¼-inch rope, while small-sized double lines of opposite lays are the hangings for the top and ends. Rope is used on the lower part of the net, because, when set close to the bottom, small line would probably be bitten off by ground-sharks, thereby causing the loss of a portion of the net.

To preserve the nets the Newfoundland fishermen make a mixture of tan and tar, which is thought better than either used separately. The tan is commonly made from spruce buds, fir bark, and birch bark (hemlock bark is not used), which are boiled together until sufficiently strong, when the bark is removed, and tar added in the proportion of 5 gallons of tar to 200 gallons of tan, the whole being stirred well together. Considerable care is necessary in applying this, or else it will not be evenly distributed on the net. The custom of mixing tan and tar has doubtless been introduced from England, as it is known that the Cornish fishermen do this, pouring out their tanning liquor into large vats with coal tar, and this mixture is found to preserve the nets much longer than simple tanning. The Newfoundland nets, when prepared in this manner, generally last about four seasons.

The floats are made of the best bottle-cork, when obtainable. Before being used they are dipped in hot pitch or tar, after which it is said they will stand for four weeks at the bottom in 50 fathoms before getting water-soaked. The fishermen have two sets of floats—one when soaked being replaced by the other.

The sinkers most generally in use by the Newfoundland fishermen are made by tying small rocks in a bag of old netting or cloth; but lead sinkers, similar to those on seines, are occasionally attached to the nets. The sinkers weigh from 1 to 2 pounds, are about 13 feet apart, and are fastened close to the bottom of the net.

Anchors, rocks, and stone killicks are used for moorings to the nets. The former weigh from 20 to 25 pounds each, while the killicks and rocks vary from 25 to 60 pounds, the heavier heading the current and the lighter being on the opposite end of the net or gang.

The buoys are generally made of dry fir poles, 6 to 8 inches in diameter, are usually from 3 to 4 feet long, and sharpened at one end, through which is a hole for the strap that the buoy-line bends to. Kegs are also used for buoys.

AMERICAN METHODS.—The nets that were first tried in Ipswich Bay were made of twine about the same size as that used in Norway; indeed, part of them were Norwegian nets which had been lent to Capt. George H. Martin by the United States Fish Commission. These were found, as in the previous trials made by the Commission, entirely too weak for the purpose, and were soon badly torn; not, however, before it had been proved that suitable nets could be very successfully used. The nets that have since been constructed for this fishery are made of twelve thread Scotch flax twine. The twine is very strong, and is found to be well adapted for the capture of large cod. The nets are 9 inch mesh (4½ inches square), that size having been found well adapted for taking the large winter cod in that locality.

The size of the nets depends somewhat on the locality where they are used, and also on the

movements or habits of the fish. In some places where the cod keep close to the bottom, long shallow nets are probably the most suitable, while at other points, as at the Lofoten Islands, where fish are often found in the greatest numbers some distance from the bottom, deeper nets are required.

The nets made for Captain Martin were 50 fathoms long and 3 fathoms deep, but as nearly all the fish were caught near the bottom, other parties have since had longer nets of less depth; many of those made for the shore-fleet are 100 fathoms long and 2 deep.* These were hung to small double lines of opposite lays, and they are generally tanned or tarred before being used. It may be well to mention here the Dutch method of tanning cotton herring nets, which is thought better than any other by those foreign fishermen, and may, perhaps, be applied with equal advantage to other nets, when made of that material. The tan is made by boiling catechu in water in the proportion of 1 pound of the former to 2½ gallons of the latter. When the solution is sufficiently strong the nets are soaked in it for twenty-four hours, after which they are dried. They are tanned and dried three times, and then soaked in linseed oil. A pound of oil is provided for each pound of net, and they are allowed to remain in it as long as any will be absorbed. They are then well drained and spread out on the ground to dry, after which the process is completed by tanning them once more.

Glass floats, similar to those of Norway, have been used on the American nets.† These cost about 30 cents each, when covered with coarse netting, and twenty-five of them are attached to a 50-fathom net. Bricks are chiefly used for sinkers, one of which is fastened to the foot of the net directly beneath each of the floats, they being held in the same manner that stone sinkers are. It is probable that suitable metal sinkers may soon be devised, and perhaps desirable improvements may be made in the floats as well, though various devices which have been tried have not met with the approval of the fishermen. The cost of nets 50 fathoms long, with floats attached, is about $18.

Fourteen-pound trawl-anchors have been found suitable for Ipswich Bay, one being attached to each end of a gang of three nets, but it is quite probable that heavier ones will be required where there is deeper water and more current.

The buoys are common quarter-barrels, rigged in the same manner as for trawling.

3. THE NEWFOUNDLAND FISHERY.

Gill-nets have long been used in the Newfoundland cod fishery, especially on the east and south coasts of the island, but the exact date of their introduction is unknown. It is asserted, however, that this method of fishing has been pursued since early in the present century, and is still carried on to some extent.

The coast of Newfoundland is indented with many large bays or fiords, which are favorite feeding grounds for the cod. In the early summer they make their appearance in pursuit of the capelin that gather in immense numbers along the shores to spawn, and generally remain from three to five weeks. During this time the schools of cod usually keep near the surface of the water and the nets are set floating, but later they are set at the bottom, for when the capelin leave the shores the cod move into deeper water. The nets are set singly or in gangs of three to seven. Two anchors are generally attached to a gang of floating nets, as represented in the plate, but where there is a current one is sometimes found sufficient. They are usually set in the afternoon and

* These nets have been principally made by the American Net and Twine Company, and H. & G. W. Lord, Boston, Mass.

† These are made at the glass factories in Boston.

hauled in the morning. Owing to the comparative lightness of the anchors fewer men are required to haul these than in Norway, as a single fisherman will sometimes take in one or more nets, though in most cases two or three go in a boat. The net-fishing is far less productive than that of Norway, but sometimes a large catch is made. Captain Jacobs states that on one occasion he took from four nets 2,000 cod, but says that this is rarely equaled. These fish are what are known in the American markets as medium cod.

4. THE AMERICAN FISHERY.

Mention has been made of the introduction and trial of cod gill-nets by the United States Fish Commission in 1878, but no attempt was made by the fishermen to use them until the fall of 1880, when Capt. George H. Martin, of Gloucester, Mass., master of the schooner Northern Eagle, fitted out with them for the winter cod fishery off Cape Ann and in Ipswich Bay. The immediate cause which led to this trial was the difficulty of procuring a supply of bait, which is a source of considerable trouble to our shore fishermen, and its cost, even when obtainable, is such a heavy tax on this branch of the fishing industry that often the fishermen hesitate to engage in it, fearing the result will be a loss rather than a gain. It was to obviate this difficulty and to render our cod fisheries more valuable in consequence, that led Professor Baird to bring the cod gill-nets to the notice of the American fishermen. The bait principally depended on by the shore fishermen in the vicinity of Cape Ann, during the fall and early winter, is young herring (*Clupea harengus*), known as the "spirling." The appearance of these fish about the cape is somewhat irregular; sometimes large schools remain for several weeks, and at other times but few can be taken. There was so little probability of getting a supply of bait in the fall of 1880 that Captain Martin hesitated about fitting out, fearing that the cost and difficulty of securing a supply of this article, which is indispensable to the trawl-line fishery, would render the undertaking unprofitable. While the matter of fitting out was under consideration, gill-nets were suggested by the father of Captain Martin, an employé of the Fish Commission, as a means of solving the perplexities of the bait question. He thought the idea a good one, and, together with several of his crew, visited the station of the Commission at Gloucester, looked at the Norwegian nets that were there, and consulted with the agent in charge as to the probabilities of success. The result of this interview was that Captain Martin decided to fit out and give them a thorough trial, and nets were therefore obtained for this purpose, part of them being supplied by the Fish Commission.

Before the trial trip was made Captain Martin had an interview with me at Gloucester, and I briefly explained to him the Norwegian methods of using the nets. He thought, however, that they might be "underrun," as trawls are sometimes, which would enable one man to handle a gang of nets for which an entire boat's crew, six to eight men, is required in Norway.

Ipswich Bay, where the nets have been chiefly used, lies north of the prominent headland of Cape Ann, which divides it from the waters of Massachusetts Bay on the south. A sandy beach extends along the northern and western sides of the bay, and the bottom sinks gradually from this, only reaching a depth of 25 to 30 fathoms at a distance of several miles from the land. The bottom of the bay is a sloping sandy plateau, with only here and there small patches of rocks or clay, supporting but a small amount of animal life that may serve as food for the cod. It is, therefore, a spawning rather than a feeding ground for these fish, and large schools visit the bay during the winter for the purpose of reproduction, and generally remaining until late in the spring. The nets are usually set along the northern part of the bay, but a few miles from the shore, in about 15 fathoms of water, where there is less current than at some other points along the coast.

A peculiar habit of the fish taken in Ipswich Bay has been observed. The fishermen state

that a large percentage of the cod which have been caught in that region have been netted on a small area of bottom, not exceeding three-fourths of a mile in diameter. This "spot of ground" appears to be swarming with cod for a considerable portion of the winter, while the adjacent bottom seems to be almost entirely barren of fish. It is rather irregular in outline, the fishermen say, judging from where the fish are taken, but so far as anything can be told of its physical conformation, it does not differ from the rest of the sandy slope immediately surrounding. It is said that there is no "feed" on the bottom. The fishermen have a theory that there are fresh-water springs in this particular locality, around which the cod love to gather; nor, indeed, can they assign any other reason, since there appears to be no special feature in the character of the bottom. So persistent are the cod in clinging to this locality that, almost invariably, nets placed within its limits come up well filled with fish, while gear set a dozen or twenty fathoms distant get very few, if any, cod. The fishermen have been very much puzzled to understand how the fish get to this spot and escape the walls of netting which surround it on all sides. They do not believe that enough cod could be there at one time to fill the nets night after night for months, and they arrive at the conclusion that the fish must reach the place during the day, at which time they are supposed to rise above and swim over the nets that bar their progress at the bottom, and which, of course, can be seen by daylight.

The common dory has been used for fishing the nets, each vessel having from seven to nine of them, according to the number of the crew. The men go singly, one in each dory, and, while out, either setting or underrunning, the vessel is generally kept under way, the captain and cook managing her and picking up the crew when the work is completed. As a rule, each one of a netter's crew, except the captain and cook, is provided with a gang of three or more nets, which are fastened together at top and bottom when set, these forming a wall at the bottom of the sea 150 to 300 fathoms long and 2 or 3 fathoms deep, being held in position by an anchor at either end. The anchor-lines are 50 fathoms long, and one end of each is bent to the upper corner of the nets.

Under favorable circumstances, one man can set a gang of nets by letting the boat drift with the wind or tide and throwing them over as it moves along, but, as a general rule, two men can accomplish this much better. When setting for underrunning, the anchor is first thrown over, and 25 fathoms of the line paid out, when the buoy-line is bent to it.* The buoy and line are then thrown over, and the remainder of the anchor-line, the end of the latter being made fast to the nets, which are the next to follow. A middle buoy is attached to the center of the gang. When the nets are all out, the other anchor-line, with the buoy-line attached, is veered out, and last of all the anchor is thrown over, which finishes the work. The nets are usually set in the afternoon, and allowed to remain setting for several days, unless for some reason the vessel leaves the fishing ground. Even then, when forced to seek the shelter of a harbor during a storm, they have sometimes been left out. The distance at which the gangs of nets are set apart is said to be about 40 fathoms, but this is a matter to which no rule can be applied, as surrounding circumstances will cause many variations. Fish are caught only at night, and consequently the nets are underrun only in the morning, unless the men are detained by unfavorable weather until later in the day. In underrunning, the fisherman goes to one of the buoys on the end of his gang of nets, takes it in the dory, and hauls away on the buoy-line, the buoy being thrown out on the other side, and the line allowed to run out on one side as fast as it is hauled in on the other. When the anchor-line (underrunning line, as it is sometimes called) is up, it is taken across the dory and the fisherman hauls along towards the nets. These are underrun by pulling them in on one side of the dory,

* It is probable that a better way would be to fasten the buoy-line to the upper corner of the net, where the end of the anchor-line is attached.

and, as fast as the fish are removed, allowing them to pass over the other side into the water, the *anchors*, which remain firmly fixed in the bottom, holding them in position until the work is accomplished. When the end of the gang is reached it is thrown off the dory, *and the nets remain setting* as before, needing no further attention until the next day. When underrunning, they may be taken across either the forward or after part of the dory, *as circumstances may require.*

The time occupied in underrunning depends somewhat on the smoothness of the sea, but more particularly on the amount of fish taken. *When the catch* does not exceed more than 4,000 to 5,000 pounds to the vessel, it is done in about two hours, but when 15,000 to 18,000 pounds are caught, about *four hours are required.*

The success which has resulted from the use of nets in Ipswich Bay has been quite remarkable, the *catch being much* more than that of the trawlers fishing on the same ground. The amount taken for the first three trials, which were made in Massachusetts Bay, in unfavorable weather *and with* inferior nets, was 4,000, 6,000, and 7,000 pounds, respectively.

On a trip ending January 11, 1881, 35,000 pounds of cod were *taken by the Northern Eagle*, 8,000 pounds of which were caught in a single morning. Two other vessels, which were absent the same length of time, fishing at the same place *with trawls, got only 4,000 and 8,000* pounds, respectively. After that time she made another trip, taking the same amount, 35,000 pounds, in four days fishing, 18,000 pounds of which *were caught in one day.* On this day the schooner Christie Campbell, of Portsmouth, set ten trawls (each trawl having 1,000 hooks) close to the nets. The 10,000 hooks caught about 2,000 pounds of fish to the *18,000 taken in the nets.*

The Northern Eagle began fishing with the nets November 27, 1880, and as early as the 20th of January, 1881, had caught 111,000 *pounds of cod.* None of the trawlers took more than one-third of that amount, though they were fishing at the same place. The netted fish are larger than those caught on *trawls, averaging, during* the first six weeks' fishing, 23 pounds each. Among these were individuals which weighed 75 and 80 pounds apiece, but no small fish, such as are frequently taken on trawls, and can be sold only at a reduced price. This has been the invariable rule whenever gill-nets have been used. No immature fish, such as are called "trash" by the *fishermen, have* been taken. In addition to the advantages already mentioned, no bait is, of course, required for net fishing, and not only is the expense for this article saved, but *the loss of time and* trouble incident to securing it and also to baiting trawls is dispensed with. In consideration of these facts it is not strange that a lively interest was manifested in the fishing communities because of this innovation, and it is not surprising that many vessels have been supplied with this kind of apparatus for the winter cod *fishery.* The advantages that may be secured by our fishermen from the use of these nets can hardly be overestimated. It is possible that they may be profitably employed on some *of the larger fishing* grounds. There is no good reason to doubt the practicability of underrunning nets on the Banks, especially on the shoaler parts. They surely may be set and hauled on *any* part where cod are now taken. The use of these, if good catches can be obtained in them on the off shore grounds, would obviate the necessity of leaving the Bank *before a trip had been* secured, as must now be done by trawlers, in order to obtain a supply of bait. It is the general custom of the trawl fishermen to use fresh bait, *and since this will not keep longer* than two to three weeks, it is easy to see that much time must be lost in seeking for it. Indeed, the supply is at all times so uncertain *that some vessels* are not actually engaged in fishing more than one-half of the time, and it may be safely said that Bank fishermen do not spend much more than two-thirds of their time on the fishing ground, the remainder being occupied in the search for bait. Again, a large sum of money is *paid for bait, and, all things* considered, it is quite apparent that even if the daily catch should be smaller than when trawls are used, the profits of the trip would be much greater.

G.—HADDOCK FISHERY OF NEW ENGLAND.

By G. BROWN GOODE and J. W. COLLINS.

The winter fishery for the capture of the haddock, *Melanogrammus æglefinus*, is carried on chiefly from the ports of Gloucester, Boston, and Portland, though participated in to some extent by vessels from Portsmouth, Swampscott, and other ports. Although haddock are caught in large quantities, from spring to fall, by numerous vessels and boats employed in the fisheries between Portland and Philadelphia, the winter haddock fishery is far more important, and is peculiar in its methods. It is of comparatively recent origin, dating back about thirty years. We are told that in 1850 immense quantities of haddock were caught on the trawls in Massachusetts Bay, and that a petition was prepared by the Swampscott fishermen asking for a law which should prohibit trawl-fishing, on the ground that this method would soon exterminate the haddock. It is impossible to trace with any degree of certainty the steps in the history of this fishery, since it is pursued only for a few months in the year by vessels otherwise occupied a large portion of the time. The fish have been disposed of in a fresh condition, and the catch has not been carefully recorded.

1. FISHING GROUNDS.

The winter haddock fishery is prosecuted, from October to April, on nearly all of the inshore ledges and the nearest of the off-shore banks south of Sable Island Bank and north of Sandy Hook. The principal haddock fishery is, however, located north of Cape Cod. The depth at which the fish are taken varies with the locality, but is within the limits of 25 and 90 fathoms; usually in water deeper than thirty fathoms.

In the fall, when fishing first begins, the vessels set their trawls along the coast from Nantucket Shoals to Grand Menan, in 30 to 90 fathoms of water. On the outside of Cape Cod the fishing is within 5 to 15 miles of the shore; in Massachusetts Bay, principally on the outer slope of Middle Bank and the southern slope of the shoal ground that lies to the eastward of Cape Ann, usually called "the Southeast," the eastern part of the shoal water on Jeffries Ledge, and along the coast of Maine within thirty miles of the shore, especially about Monhegan Fall, South-southwest, and Western Ground. Fishing in this region continues until midwinter, and is kept up by a smaller class of vessels, such as those hailing from Portland, throughout the whole season. The larger vessels, comprising the major portion of the Gloucester fleet, strike farther out to sea, fishing upon George's Bank, usually in 25 to 40 fathoms, near the localities frequented by the winter cod-fishermen, and also on the western part of the Bank. They also fish on Brown's Bank, in water about the same depth, and on La Have and about Cape Sable. The fishing on La Have Bank for haddock was first attempted in the winter of 1880-'81.* This fishery has been attended with the greatest success. Fishing continues on these outer banks until the end of the season, when it is time for the vessels to engage in other fisheries. A few large schooners follow the haddock fishery during the whole year, often visiting the off-shore grounds, and marketing their catch at Boston.

* Capt. S. J. Martin, of Gloucester, writes, under date of May 10, 1881, as follows: "The first vessel that went to La Have Bank for haddock was the schooner Martha C., of this port. She made her first trip there last winter."

2. THE FISHERMEN.

The fishermen who take part in this fishery are usually picked men from the Gloucester fleet. A large portion of them are engaged in the mackerel fishery in the summer.

This fishery requires as much skill, pluck, and endurance as the halibut fishery, and men are selected in both of these fisheries on account of similar qualifications. Not infrequently the same crew will remain with the vessel in the summer when she is in the mackerel fishery, and in winter when she is employed in the haddock fishery. There is so much competition among those who desire to ship with a good skipper that very often his entire crew list is made out five or six months in advance.

3. THE VESSELS.

The vessels composing the Gloucester fleet are chiefly the stanchest and swiftest of those which in summer engage in the mackerel and cod fisheries. The Portland fleet is made up of a smaller class of vessels, averaging from 35 to 40 tons; these in summer are engaged in the mackerel or shore fisheries. The few Swampscott and Boston vessels which take part in the winter haddock fishery are marketmen and mackerelmen in the summer. A few vessels of the Boston fleet have been built specially for the haddock fishery. Some of these, built in 1884–'85, are of extra depth and large size, and are specially adapted for heavy weather.

The rigging of the haddock catchers is precisely similar to that of the halibut catchers. Since 1879 many of the largest vessels of the Gloucester fleet have been employed in haddock fishing; these generally carry riding-sails, and they usually have gaff-topsails. Formerly very few of them carried gaff-topsails. Their outfit of nautical instruments and charts is, as might be expected, less complete than that of the halibut vessels.

Since the haddock vessels are rarely, if ever, anchored on the fishing grounds, their arrangement of cables and anchors is very different from that in use in the halibut and George's fleets. They usually have a chain cable on their starboard side, and upon the port side a cable similar to that used by the George's and halibut vessels, from 150 to 225 fathoms in length, which is stowed in the fore hold. One end of this cable is bent to the anchor and the other passes down through a hole in the fore hatch and is coiled below in the fore hold. The anchors are like those used on George's-men.

The deck is arranged in a manner different from any that has yet been described. There is usually a single gurry-pen forward of the house, and the space between the sides of the gurry-pen and the house, and the rail on either side, is so arranged that it can be divided into pens for the reception of the fish. Three or four pens may be placed on each side.

The remainder of the deck is clear, but there is a booby-hatch over the main hatch, through which access is gained to the bait-room.

The haddock-catchers do not ordinarily carry davits or a reefing-plank. The mainsail is provided with an "out-hauler" or patent reef-gear, which answers the purpose of a reef-tackle and earing, and facilitates the process of reefing from the deck. A few of the larger vessels, however, are provided with davits and reefing-planks.

The arrangement of the hold is also peculiar. The space which in a halibut catcher is occupied by the forward ice-house is here taken up by the bait-room. The bait-room is sometimes, but not always, bulkheaded off from the fore hold. It is one large compartment, with rough board benches all around, on which the men sit while baiting their trawls. In the center stands a stove. In this room the fishing-gear is always stowed when not in use. The after hold is generally fitted up with

pens resembling those in the after hold of a halibut schooner. In these pens ice is carried when the vessel is making long trips. When large fares are obtained, part of the fish are stowed in the bait-room, which, on the larger vessels, is so arranged that pens can be built in it by sliding boards into grooves. The haddock schooners carry a larger amount of ballast than those of any other class; a vessel of 50 tons requiring 30 or 35 tons of ballast.

4. APPARATUS AND METHODS OF THE FISHERY.

DORIES.—The larger haddock-catchers carry six dories, the smaller four or five.* Most of the dories used in this fishery are deeper and wider than those in any other fishery, and are built specially for the purpose. The ordinary bank dory is also frequently in use. The so-called "haddock dories" are 14 feet in length on their bottoms. When on deck they are nested in the ordinary *manner, two or three on a side, and are stowed nearly amidships on each side of the booby hatch,* not nested close to the rail, as is the practice upon other vessels carrying dories. A haddock dory ready to leave the vessel in order to set its trawl is provided with the following articles in addition to the trawl-lines: Trawl-roller, two pairs woolen nippers, dory-knife, gob-stick, gaff, bailing-scoop, thole pins, two pairs of 9-foot ash oars, buoys, buoy-lines, anchors, and black balls.

TRAWLS.—The haddock trawls have the ground-line of tarred cotton, of 14 to 18 pounds weight to the dozen lines of 25 fathoms each in length. Hemp is occasionally used, especially by the Maine vessels and by some of the Irish vessels from Boston. The gangings are of white or tarred cotton, in weight about 4 to 6 pounds to the 300 fathoms of line. They are about 2 feet in length, and are fastened to the ground line at intervals of 3½ feet. The manner of fastening the gangings to the ground-line is different from that upon the halibut trawls.† The hooks are *numbers 15 or 16, center draught, and eyed.‡ The hooks are fastened to the gangings in the same* manner as on the cod trawls. The haddock trawls are coiled in tubs, similar to those employed in the George's fishery. A flour barrel, sawed off above the lower quarter hoops, is used for a tub. Each tub of haddock trawl contains 500 hooks, or about 292 fathoms of ground-line. Each dory is provided with six or eight tubs of trawl, and two to eight of these tubs of line are set at once, as the case may require. Sometimes only two or three tubs are set at a time, and several sets are frequently made in a day, when the weather is suitable.

One of the anchors is similar to those used upon the cod trawls, while the second anchor is often of the killick pattern. The buoy-line is the same as in the cod or halibut trawl, and its length is 15 to 30 fathoms more than the depth of water in which it is used. The buoys are similar to those used in cod-trawling. Each buoy at the end of the trawl has a black ball upon it, and a middle buoy, without a staff or black ball, is also used§ when the whole length of the trawl is set.‖ Instead of the regulation keg buoy, a "kit" is sometimes used by the haddock trawlers.

BAIT.—When it can be obtained, the principal bait used by the haddock catchers is salted menhaden slivers. This is considered the best bait, and it is said that haddock will often bite at this when nothing else will tempt them. The trawl-hooks, when this bait is used, may be baited days or even weeks in advance, while the vessel is waiting for a chance to set. When fresh bait is used the trawls can be baited only a short time before, indeed, only a few hours before they are to be set.

---

* *The haddock-catchers of Maine and some of the ports in Massachusetts, fishing with "single dories,"* carry one for each man besides the skipper and cook. These boats are 13 feet long, and managed by a single fisherman.

† They are fastened either by tucking and hitching or by a simple hitch around the ground-line.

‡ The Irish fishermen of Boston sometimes use a galvanized hook of the same size without an eye.

§ This is to aid the fishermen in recovering their trawls in case they are parted at either end.

‖ When the trawls are set in shallow water where there is a rocky bottom three or four middle buoys are sometimes used.

Fresh herring is also used for bait, though to a comparatively limited extent, until within the past five or six years, when they have been the only bait which could be procured.

Capt. S. J. Martin, of Gloucester, writes: "Five or six years ago pogie slivers were exclusively used for bait by haddock fishermen, but for the past two winters none of these could be obtained, and mackerel and herring have been the principal bait. The first vessels that started in October (1880) took fresh mackerel for bait. When the herring came on the coast, or were brought to Gloucester frozen, they were the bait depended on by the haddock catchers."

In cutting up menhaden slivers for haddock bait sections are made trapezoidal or square in form, with a surface area of about a square inch. One of these pieces is placed on each hook, and as the hooks are baited the line is coiled in the tub, the hooks being placed around on the side, points up.* When the fisherman is ready to bait his trawl, he sits upon his bench, with the empty tub between his legs and the trawl-line removed from the tub and turned right side up in front of him, his bait being in a bucket at his side. In his left hand he takes eight or ten pieces of bait, and with both hands he pulls the line toward him, coiling it in the tub after baiting the hooks; he places them in the tub in the manner just described.

As is always the case where a number of men are working together at the same employment, there is sharp competition among the men as to who shall be the first to get his trawl baited. The average time consumed in baiting five hundred hooks is from forty-five to sixty minutes, though the most skillful men have been known to accomplish the task in half an hour. It will be seen that the labor of baiting three or four tubs, which falls daily to each man when the fishing is good, occupies a considerable portion of the day, or rather of the night, since the baiting is usually done at night. In baiting at night each man has a lamp of peculiar pattern, which is fastened to the edge of his tub by a hook; sometimes the trawls are snarled, and the whole night is devoted to clearing and baiting them. A man will go into the hold to bait after the fish are dressed in the evening and perhaps not finish his task until daybreak, when it is time to go out to set again.

METHODS OF FISHING.—As has been remarked, the haddock catchers never anchor on the banks when fishing. The usage in this respect has greatly changed within the last few years. When the fishery was less extensive and was carried on entirely upon the inshore grounds they were accustomed to anchor, set their trawls, and underrun them, but now the trawls are all set while the vessel is lying to, waiting for the dories. This operation is called "setting under sail," and its successful performance is one of the most complicated evolutions performed by vessels and boats, requiring a high degree of skill on the part of the men on the vessels and in the boats.

Let us imagine ourselves on the deck of a haddock schooner at daybreak approaching Jeffries Ledge. The skipper, having first sounded and obtained the desired depth of water, decides to make a set and gives the order, "Get the top dories ready!" at the same time indicating how many tubs he thinks it is desirable for each dory to set. The four men to whom the two top dories belong adjust the anchors, buoy-lines, and buoys which are already in the dories, and also place in them the other necessary fishing-gear. The dory-tackles are then hooked on, and the boats are swung over the side of the vessel. The middle dories are then equipped in a similar manner by their respective crews, and as soon as these are ready the top dories are dropped into the water and paid astern and the middle ones are swung over the side, the bottom dories being then prepared for action in their turn. The middle dories are now dropped down and paid astern with the others, and the bottom dories are swung upon the sides and are ready to be lowered at the proper moment. Eight men take their places in the dories towing astern; perhaps, in fact, the four men belonging to the top dories are already there and ready to set.

* The Irish fishermen of Boston place their trawls in baskets, coiling the line in one part and putting the baited hooks in another division of the basket.

The skipper now gives the order to one of the dories that was first put out, "Throw out your buoy." This being done the dory tows astern of the vessel until the buoy-line runs entirely out; the men in the dory then sing out, "Let go the painter!" The dory is cast off and they begin to set their trawl in the ordinary manner, their course usually being to leeward, and nearly at right angles with the direction of the vessel. This operation is repeated in succession with each boat: the last dories dropping astern after the others have been let go. Sometimes when the wind is moderate and it is practicable, all six dories are dropped down before the first begins to set. The boats having been let go in the manner described, are thus left scattered along in the wake of the schooner at intervals of 100 to 200 fathoms, the first and the last dory being from three-quarters of a mile to a mile and a half apart. As soon as the last dory has been dropped, the vessel keeps off and runs to leeward, and is ready to pick up the first one as soon as her trawl has been set, and the others in regular succession. The time occupied in setting the trawls under sail varies from half an hour to an hour.

When the dories are picked up, a part or all of them are taken on deck and the vessel immediately begins to work back toward the weather buoys; as soon as the weather buoys are reached the boats are usually dropped again in the manner already described, and the men begin hauling. This second evolution occupies from one hour to an hour and a half, according to the strength of the wind and other circumstances. As the dories are dropped a second time they find themselves at the very place where they threw overboard the first anchor and a mile or two to the windward of the place where they dropped their last anchor. They are now able to haul to the leeward, which is easier than hauling to the windward and is more advantageous to the fishing, since the tender-mouthed haddock are less liable to drop from the hooks of a trawl when it is slack than when it is taut.

For the dories to haul their trawls occupies from one to four hours, according to the length of the trawl, the number of fish on the hooks, and the state of the weather. While the dories are hauling, the vessel is lying-to with the jib to windward and drifting back and forth along the line of boats, waiting for the men to finish hauling their trawls or signalize, by raising one of the oars, that they have a load of fish and wish to be taken on board. After the lines have all been hauled the dories are again taken on deck, unless another set is to be made on the same ground. When the dories set the whole length of lines it is very unusual for a vessel to make more than one set in a day; sometimes, however, a smaller number of lines is set and the operation is twice performed. In exceptional instances, after the whole string of tubs has been once set, a smaller number, perhaps a tub to each man, is set in the latter part of the day.

The operation of shooting alongside of the dories and picking them up is one of the most difficult feats of seamanship which can be accomplished by a fishing schooner.

The haddock trawls are often set in rough weather and at times when there is what would be called a strong, whole sail breeze, and, occasionally, when it blows hard enough to make it necessary to reef the sails. After the trawls have been set and the vessel worked back to the weather-buoys, if the weather looks at all threatening, it is customary to take the bonnet out of the jib and put a reef in the mainsail, so that if the wind should increase while the trawls are being hauled the vessel can be managed by the skipper and the cook—the only men left on board.

As might be expected, men are sometimes lost in this method of fishing, the losses being occasioned by sudden snow-storms which cut the dories off from the view of those on board of the vessel, or by heavy squalls which render it impossible for the schooner with only two men on board to go through the necessary evolutions.

It should be stated that the evolution of setting under sail is varied at different times and by

different skippers, but that the differences in the manner of performing the evolutions are not of much importance, and that the most common method is that which is here described.

When fishing on George's Bank, the Gloucester haddock vessels are obliged by the force of the tide to resort to another method of setting, which is called "*double-banking the trawl.*" The tide is so strong that the trawls cannot be set in the ordinary way, for the buoys would be carried beneath the surface. Two dories are therefore lowered at once, and jointly perform the act of setting; only two tubs are set by each pair of dories. The set is made in the following manner: The men in one of the dories hold fast to the weather-buoy, while the men in the other dory set the trawl. After the trawl is out, the dory which sets it holds fast to the lee buoy until by some signal, such as lowering the jib, the skipper of the schooner gives the order to haul. The trawls are left on the bottom fifteen or twenty minutes before they are hauled. The men in the two dories begin to haul simultaneously; the anchors are thus first raised from the bottom and presently the bight of the trawl and the two boats drift along with the tide, the distance between them gradually narrowing as they haul.

Haddock are often found so plenty on George's that it is not necessary to set more line at a time, even were it easier to do so, since a single tub of trawl will often bring up enough fish to fill a dory. Several sets of this kind can be made in a day, when the weather is favorable.

Some of the Maine and Swampscott vessels send out only one man in a dory. This usage is called "fishing single dories," and is, of course, practicable only in comparatively moderate weather.

5. THE MANNER OF CARING FOR THE FISH.

As the fish are brought alongside they are pitched into the pens already described. As soon as the dories are discharged and taken on deck, and the vessel is under way, the men begin to dress the fish. The process of dressing differs entirely from that of dressing cod. There are no *dressing-tables* or *dressing-tubs*. The men *distribute themselves* among the pens. Four or five men are engaged in ripping the fish, this operation being performed by seizing the fish by the eyes or some part of the head with the left hand and ripping them down from the throat. The remainder of the crew occupy themselves in taking out the liver and roes, which are saved in barrels separately, and in removing the viscera. The fish are washed by pouring buckets of water over them as they lie in the pens or on deck, and are packed away in the hold or left on deck, unless, on account of distance from the land or mildness of the weather, it is necessary to ice them, in which case two or three men go into the hold and stow the fish away between the layers of ice. The fish are iced with greater or less care, according to the length of time expected to elapse before the arrival of the schooner at the market. All the vessels going to La Have, George's, and Cape Negro *carry from 5 to 6 tons of ice each trip.*

6. PRODUCTIVENESS OF THE FISHERY.

The vessels of the Gloucester fleet, in the winter of 1880–'81, obtained, on an average 350,000 pounds of haddock, valued at $6,000. The schooner Martha C. obtained about 600,000 pounds, stocking $11,500. The Edith M. Pew obtained 550,000 pounds, stocking about $11,000.

Capt. S. J. Martin, of Gloucester, Mass., writes under date of February 12, 1882: "The schooner Martha C. arrived yesterday with 90,000 pounds of haddock; she was gone eight days. Schooner Josie M. Calderwood, 85,000 pounds, gone seven days. Schooner H. A. Duncan, 80,000 pounds, gone seven days. Four vessels left Gloucester on Saturday and were back on Wednesday, each with 40,000 pounds of haddock, having fished one day and a half. That is good and quick work."

The Cape Ann Advertiser of February 10, 1882, says: "Schooner Mystic, Capt. John McKennon, has stocked the year ending February 8, 1882, $21,002. He claims high line of the shore haddocking fleet, and so far as we know this is the largest stock ever reported in this fishery. The crew shared $780.06. In 1880 he stocked $17,765, the crew sharing $765.

"The New schooner Dido recently built at Essex, for Mr. George Steele, of this city, has been engaged in the haddock fishery just one month to-day, during which time she has made three trips, stocking $3,750. On her last trip she stocked $1,400. Her crew shared for the month $138 each. The Dido is commanded by Capt. William N. Wells. Schooner Richard Lester, Capt. Ozro B. Fitch, on a recent haddock trip stocked $1,100."

The same paper, on February 24, 1882, states that "the largest haddock fare ever landed was that of the schooner Martha C., of Gloucester, Capt. Charles Martin, which arrived at Boston on Friday [February 17] from a George's haddock trip, and weighed off 93,000 pounds haddock, stocking $1,943, the crew sharing $91, the result of two and a half days' fishing. Absent ten days. This was the largest catch and best stock ever reported in the haddock fishery."

The Martha C., in thirteen hours' fishing, in the winter of 1880–'81, caught 90,000 pounds of cod and haddock. The total amount of haddock carried into Boston in 1870 was 17,000,000 pounds; of this amount probably at least 13,000,000 were obtained by the winter haddock vessels. The total yield of this fishery does not, probably, fall below 18,000,000 to 20,000,000 pounds.

7. RUNNING FOR THE MARKET.

No class of vessels, not even the halibut schooners, take more risks in running for market than do the haddock schooners. It is of the utmost importance to them to reach the market with their fish in good condition, and, if possible, to be in advance of other vessels engaged in the same business. In the stormiest of weather all sail that they will bear is crowded upon them, and harbors are made even in heavy snow and thick fogs. The trips are short, averaging frequently not more than two or three days, and rarely longer than a week or ten days; they are, therefore, constantly running for the land, and are more accustomed to making the coast than the halibut vessels, and become so familiar with the harbors most frequently resorted to, especially with that of Boston, that they are able to enter them when no other vessels, probably not even pilot boats, would care to make the attempt. What has already been said about the dangers encountered by the halibut schooners will apply as well, in its fullest extent, to the haddock schooners.

8. THE MANNER OF OUTFIT.

In the winter haddock fishery every man supplies his own dory and outfit complete, besides paying his share of the provision bill. In the settlement of the voyage the vessel draws one-fourth of the net stock, or in the case of the older vessels, according to the old system, only one-fifth, after certain stock charges have been deducted for bait, ice, wharfage, and towage. The remaining three-fourths or four-fifths of the net stock is divided equally among the crew, the owner paying the skipper's commission or percentage from the vessel's share. The average share of each man in the Gloucester crews for the winter of 1880–'81 was about $290. The most successful shared $500 to $550. The largest stock ever made in one day's fishing in the winter's shore fishery up to 1880 was that of the Eastern Queen, of Gloucester, which carried to the Boston market, in 1873, 25,000 pounds of haddock, and stocked $1,100. This vessel also made the largest stock of that season, realizing in five months $10,250 clear of all expenses, the crew sharing $550 each. The crew of the schooner David J. Adams, in March, 1881, shared $107 each in a ten days' trip in the haddock fishery.

9. THE HADDOCK FISHERY FIFTY YEARS AGO.

A writer thus describes the haddock fishery from Gloucester Harbor in the early part of the present century:

"The fitting out of the fleet for the haddock fishery commenced about the first of April. The first move was to run the boats on the beach, or landing as it was then called, and have them calked and graved. The latter process consisted in applying a coat of pitch to the bottom and burning it down with a tar-barrel, which gave a smooth and glossy surface. Painted bottoms in those days were very rare.

"The time occupied in making a haddock trip was from two days to a week, the fish being mostly taken on Old Man's Pasture, Heart's Ground, and Inner Bank, about twelve miles off of Eastern Point. The fish were taken to Charlestown for a market and purchased by the hawkers, among whom were Johnny Harriden, Joe Smith, Isaac Rich, and others, who took them over to Boston in hand-carts and retailed them at a good profit. The codfish were generally salted. The smallest were cured for the Bilboa market, and the largest were made into dun fish, as they were called, for home consumption. They were kept on the flakes several weeks, and thoroughly dried until they became of a reddish color, and were highly esteemed as an article of food. The haking season commenced in July, and the pollock fishery was prosecuted from September to the middle of November. Each boat carried three men—skipper, forward hand, and cook, who went at the halves, as it was called, the crew receiving one-half the gross stock, and the owners the balance."*

8.—THE HAKE FISHERY.

By G. Brown Goode and J. W. Collins.

The capture of hake is a branch of the shore fisheries, and is by no means as distinct an industry as those which have been already described. It is generally carried on from June to November along the New England coast north of Cape Cod, chiefly by small vessels of 20 to 40 tons, and which at other seasons of the year are often hauled up, though some of them engage in the winter shore haddock or cod-fishery or in the fall herring fishery, and in the spring are more frequently employed in the cod-fishery before the hake make their appearance. The hake fishery is also carried on from small boats.

The men engaged in the hake fishery are of the class described in the chapter on fishermen as the shore fishermen of Maine.

1. THE FISHING GROUNDS.

The coast of Maine is a favorite region for the hake fishermen, almost every settlement along its whole extent having some small boats or a few vessels engaged in this fishery. The fishing is also carried on in Ipswich Bay by boats from Rockport, Pigeon Cove, Folly Cove, Lane's Cove, Annisquam, and the Isles of Shoals.

About the mouth of the Bay of Fundy there is excellent hake fishing, and around Prince Edward Island the hake are very large and abundant, and some of the Maine vessels occasionally visit this region to engage in the capture of this species. In 1878 and 1879 several vessels from Bristol, Me., were thus employed.

* Fisherman's Memorial and Record Book, Gloucester, 1873, p. 73.

The favorite fishing grounds are upon soft and muddy bottom in 25 to 75 fathoms of water, and usually within 15 miles of shore. Frenchman's Bay is one of the favorite haking grounds, being largely frequented by the smaller boats. As long ago as 1850 it was customary for the New England fishermen to resort in large numbers to this locality.

Many of the grounds formerly considered very good are now thought by the fishermen to be of little importance. The fishermen attribute the remarkable decrease which, in many instances, has occurred in the abundance and size of the species, to the absence of menhaden from the coast north of Cape Cod, which fish they believe formerly attracted the large hake near the shore. Where large hake were formerly caught only small ones can now be taken.

2. THE VESSELS.

The vessels are the smallest class of fishing vessels, and the majority of them old-fashioned, and only used in the season of pleasant weather. Most of them are schooners, a few are pinkies, and quite a number of them are of the old-fashioned, round-bowed, square-stern model, long ago abandoned by builders. Many of them date back to the first third of the present century. They carry from one to four dories, according to the size of the vessel, and are provided with light cables and anchors of no uniform pattern. There is no uniform method of fitting up the hold of the vessel or its deck, none being required in this kind of fishing.

3. APPARATUS AND METHODS OF THE FISHERY.

The boats are of all patterns, from the dory to the Quoddy boat.

The fishing is carried on, for the most part, at night and chiefly with trawls. A few of the boat fishermen still use hand-lines. The trawls are similar to the haddock trawls, though sometimes slightly heavier. They are coiled in tubs and are set in strings with 300 to 1,500 hooks each. They are set from the boats or dories in the same manner as the trawls used in the shore cod fishery, and are usually underrun twice a day—in the morning to remove the fish, and at night to bait the hooks. Some fishermen, however, bait in the morning when they remove the fish. Others, again, will remove the fish and rebait both in the morning and in the evening. The trawls are left down until it is necessary to change their position, or until a fare of fish is obtained. It is not unusual for a trawl to be left down, by a boat fisherman who carries his fish daily to the shore, for several weeks at a time.

The favorite baits are herring and mackerel, which are, for the most part, obtained from the weir fishermen along the shores, though occasionally the bait is caught in gill-nets. In former years, when menhaden or pogies were abundant on the coast of Maine, they were the favorite bait. The hooks are baited as in the cod fishery.

4. THE PRODUCTS.

The hake vary in size from 1 to 20 pounds, and individuals of 30 or 40 pounds are occasionally obtained. At the present time they are chiefly valued on account of their sounds and livers, the former being used in the manufacture of isinglass (see chapter on isinglass), the latter for the manufacture of oil. Until within thirty years the sounds had no value, but since that time the isinglass industry has sprung up.

The fish are split and salted in the ordinary manner, and stowed in the hold of the vessels or in fish-houses, by the boat-fishermen, by whom they are shipped to Gloucester, Portland, or Boston in freight vessels as soon as the curing is completed, or, at latest, at the end of the season. The

sounds are removed and dried. They are strung upon strings and hung either in the rigging or in the cabin or forecastle of the vessel—wherever there may be a fire—or else, by the boat-fishermen, about the buildings on shore or on small hurdles or flakes made of old netting. The sounds are sold to the agents of the isinglass factories, who make trips to all the hake fishing stations in person, and ship their purchases to their employers by rail or steamer. The livers are sold to persons at various points along the coast, who make a business of extracting the oil by exposure to the sun or by the ordinary methods of boiling.

The total catch of hake for the United States is about 33,000,000 pounds in the fresh condition, 90 per cent. of which is cured by drying. On the hake-trawls are caught considerable quantities of cod, haddock, pollock, and cusk, which are split and salted with the hake and disposed of in the same manner.

According to Mr. A. Howard Clark, 25 per cent. of the boneless fish packed in Gloucester in 1880 were hake. In 1881 there was landed in Gloucester from Eastport alone 180,000 pounds of hake.

Blank page retained for pagination

PART III.

THE MACKEREL FISHERY OF THE UNITED STATES.

1.—THE MACKEREL PURSE-SEINE FISHERY.

1. The fishing grounds.
2. The fishermen.
3. The vessels.
4. Apparatus and methods of fishing.
5. The care of the fish.
6. Running for the market.
7. Landing the cargoes.
8. Financial profits of seining.
9. History of the use of purse-seines.
10. The attempted use of the purse-seine in Norwegian waters.

2.—THE SPRING SOUTHERN MACKEREL FISHERY.

1. Fishing grounds.
2. Early catches of mackerel, 1878 to 1881.
3. The vessels, apparatus, and methods of fishing.

3.—THE MACKEREL HOOK FISHERY.

1. The fishing grounds.
2. The fishermen.
3. The vessels.
4. Apparatus and methods of fishing.
5. The care of the fish.
6. Homeward passage and disposition of the fish.
7. Financial profits of the mackerel hook fishery.
8. Itinerary of a mackerel voyage to the Gulf of Saint Lawrence.

4.—THE MACKEREL GILL-NET FISHERY.

1. Apparatus and methods.
2. History of mackerel gill-net fishing.

5.—EARLY METHODS OF THE MACKEREL FISHERY (1620 TO 1820).

1. Catching mackerel with drag-seines.
2. Drailing for mackerel.

6.—LEGISLATION FOR THE PROTECTION OF MACKEREL.

1. Legislation in the seventeenth and eighteenth centuries.
2. Protest against gigging and seining in the present century.

7.—STATISTICS OF THE MACKEREL FISHERY.

1. Statistics of the fishing fleet and the products in 1880.
2. Statistics of the New England fleet in 1879, 1880, and 1881.
3. Statistics of mackerel fishing by American vessels in the Gulf of Saint Lawrence from 1873 to 1882.
4. Statistics of inspection of pickled mackerel.

Blank page retained for pagination

PART III.

THE MACKEREL FISHERY OF THE UNITED STATES.

By G. Brown Goode and J. W. Collins.

1.—THE MACKEREL PURSE-SEINE FISHERY.

The purse-seine has come into general use since 1850, and with its introduction the methods of the mackerel fishery have been totally revolutionized. The most extensive changes, however, have taken place since 1870, for it is only during the last ten years that the use of the purse-seine has been at all universal. As late as 1878 a few vessels have fished with the old apparatus in the Gulf of Saint Lawrence, and also a few on the coast of New England. Such changes in the manner of fishing for mackerel have brought about also a change in the fishing grounds. Vessels fishing in the old style were most successful in the Gulf of Saint Lawrence, but the purse-seine can be used to very much better advantage along our own shores between Cape Hatteras and the Bay of Fundy.

The mackerel fleet in 1879 and 1880 was owned almost entirely by Massachusetts and Maine, a very few vessels from New Hampshire and Connecticut also participating. The distribution of the vessels in the mackerel fleet, their tonnage, and the number of men employed are shown below in the tables prepared by Mr. R. Edward Earll.

1. THE FISHING GROUNDS.

In the spring, from March to the 1st of June, the mackerel seiners cruise between the capes of the Chesapeake and the South Shoal of Nantucket. The mackerel are first encountered off Chesapeake and Delaware Bays, from 20 to 50 miles from the land, and gradually move northward, followed by the fleet. When off the coasts of New Jersey, Long Island, and Block Island, the fish usually draw closer in to the land, frequently approaching within 1 or 2 miles of the shore. During the summer and fall months the principal seining ground for mackerel is in the Gulf of Maine, from the Bay of Fundy to Cape Cod; the immediate vicinity of Mount Desert Rock, Matinicus Rock, Monhegan Island, Cape Elizabeth, Boone Island, and Massachusetts Bay being favorite localities. Good catches of mackerel are frequently made in summer on George's Bank, and, within the past few years, near Block Island. Though mackerel have at times been taken in seines in the Gulf of Saint Lawrence, so little, comparatively, has been done in this locality that it can scarcely be classed among the grounds generally resorted to by the mackerel seiners. In a large majority of cases the mackerel schooners which have gone to the gulf within the last six or seven years have met with decided failures, and in 1880 several returned home from there without a single barrel of fish.

2. THE FISHERMEN.

The mackerel fleet contains a larger percentage of American-born fishermen than any other. The 113 mackerel vessels from Gloucester in 1879 were manned by 1,438 men, of whom 821 were

Americans; 322 Provincials; 24 British, most of whom were Irish; 39 Scandinavians; 6 French; and 13 Portuguese. The mackerelmen belonging to other ports in Massachusetts and on the coast of Maine have a still larger percentage of Americans in their crews, most of the vessels being manned *entirely by natives of New England. Many of the Gloucester fishermen engaged in the* mackerel fishery are in winter employed in the haddock fishery, in the George's cod fishery, or in the fresh-halibut fishery. Many others, like those from Provincetown and Maine, do not go to sea in winter. The winter herring trade is carried on almost entirely by the mackerel schooners and their crews from Gloucester and Maine, and the winter oyster business is in the same manner monopolized by the Cape Cod and Portland mackerel vessels, while some of them enter into the business of bringing fruit from the West Indies to the United States.

3. THE VESSELS.

The mackerel fleet in 1880 was made up of four hundred and sixty-eight vessels, which *pursued this fishery to a greater or less extent. Of these, two hundred and thirty-five vessels were* employed exclusively in catching mackerel between March and November, though some of the fleet did not start before June or July. A large number of these, the best fishing vessels of New England, in winter are engaged in the haddock fishery, in the George's fishery, in the herring trade, in the oyster trade, and in the West India fruit trade, as well as in the shore cod fishery.

There is a small fleet of vessels which, though, like their companions, designed for rapid sailing, are seldom employed in the winter, except in the herring trade to New Brunswick, on account of the shallowness and sharpness of their hulls, which renders them unfit to encounter the heavy winter gales in the open ocean.

The mackerel vessels are, as a class, swift sailers; they carry, while engaged in this fishery, all the canvas which their rig will allow. The manner in which their sails are managed, and the amount of canvas *which they carry, are fully described in the chapter on the fishing vessels.* The mackerel schooners, as a rule, spread more sail, in comparison with their size, than any other vessels in the world, except, perhaps, the extreme type of schooner-rigged yacht, which is essentially a development of the fishing schooner.

Vessels designed especially for the work of seining mackerel usually have a wide deck, much deck-room being necessary for the proper handling of the fish. Many of the schooners of 60 to 80 tons have a beam of 21½ feet to 23 feet. But, although plenty of deck-room is considered of great importance to a mackerel vessel, even deck room is held to be less necessary than speed. In consequence, every effort has been made by the builders to construct swift sailing schooners, and the result is that many of the vessels composing the mackerel fleet are able to cope successfully with many yachts of the same size. The mackerel vessel is fitted for seining: (1) By placing upon her a summer outfit of repairs and sails.* (2) By removing the heavy cables used in

* Whatever repairs are needed are first attended to, while, in the mean time, the jibboom is rigged out, the foretopmast (if the vessel carries one) is sent up, the spars cleaned and painted, and the rigging tarred. This having been done, the vessel is taken on the railway and thoroughly cleaned and painted. The work of cleaning and painting spars, tarring rigging, &c., was formerly done by the vessel's crew, but at the present time it is done by gangs of shoresmen organized for the purpose, the expense for the labor performed being paid for by the fishermen. The custom of hiring others to do this work began about 1863 or 1864. The fisheries were at that time very prosperous, and many of the fishermen preferred to pay some one for tarring and such work rather than to do it themselves. At first two or three men of the crew usually did the work, being paid for it by their shipmates, but in a short time it passed into the hands of the longshoresmen to the general satisfaction of both owners and crews. The work of cleaning the vessel's bottom, preparatory to painting it, is now often done by shoresmen, who are paid by the crew. The practice of hiring men to do this kind of work is general, and the above remarks apply equally well to all first-class fishing vessels sailing from Gloucester, though we are not aware that this custom has been so fully adopted elsewhere.

winter fishing, and substituting chain cables. This change is not necessary in the case of many of the Cape Cod and Portland vessels which are employed in the oyster trade, or in the case of most of the Gloucester vessels engaged in the herring trade, since these use only chain cables at any season. (3) By the removal of gurry-pens, and all other incumbrances from the deck. (4) By the rigging of a seine-roller upon the port-quarter rail. This is a wooden roller almost invariably made of spruce, 6 inches in diameter, and 9 to 10 feet long, which revolves on pivots in its ends, received into iron sockets in cleats, which are fastened to the rail. The forward end of the roller is about 3 feet aft of the main rigging. The use of this roller is to lessen the friction between the rail of the vessel and the seine, as the latter is being hauled on deck or overhauled into the boat.* (5) By the head-box being fastened to the forward end of the house. The head-box is a bin 10 or 12 feet long, and wide enough to receive the head of a fish-barrel. In this box are stowed the heads of the barrels that happen to be on deck. (6) By placing the bait-mill on deck, and fastening the bait-box (when one is used) to the main rigging on the starboard side. (7) By nailing boards to the top timbers underneath the main rail, between the fore and main rigging; these are about 6 inches in width, and are provided with single ropes, or stoppers, 2 or 3 feet apart; the object of these stoppers is to hold the cork rope of the seine when brought over the rail, preparatory to bailing the fish from the seine upon the deck. (8) By taking on board an ice-grinder, these being used only on vessels which carry their fish fresh to market. (9) By clearing the hold of all bulkheads, ice-houses, or other appliances, which may have been used in the course of the winter's fishery. (10) By properly adjusting the quantity of ballast; if the vessel has been in the haddock or George's fishery, ballast must be removed; if in the herring trade, ballast must be added; a mackerel schooner of 60 tons will carry from 15 to 20 tons of ballast, and in exceptional cases somewhat more. (11) By constructing an ice-house on those vessels which intend to take their fish fresh to market, somewhat similar to that on board the halibut vessels;† and (12) by taking on board the necessary supply of barrels.‡ Vessels which take their fish fresh to market carry from 175 to 250 barrels; those intending to salt their fish carry from 175 to 500 barrels, about one-third of this number being filled with salt, which is used in curing the fish, and serves in the meantime as ballast.

---

* Capt. George Merchant, jr., of Gloucester, Mass., states that purse-seines were used by the fishermen of that port for six or seven years before "seine-rollers" were put on the vessel's rails. This useful implement was first invented and used by Capt. Simeon Tarr, of Gloucester, about the year 1857, while he was in command of the pinkey Andes.

† The mackerel schooner's ice-house, as a rule, occupies the middle portion of the hold, extending from side to side of the vessel one way, and from the grub beam to the forward side of the main hatch the other way. It is separated from the other sections of the hold by bulkheads, and is divided into a number of pens similar to those in the ice-house of a halibut schooner. Each of these pens is subdivided into three parts by shelves, which are constructed, when occasion requires, by laying some boards crosswise, the ends resting on cleats which are nailed to the sides of the pens. The first shelf is put in about 15 inches above the floor of the ice-house, and a second shelf 15 inches above the first. The front of the pens are closed by boards which slide in grooves on the stanchions or bulkheads. The mackerel are iced 15 inches deep on the floor of the pen, after which the first shelf is laid and another tier of the same depth is put on that. After the second shelf is put in, the fish are iced on it nearly to the deck, a covering of ice being put over all. In this way the fish can be kept in a better condition than if they were packed in a large bulk. If stowed in bulk the fish are jammed and soon become worthless. An average sized ice-house has a capacity of about 200 barrels of fresh mackerel; some ice-houses will hold 300 barrels.

Capt. Joseph Smith, of Gloucester, tells us that at present few of the mackerel vessels carry ice-grinders, since the fishermen prefer to use the ice-pick instead. Each vessel employed in market fishing is provided with from two to four ice-picks, and three men can pick up ice fast enough to supply a whole crew, even if they should ice 100 barrels or more an hour, which is about the average speed with which mackerel are taken care of. Captain Smith thinks his crew, on one occasion, iced 200 barrels in an hour and a half. About 4 tons of ice are put on 100 barrels of fresh mackerel.

‡ Vessels which carry a mackerel pocket or "spiller" are provided with outriggers on the starboard side and other necessary arrangements for its proper management. All of the seiners also have an outrigger on the port side, near the fore rigging, to which to fasten the seine-boat.

Wellfleet has a three-masted schooner, the Carrie D. Allen, employed in the mackerel fishery. Her burthen is 175 tons, and she carries 25 men.*

4. APPARATUS AND METHOD OF FISHING.

THE SEINE-BOAT AND ITS FITTINGS.—The boats used by the Gloucester fleet in the purse-seine fishery are built after a peculiar model and solely for this purpose. The present form of the seine-boat was devised about the year 1857 by Messrs. Higgins & Gifford, boat-builders, Gloucester, Mass.† The seines had previously been set from square-sterned, lap-streak boats, about 28 feet in length, and resembling in shape an ordinary ship's yawl.

The seine-boat, as now in use, resembles the well-known whale-boat, differing from it, however, in some important particulars.

The seine-boat, according to Mr. Gifford, must have three qualities: (1) It should tow well; consequently it is made sharpest forward. A whale-boat, on the other hand, is sharpest aft, to facilitate backing after the whale has been struck. (2) It should row well, and this quality also is obtained by the sharp bow. The whale-boat also should row well, but in this case it has been found desirable to sacrifice speed in part to the additional safety attained by having the stern sharper than the bow. (3) It should be stiff or steady in the water, since the operation of shooting the seine necessitates much moving about in the boat.

The Gloucester seine-boat of the present day is a modification of the old-fashioned whale-boat, combining the qualities mentioned above. The average length of such a boat is about 34 feet, its width 7 feet 5 inches, its depth amidship 33 inches. At the stern is a platform, measuring about 4 feet, fore and aft, on which the captain stands to steer; this is 6 to 8 inches below the gunwale. Another platform extends the whole length of the boat's bottom, from the afterpart of which the seine is set. In the bow is still another platform, on which stands the man who hauls the cork-line. There are four thwarts or seats, a large space being left clear behind the middle of the boat for the storage of the seines. Upon the starboard side of the boat, near the middle, is arranged an upright iron support, about 18 inches in height, to which are attached two iron snatch-blocks used in working the purse-ropes.‡ Upon the opposite side of the boat, generally near the bow

* The three-masted schooner Carrie D. Allen, of Wellfleet, Capt. Darius Newcomb, arrived at Gloucester June 18, 1874, with 900 barrels of mackerel. Only vessel of her class in the coast fisheries; 175 tons, carries 25 men. (Cape Ann Advertiser, June 26, 1874.)

† *Capt. George Merchant, jr., of Gloucester, Mass., claims to have been the first to design and introduce the form* of seine-boat now universally employed in the mackerel fishery, and which has been used to some extent in the menhaden fishery since 1857.

In 1856, while engaged in fishing for menhaden, he carried two boats, one of which was a whale-boat of the ordinary type. The latter, which he used for a "second boat," proved very serviceable—rowing and towing easily, and turning quickly—and was much better adapted for seining than the old-fashioned square-sterned seine-boats which were in general use at that time. Captain Merchant therefore conceived the idea that a decided improvement could be made in seine-boats by building them on the same general plan as the whale-boat, through making them somewhat wider than the latter, especially towards the stern, so that they would be better able to bear up the seine. Having decided on the dimensions required, Captain Merchant wrote to Mr. Higgins (now the senior partner of the boat-building firm of Higgins & Gifford, Gloucester, Mass.), who was then at Provincetown, desiring the latter to build a boat 21 feet long and according to the plan submitted, and which should be ready for the season of 1857.

Many of the old fishermen laughed at the idea of attempting to use a sharp-sterned boat for purse-seining, declaring that it would upset while the seine was being "pursed up," that it would tow under, and making other unfavorable predictions. Notwithstanding their croakings, they soon became convinced of the good qualities of the new boat, and in the following years hastened to adopt the same kind themselves.

‡ The first iron purse-davit (with wooden snatch-blocks), according to Captain Merchant, was invented and used by Capt. Henry Blatchford in 1858. With the exception of the blocks it was essentially the same as the purse-davit in use at the present time. Previous to this a wooden davit (usually an old one), such as were in use on the fishing vessels, was employed for the purpose of pursing up the seine. These davits were rigged out over the side of the boat, a place being cut in them three or four inches deep, so that they might fit over the gunwale of the boat in such a manner as to steady the outer end while the inner end was secured to the midship thwart by a grommet strap.

and stern, but with position varied according to the fancies of the fishermen, are fixed in the gunwale two staples, to which are attached other snatch-blocks used to secure additional purchase upon the purse-ropes. In the center of the platform at the stern of the boat is placed a large wooden pump, used to draw out the water which accumulates in large quantities during the hauling of the seine. The steering rowlocks, with the peculiar attachment for the tow-rope and the metallic fixtures described above, are manufactured especially for seine-boats by a firm at Middletown, Conn.

Until 1872 the seine-boats were always built in the lap-streak style; since that time an improved form of smooth-bottomed boats, built with battened seam, set-work, sheathed inside with pine, and with oak frame and pine platform, has been growing in popularity. The advantages claimed for this boat by the builders are: (1) Increased speed; (2) greater durability, on account of the more solid character of the woodwork and tighter seams; and (3) less liability to catch the twine of the nets by reason of the smooth sides. It is not so stiff as a lap-streaked boat of the same width, but in other respects is superior.

Since the general adoption of the purse-seine in the menhaden and mackerel fisheries, an account of which is given elsewhere, there has been a gradual increase from year to year in the size of the seine-boats, keeping pace with a corresponding increase in the size of the seines.

In 1857 all boats were 28 feet in length; in 1872 the length had increased to 30 feet, and in the summer and fall of the same year an additional foot was added to the length; in 1873 almost all boats which were built had a length of 31 feet, a few of 32 and 33; in 1874 almost all were 33 feet, as they were during 1875 and 1876, although some were made 35 and 36 feet; in 1877 34 feet was the most popular length, though one or two 38-foot boats were then built. Seven, eight, or nine oars, usually 13 or 14 feet in length, are used in these boats, besides a steering-oar of 16 or 17.

These boats last, with ordinary usage, six or seven years. At the close of the fishing season they are always taken ashore and laid up for the winter in a shed or under trees, and are completely refitted at the beginning of another season.

The seine-boats carried by many of the "menhaden catchers" south of Cape Cod and by some of the steamers are shaped like ships' yawls, square-sterned, smooth-bottomed, and batten-seamed, 22 to 26 feet long and 6½ feet beam. They are built at New Bedford, New London, Greenport, and at Mystic River, and cost about $125 each, the finest $185. The New Bedford boats are preferred by many fishermen.

The Cape Ann fishermen stow their seines in one boat, and in shooting the seine one end of it is carried in a dory.*

The arrangement of the thwarts is especially adapted for the mackerel fishery. There is some variation, however, as to the number of these in the different sizes of boats. In the size most commonly in use at the present time (1881) there are six thwarts, five of these being forward of midships and one 7¾ feet farther aft. The following are the general dimensions of the boat: 36 feet long over all; 7 feet 7 inches wide; 2 feet 8 inches deep. The bow thwart is placed 4 feet from the stem, and there is a space of 2½ feet between each of the five forward thwarts. The boat is ceiled to the gunwales and platformed inside. In the bow she has a raised platform, which comes up to the level, or nearly so, of the forward thwart, to which it extends, and is bulkheaded on the after end. The stern is covered over on the top of the gunwales, forming the stern sheets, this being 3 feet long forward of the stern-post, with a bulkhead on the forward side. Forward of this again, and a little below the level of the thwarts, is another platform, 3 feet in length, also bulkheaded on the forward side. On this the seine-master stands while steering the boat, and in

* Goode, History of the American Menhaden, p. 122.

it is placed the pump by which the boat is freed from water. The after portion of the boat between the two after thwarts is used for stowing the seine, this being a section 7¾ feet long by 7¼ feet wide. There are five rowlocks on either side, corresponding to each of the five thwarts. The purse-davit is placed on the starboard side and usually stepped in the midship thwart near the gunwale. At present, however, an improvement has been made in placing the purse-davit by stepping it in the thwart nearer to the center of the boat, it being placed at a distance of 18 inches to 2 feet from the gunwale. It is said that by this improvement the seine can be more easily pursed up, and the pursings taken over the gunwale of the boat without the use of a pry or lever, and also that there is less probability of the boat being capsized. The boats of the most recent construction have their purse-blocks on the port side, nearer the bow and stern than formerly, the forward being 2 feet aft of the stem, and the after one close to the upper stern sheet, about 3½ feet from the stern-post. Galvanized iron plates, each provided with a projecting eye, are neatly fastened to the gunwale, and the snatch-blocks are hooked into these eyes.

Until recently it has been customary to build these boats with a raised garboard, in imitation of the whale-boat (whale-boats are constructed in this way by some builders), but in 1881 a Gloucester firm of boat-builders, the principal, if not the only constructors of this style of boat in the United States, built them with smooth garboards, which have given better satisfaction than the old style. They are remarkably well adapted for swift rowing and for towing. Both of these qualities are very desirable, especially the latter, since they are frequently towed at a rate of 10 or 12 knots. The thwarts are double-kneed but not dunnaged. The boat is steered with an oar similar to the whale-boat. On the port side are two oar rests in which the oars are placed after the seine has been shot. The after one of these is just forward of amidships, and the two are separated 8 feet.

The seine-boat is usually towed astern by a warp, a 2½ or 3 inch rope, 20 to 50 fathoms in length. When the vessel is making a long passage the seine-boat is hoisted upon the deck. Most of the larger vessels carry two seine-boats and two seines.* On the largest schooners these boats are both of a large size; in other vessels, one of them is usually a small one. In addition to the seine-boats, each vessel carries two dories. One of these is usually towed astern when the vessel is on the fishing grounds; sometimes both. They are taken on deck in rough weather, when making a passage, or when not required for use in fishing.† When a large catch is obtained at the last set of a seine for the trip, and more mackerel are secured than the barrels on board will hold, the dories are taken on deck and filled with fish. During the mackerel season it is a common occurrence to see, in any of the large fishing ports, vessels arrive with both dories piled full of mackerel.

THE SEINE.—Two kinds of seines are used. The large seine, used only in connection with the

* The steamer Novelty, built especially for the mackerel seine fishery, in the summer of 1885, carries four seines and four boats. The latter, when the steamer is cruising, are hoisted to davits, two boats being taken up on each side of the vessel.

† The following is the price-list of a reliable firm of boat-builders in Gloucester, Mass., for 1880:

Seine-boats, including pump, iron breast-hook, outside tow-iron, and iron stem-cap.

Smooth bottom, battened seam, 31 feet	$186 00
Smooth bottom, battened seam, 32 feet	192 00
Smooth bottom, battened seam, 33 feet	200 00
Smooth bottom, battened seam, 34 feet	210 00
Smooth bottom, battened seam, 36 feet	225 00
Galvanized rowlocks, with brass sockets, per set (5)	6 50
Pursing-gear	8 50
Patent steering rowlock with socket	1 25
Pursing-blocks, per pair	6 00
Towing iron and pin	2 00

largest kind of seine-boat, is 190 to 225 fathoms in length, and 20 to 25 fathoms in depth when it is hung, being deeper in the center of the bunt than at the extreme wings, one of which, the "boat end," is from 1 to 10 fathoms deep, and the other, the "dory end," varies from about 7 to 15 fathoms in depth.* It is made of three kinds of twine. The "bailing-piece," which is a section of the net occupying about 10 to 12 fathoms along the center of the cork-line, and having about the same depth as length, is made of the stoutest twine. Beneath this, and composing the remainder of the bunt and extending to the bottom of the seine, is a section knit of twine a size smaller. There is also a band of large twine, 15 meshes in depth, extending along the cork-line of the seine on either side of the bailing-piece to the extremity of each wing. The remainder of the net is made of smaller twine.

A seine 200 fathoms in length is usually about 1,000 meshes deep, both in the bunt and in the wings. The strongest twine is placed at those places where the seine is subjected to the greatest strain. On the cork-line are two or three sizes of corks, the largest being placed over the bailing-piece, the smallest generally at the ends of the wings. The cork in the middle of the seine is much larger than the rest, and is painted or covered with canvas in order that it may be easy to find the center of the net either night or day. To one end of the cork-line at the upper corner of the wing, which is first thrown out when the seine is set, is a buoy. The seine is hung to lines which are called the hanging-lines. The lead-line is placed as in an ordinary seine, and is weighted with sinkers about two ounces in weight, which are attached to it at intervals varying from a few inches to several feet. The arrangement of the pursing rings and bridle is described elsewhere. In a mackerel seine of 175 fathoms the bridles are about 15 to 18 feet in length, and the rings, which weigh 1¼ pounds and are 3 inches in diameter, are fastened to the middle of each bridle. The middle ring is on the bottom of the seine, opposite the middle cork already referred to, and is usually made of different metal from the other rings, or is larger, so that the center of the bottom of the seine can be easily found. Small galvanized-iron blocks or pulleys are now used to a considerable extent instead of rings, and are found much better adapted for the purpose, since the purse-line runs far easier through them. The purse-line extends through the rings; its center is marked by a line tied around it or tucked through its strands, but more frequently now by a brass swivel, into which the purse-rope is spliced, and which serves the double purpose of marking the center of the line and preventing it from kinking.†

---

*Capt. Joseph Smith tells us that the depth of the seine-ends varies a great deal, according to the fancy of the fishermen. Some of the skippers prefer to have the ends of their seines "taken up" enough to make them very shallow, while others think a net with deep ends will fish the best.

†The following dimensions of an average-sized deep-water mackerel purse-seine have been supplied by Capt. George Merchant, jr., of Gloucester, Mass.:

Total length of seine when hung, 203 fathoms.
Depth, 1,000 meshes, or about 21 fathoms.
Size of mesh in all its parts, 2 inches.
Length of "bailing-piece" or "bunt," 500 meshes; size of twine, 12-9.
Depth of "bunt" or "bailing-piece," 500 meshes.
Length of "sides," each, 300 meshes; size of twine, 20-9.
Depth of "sides," each 500 meshes.
Length of "under," 1,100 meshes; size of twine, 20-9.
Depth of "under," 500 meshes.

The central section of the mackerel purse-seine, that portion composed of the bailing-piece, sides, and under, is generally spoken of as the "bunt," though the bunt proper constitutes only a small portion of it. Capt. Joseph Smith, of Gloucester, says that at present the whole center of the seine (including the bunt, sides, and under) is made of one size of twine, 20-12, this portion being 1,000 meshes square.

There is sometimes considerable difference in the length of the wing and arm of one end of the seine from that of the other, though some are constructed with both ends of equal length. Many of the seiners prefer to have the bunt of their seines a little to one side of the middle of the net. In such cases the ends are, of course, of unequal lengths.

When the vessel is not searching for fish the seine is stowed on a grating forward of the house, between that and the after hatch. This grating is a frame-work, about 8 to 10 feet square, made of boards from 4 to 6 inches in width, crossing each other at right angles. The boarding is supported on a frame-work of joists. The top of the grating is 4 to 6 inches above the surface of the deck. When two seines are carried, the grating must be wider. When the seine is stowed in the boat or upon the deck, it is always "salted down" to prevent it from rotting or burning. From a bushel to a barrel of salt or more is used, according to the necessity of the case. When the seine is thus stowed, it is often protected by a canvas cover.

When looking out for mackerel the seines are generally stowed in the seine-boats upon the platform arranged for that purpose between the two after thwarts. The cork-lines are stowed aft and the lead-lines forward, the seine always being set from the starboard side of the boat.

As has been stated, the small seine differs from the large seine only in its size, being from 150 to 175 fathoms in length and 10 to 12 fathoms in depth. These seines are used in shallow water, and those vessels which have gone to the Gulf of Saint Lawrence for the purpose of catching mackerel by this method have generally carried them.

Many of the large schooners carry two seines whether they have two seine-boats or not, since the deep seine cannot be used on rocky bottom in shallow water.

The seine is always passed from the boat to the vessel, and *vice versa*, over the roller upon the port side, which has already been described. To transfer the seine from the vessel to the boat requires five or more men. The operation can be performed in from 15 to 30 minutes. To haul the wet seine from the boat to the vessel is a somewhat laborious task, but as less care is required than in stowing it in the boat, less time is usually needed to perform this operation.

BAIT.—Mackerel seiners usually carry a small supply of bait for the purpose of tolling the fish to the surface and, incidentally, of catching fish with the jigs when they are not schooling.

It may also be mentioned that a border of stout twine (size 20-9), 15 meshes deep, extends along both the top and bottom of the wings and arms of each end of the net.

Size of the first wing, 125 yards long in the web, 1,000 meshes deep; size of twine, with the exception of that for the border, 16-6, hawser-laid; size of first arm on the same end of the net as the wing just described, 125 yards long in the web, 1,000 meshes deep; size of twine, exclusive of that in the border, 20-6, hawser-laid. Size of wing No. 2, on the other end of the net, 150 yards long in the web; depth, 1,000 meshes; twine, 16-6 hawser-laid. Size of arm No. 2, 150 yards long in the web; depth, 1,000 meshes; size of twine, 20-6, hawser-laid, exclusive of the border.

Captain Merchant writes: "We always use for hangings 6-thread manila right and left rope. In Boston factories they sometimes use 9-thread manila for bridle-rope, or 'loops,' as they are occasionally called." These loops, to which the purse-rings are attached at the bottom of the seine, are one part of the hanging-rope, and are made three fathoms long, the spaces between them being the same distance. Thus it will be seen that the purse-rings are about 6 fathoms distant from each other. Captain Merchant adds: "We use the left-laid rope for loops and the right for the sinkers. The loops are formed by separating the ropes at what are called the 'bridle hitches.' Only one ring is attached to a loop. The net has attached to it, when completed, 800 No. 1 corks, 1,200 No. 2 corks. The No. 1 corks, which are the largest, are placed in pairs in the center of the bunt of the seine, at a distance of 10 inches between the pairs. The 'middle cork,' however, is made of three, joined together and covered with canvas. This is for the purpose of determining the center of the seine when it is being overhauled. The No. 2 corks are secured to the upper part of the seine upon the wings and arms, being placed 15 inches apart. From 65 to 75 pounds of lead sinkers, which weigh from 2½ to 4 ounces each, are placed at the bottom of the seine. None of these are put in the bunt, but are scattered along the foot of the wings and arms, being nearest together close to the ends of the net. The rings used at present are made of galvanized 1-inch iron, and weigh about 2½ pounds each; with the sinket-leads they make about 160 pounds weight attached to the bottom of the seine. One and three-fourth inch hemp rope is used for the purse-line, the length of this being generally about 25 fathoms more than that of the seine. In hanging the seine it is 'taken up' at the ends, so that one end is 7 fathoms deep while the other is only 1 fathom deep, though the middle of the net will go down 125 feet. The first or deepest end is called the 'dory end' or 'outer end,' and the other is known as the 'boat end' or 'inner end.' As will readily be understood by reference to the preceding dimensions of the purse-seine, the difference in the depth of the several sections of the net, when hung, is due solely to the 'taking up' in the process of hanging it, since the webbing is of the same depth throughout. The purse-seines, like many other things, are being improved. Those we are making now (for the mackerel fishery) are much lighter than we have been making them in former years, and can be handled with greater ease and rapidity."

Sometimes they toll the school alongside and spread the seine around the vessel, and after she sails over the cork-rope and away to leeward, the net is pursed up and the fish captured. It is often the case, too, when mackerel are moving rapidly, for the men in the dory to throw bait ahead of the school, and while the fish are thus induced to stop, the seine-boat circles around them, the net is thrown out and while yet engaged in feeding, the fish are inclosed in the big purse. Many good catches are obtained in this way. The favorite bait is slivered and salted menhaden, of which each vessel carries 5 to 10 barrels when they can be procured. Most of the vessels, however, at the present time, depend entirely upon small mackerel, which they catch and salt. The bait-mill, bait-boxes, and bait-throwers are similar to those used in the mackerel-hook fishery, and are used in the same manner.

METHODS OF SEINING BY DAY.—The following description of the method of seining mackerel is mainly from the pen of Mr. J. P. Gordy: When a vessel is on the fishing grounds and there are no signs of fish, if the weather is favorable, a man is stationed at the mast-head on the lookout, while the rest of the crew, excepting, of course, the man at the wheel, lounge lazily around, amusing themselves as they feel inclined. If a whale is seen blowing or a vessel is "putting out her boat," the man at the wheel steers toward them. The skipper is usually on deck directing the evolutions of the vessel, and is consulted before any change is made in the course of the vessel. When signs of fish begin to be numerous, and sea geese and gannets are plenty, and whales and porpoises show themselves frequently, the "fishy men" of the crew stop lounging and begin to survey the surface of the water intently. At such times one can count half a dozen here and there in the rigging, carefully observing the movements of other vessels, if any of the fleet are in sight. "There's crooked actions, men," the skipper exclaims, meaning that some vessel in sight suddenly alters her course, and that she is either on fish herself or sees another vessel that is. When one school appears, another is likely to be seen, and when a vessel has "crooked actions," those who observe them bend their course in the direction in which she is sailing. When a man sees fish, he shouts, "I see a school." "Where?" asks the captain. The direction is indicated. "How does it look; is it a good one?" He wants to know whether they are tinkers or whether the fish seem large. If they are abundant he will wait until he gets a "sight" at a good school. Much attention is paid by the lookouts to the manner in which the school of fish is moving. The seiners prefer those schools which are "cart wheeling,"* or going round and round in circles in a compact body, in the act of feeding. Fish which are "cart wheeling" can be surrounded with a seine much more readily than those going straight ahead in one direction.

If the man who has found the school is not experienced, the captain examines it for himself, and if satisfied that it is a good one he shouts, "Get in the seine-boat; look alive, boys." As a pack of school-boys jump from an apple tree when the indignant owner appears, so eleven men leap into the seine-boat one over another, as if they had meant to jump overboard but by accident had reached the seine-boat instead. The captain takes his place at the steering-oar. Two men sit on the forward part of the seine and one at the cork-line, ready to "throw out the twine" when the captain gives the word of command. The remaining seven row swiftly and silently until the fish disappear or the captain orders them them to "stop rowing." All the while the captain is eagerly watching the fish, noticing which way they move and how fast. Before beginning to put out his twine, he wants to get near enough to enable him to make the wings of the seine meet around the school. He must, therefore, keep far enough away to prevent the head of the school from striking the seine until it is nearly pursed up. He calculates the speed of the fish, and sets the seine in such a manner that by the time the school gets thoroughly within the circle of the net he will be able to come

*This habit of circling, which the mackerel performs, is also called "milling" by the fishermen.

round to the starting point and completely encircle them. If he fails in this, the wings of the seine must be towed together before it can be pursed up, and in the time thus occupied there is a chance of losing the fish. A skillful skipper rarely fails in making the ends of the seine meet. In seining on George's, or any other place where there is a strong tide, it requires much skill and judgment to set the seine in such a manner that it shall not be tripped and thrown out upon the surface of the water. Under these circumstances, to prevent "tripping," the seine should be so set that the bunt of it will be in the direction from which the tide runs; the force of the tide then aiding the act of pursing the net.

When the skipper is near enough to satisfy the conditions of the above problems he orders the men at the seine to "put out the twine." They begin their work, the oarsmen in the mean-time rowing as fast as possible. The skipper steers the boat around the school in such a manner that when the seine is fully out the cork-line approximates more or less closely to the form of a circle. Two of the men who did not get in the seine-boat now appear on the scene of action in the dory in which they have closely followed in the wake of the seine-boat until the act of setting begins. As soon as the first end of the seine has been thrown overboard they row up to it and seize the buoy at the end of the cork-line, which they hold until the seine-boat has made a circle, merely rowing fast enough to keep the end of the seine in its place and to prevent it from swagging. When the seine-boat has completed its circle, it approaches the dory, which is holding fast to the buoy. When the two ends of the seine meet, the men in the dory get into the seine-boat to assist in pursing; sometimes, however, the ends do not meet, and in this case they are brought together by means of a line, about 20 fathoms in length, which is always taken in the dory and is fastened by the men in the dory to the buoy and carried to the seine-boat.*

The work of "pursing up" is now to be performed with all possible speed. Until this is begun the seine is in the form of a hollow cylinder, and the fish, in order to escape, have only to dive down and swim away under the lead-line. In pursing, the bottom of the seine is to be closed up, and in this operation the saying of the men, "A man who won't pull every pound he can and *an ounce more* is not fit to be a fisherman," is fully exemplified.

The men stand six in one end of the seine-boat and seven in the other end, holding the two ends of the purse-line, which, having passed through the rings in the bridles on the lead-line of the seine, pass round the two blocks of the purse-davit and through the snatch-blocks on the opposite side of the seine-boat, one of which is forward and the other aft. One of the uses of the bridles now appears. As soon as the men in the seine-boat commence pursing up the seine, the rings, which before this have been hanging downward below the lead-line, now extend the same distance laterally from this line. We have only to remember that they all extend toward each other to see that they considerably diminish the open area at the bottom of the seine. To be sure, the spaces between the bridles are open, but the fish are not likely to escape through these, for in such an attempt many of them would strike the bridles and finding such obstacles would turn, hoping to find an outlet in some other direction.

The men stand, as has been said, when pursing up the seine, six in one end of the boat and seven in the other. They are divided into three rows of three and one of four men. On the side

* Capt. Nelson A. McKenney, of Gloucester, states that two men usually go in a dory, one of whom pulls a little while the other holds to the end of the seine. If the one having the oars is an expert (and as a rule only old hands do the rowing), he will quickly and dexterously turn the dory as the seine-boat approaches "close to," so that the latter may shoot alongside of the former in such a manner that the purse-line held by the man in the stern of the dory may be easily transferred to the larger boat. As soon as this is done both of the dorymen jump aboard the seine-boat and assist in "pursing up" the seine.

of the boat next to the seine are two rows of men facing each other, and pulling; one row on the end of the first line that passes over the blocks in the purse-davit nearest them, the other on the other end of the purse-line passing over the other block of the davit. Each end of the purse-line passes around another block, which changes the direction of the line, and two rows of men on the side of the boat away from the seine stand back to back, pulling on the purse-line, its direction having been changed by the pulleys.

As previously remarked, the seine before being pursed up is in the shape of a hollow cylinder. A strong tide may make it take the form of a hollow frustum with a slit in its side. Its longer area is at the bottom. In such a case the slit is wider at the bottom and grows narrower toward the top, until it vanishes at a point where the two ends of the purse-line bring the seine together at the purse-davit. Then the purse-weight comes into play. This is "reeved out" to the two end lines, and its weight brings the two ends of the seine together, closing up the slit and destroying the frustum shape of the seine. If this were not done the fish might escape at the side as well as at the bottom.*

When the seine is pursed up it is in the form of a bag, the bottom of which does not hang freely, for it is bent upward, having been drawn up by the purse-line near the side of the boat, and during the operation of pursing up the boat is pulled nearly into the center of the circle made by the corks on the upper edge of the seine. Occasionally, when there is a current, the boat is brought up against the corks in the bunt of the seine. The object is now to get the fish, if they have any, into such close quarters that they may be taken on deck. To this end the larger part of the seine must be pulled into the seine-boat, and this operation, called "drying up," now begins. The seine is taken up entirely if there be no fish, partly if the school has not escaped, and the net is so drawn up that the "bailing-piece" will inclose the fish at last. The position of this part of the seine being marked by the central cork already spoken of in the description of the seine, it is of course not difficult to bring it around the fish. The experienced fishermen can also quickly tell, either *night or day*, when the bunt of the seine is reached in the process of drying up, since the difference in the size of the twine of which the bailing-piece is made and that of the other parts of the net is readily detected.

If any fish have been caught, especially if the school is large, the skipper and three or four men go in the dory to the vessel to help the cook, who is the only man on board, to bring her alongside of the seine-boat. If the school is very large the dory is rowed to the vessel as rapidly

*It should be stated that the large purse-weight is at present seldom used. The tide is rarely so strong as to make it useful, and even then the process of "reeving" is likely to be so tedious as to make the loss of time more than balance the gain through its use. According to Capt. Joseph Smith the majority of the mackerel seiners now use two purse-weights, each of 75 or 100 pounds weight, instead of the old-fashioned "Long Tom," which usually weighed 150 pounds. The two weights above mentioned, being so much lighter than those formerly employed, can be handled by one man, and rove on the purse-line very much quicker than if the heavier, or "double weight," as it is called, was used. These small purse-weights are provided with one block, and each weight has a line attached of sufficient length to reach the bottom of the seine. The time occupied in reeving them on the purse-line rarely exceeds fifteen or twenty seconds. One of the purse-weights is most commonly used on the "boat end," or the end of the seine last thrown out, for the reason that this part of the net has not usually time to sink down to its full extent before the pursing begins. A weight is more rarely used on the end of the seine which is first thrown out, and, consequently, has had time to sink to its extreme depth; though sometimes, on account of the current, or for some other reason, it may be found necessary to put the purse-weight upon this end, as well as upon the other. In using one large weight as formerly, it would be necessary, of course, to always put it on both ends of the purse-line of the seine, but in having two weights one can be attached and run down on either end of the purse-line as required. That sinks it and keeps the net deep, and if both ends "purse high" a weight should be put on each end. The ends of the purse-line, when the weights have been run down, in the manner above stated, will stand out from each other, something in the form of the letter A, both parts coming nearly together at the purse-davit and being separated several fathoms at the lower part of the net, as the first purse-rings are attached about 15 fathoms from the ends of the seine.

as possible, and the second dory is rowed back to the seine for the purpose of holding up the bunt, since a school of 500 barrels may sink both seine and seine-boat if left without assistance. This, however, rarely occurs, and it generally happens that the school either is small enough to be dipped into the dory and to be taken to the vessel, or that the seine-boat without any assistance is capable of managing them until the vessel is brought alongside.

While the fish are being caught the cook has charge of the vessel; if it happens to be about meal time he attends to the cooking as best he can, but whether the cakes burn or not the vessel must be cared for, and he generally divides his time between the forecastle and the wheel. If he is preparing dinner and is able to, he continues his cooking, taking charge of the vessel at the same time.

The vessel usually "lays to," with the jib to windward, not far from the seine-boat; and perhaps, as the cook sits at the wheel, he has a basin of potatoes before him, which he peels while he is eagerly watching every movement of the seine-boat, trying to ascertain whether his mates are successful, and, if so, to what degree.

When the dory has been rowed aboard, the men at once take measures to bring the vessel alongside of the seine-boat. The evolution of shooting alongside of a seine-boat (described elsewhere) calls into play all the skill of the steersman. The vessel must approach so near that a rope may be thrown to the men in the seine-boat, and in such a manner that she will move slowly enough not to tear the seine as it is pulled along, before the schooner is "bowsed to the windward" and her motion ceases.

The cork-line is then taken over the side of the vessel and made fast by "stoppers" along the rail. This having been done the process of drying up is resumed, and the fish are gathered together in a compact body so that they can be dipped out upon the deck. When the fish are to be taken on deck the men are distributed as follows: Three or four are employed in hoisting the fish by means of a large dip net attached to the main and fore staysail halyards; the captain directs the movements of the net, holding its long handle, and shouting "Hoist!" when it is about half full of fish two men standing by the rail empty the dip-net on the deck.

When all the fish have been bailed out the seine is overhauled and salted. In the mean time most of the crew are making preparations to dress the fish. If the school is large, the crew, cook and all, unless it is just at meal time, begin the work as soon as the fish are ready; if the catch of fish is small, and there is a prospect of getting another set that day, a part of the crew take the seine out of the seine-boat to mend it, if necessary, and lay it back in an orderly form so that it may be thrown out without difficulty.

The operation of setting a seine around the school and pursing it up usually occupies from ten to twelve minutes, though it is claimed by some expert fishermen that they have done it in seven minutes. Under unfavorable circumstances it may be nearly an hour from the time the first end is thrown out until the "pursings" are on the boat. This delay is usually caused by a strong tide, such as is generally found on George's. The catch of a purse-seine may vary from one barrel to five or six hundred barrels. The seine may be set eight or ten times in the course of a day without getting any considerable quantity, or perhaps no fish, the mackerel escaping by diving under the "lead-line"; and then a more fortunate set will secure more fish than can by any possibility be taken care of by the crew of the vessel. Under such circumstances it is customary to set a flag from the main-topmast head or main peak. This is to indicate to vessels which may be in sight that more fish have been caught than can be taken care of, and that the skipper is willing to dispose of some of them. This is called "giving the seine away." Sometimes the fish are given away to

be dressed on shares, and at other times they are given away without expectation of return.* An ordinary crew can dress and salt at one time about 100 barrels of small mackerel or 200 barrels of large ones.†

Very large quantities of fish can be taken care of in a short time. Vessels have been known to leave New York on one day and return the next day with 200 to 300 barrels of fresh mackerel, while some Gloucester vessels in the course of a week have caught and salted 500 or 600 barrels, landing two or three cargoes during that time.

It sometimes happens that, when a large school of mackerel has been taken in a seine, the fish press down so hard on the bottom of the net that the fishermen find it difficult, if not impossible, to gather in on the twine sufficiently to "dry the fish up" enough to bring them to the surface. It has been found, however, that by throwing coal ashes into the water alongside of the seine the fish are caused to rise to the surface, being frightened by the whitish appearance which the ashes give to the sea. When the mackerel rise the twine can be readily drawn in. The same result is secured in another way by the menhaden fishermen when they have a large school of menhaden in their seine alongside of the steamer. If the fish hang heavy on the twine, one or two quick turns are given with the propeller and the frightened menhaden rise quickly to the surface. This method is called "whirling 'em up."

METHODS OF SEINING BY NIGHT.—The practice of fishing for mackerel—purse-seining in the night-time—which has recently come into quite general use, was first attempted, so far as we can learn, prior to 1874. Captain Merchant says that night seining for pogies was in practice as early as 1864, but that up to 1874 no mackerel of any amount had been taken in this way. In 1874, and up to 1877, a large quantity was taken. Since the latter date night seining has been the general custom in the latter part of the summer and fall. The honor of introducing this method of fishing is assigned to a number of the more enterprising captains of the mackerel schooners, and, in consequence, it is difficult to say here who should receive the credit for the innovation. As is well known to all who are familiar with the sea, the water, on dark nights, frequently exhibits a remarkably brilliant phosphorescent display. At such times objects moving in the sea can be distinctly traced by the illumination which they leave behind, and schools of fish rising near the surface can be readily seen. Indeed, on some occasions so remarkable is the phosphorescence thrown out from a large school of fish that it frequently seems to light up the surrounding darkness. From this reason, and the fact that the fishermen, by long experience and close observation, can accurately

*The schooner Oliver Cromwell, while on a mackerel cruise recently, had a curious incident befall her. Her seine being out, a school of mackerel suddenly turned, and, making for the seine, took it down. A vessel in the neighborhood immediately answered a call for assistance, and swept her seine under that of the Oliver Cromwell. Twenty-three hundred dollars' worth of mackerel were secured, the two vessels dividing the catch, the fish selling on an average at nine cents each. The bunt of the seine belonging to the Oliver Cromwell was badly rent by the sudden rush of the fish or more would have been secured. This is the second time the seine of the Oliver Cromwell has experienced similar treatment, losing all the fish at the first on account of the seine giving way and there being no help near. (New Bedford Mercury, 1875 (?).)

Captain Merchant writes us that "in 'giving the seine away to another seiner,' we never expect to get any return of fish, as it is supposed the receivers will do the same by us as we have done by them whenever they may have the chance. We are therefore satisfied if proper care is taken of the seine. We expect those vessels to return a part of the mackerel who are hook and line fishing and have no seine to catch them with."

†A much larger quantity could be taken care of were it not for the fact that mackerel, after being kept a certain length of time, grow "soft," and rapidly become unfit for food. This change takes place much sooner when the weather is warm than at other times. The fishermen, however, are generally able to tell pretty accurately how many fish can be dressed and salted before they spoil. When good catches are made for several days in succession the fishermen get no sleep, being constantly employed night and day in taking and curing the fish. The above remarks apply more particularly to the methods in use prior to the general adoption of the mackerel pocket. At present all mackerel vessels are supplied with a "pocket," and since the fish can be kept alive in this for a considerable length of time, it follows, of course, that a part of the catch is seldom given away.

determine the kind of fish which he may see sporting at night, he is thus often enabled to learn the whereabouts of certain species, such, for instance, as the mackerel and their abundance, even when they do not come to the surface during the day. The mackerel is a remarkably capricious fish, and perhaps for many days in succession its presence cannot be detected in its favorite haunts while daylight lasts, and the fishermen therefore seeks for it in vain, but as soon as the sun sets and darkness appears over the sea the schools rise to the surface and the fish continue to disport themselves in this manner until near daylight, when they again sink out of sight.

For many years after the introduction of purse-seines it was considered impracticable by the fishermen to catch mackerel in the night, but at last some of the more adventurous skippers, having a favorable opportunity for night fishing, and deeming it possible to catch the mackerel, made an attempt and met with even better success than they dared to anticipate. Thereafter they followed up this method of fishing whenever a good chance occurred, but as it usually resulted greatly to their personal success, as well as increased their reputation among their fellow fishermen, on account of the additional amount of fish caught, they were by no means anxious to tell that part of their catch was made in the night, since, if they did so, all the other mackerel fishermen would at once come directly into competition with them. As a matter of course, however, the fact of mackerel being seined at night could not long be kept a secret, and the result was that one after another began to adopt this practice until in the fall of 1881 it reached its climax, nearly every vessel in the fleet engaging to a greater or less extent in night fishing.*

Previous to this time the public at large were not, it seems, aware that such large quantities of mackerel were taken in the night, though it was on record that night fishing had been previously attempted, and with good results.†

The method of seining mackerel in the night is as follows: The vessel being on the fishing-ground, if the night is favorable, she is allowed to sail slowly ahead while a man goes aloft to the foremast-head and keeps a lookout for the fish. If the signs are peculiarly favorable, perhaps two or more men may be aloft for this purpose. These lookouts are the men who have the watch on deck, and, *not infrequently, the skipper may be one of them, his ambition to succeed often impelling* him to remain up during the entire night, constantly keeping on the alert for fish and watching the movements of surrounding vessels. The remainder of the crew—those having a watch below—are thoroughly prepared and dressed in their oil-clothes ready to jump into the seine-boat at a moment's warning. If the fish are not seen in the first of the night, the men off duty lie down on the cabin or forecastle floors or stretch themselves on the lockers, and endeavor in this way to get what sleep they can, unless, indeed, they may be busy on deck in caring for the fish taken the

* Mr. A. Howard Clark, writing under date of October 28, 1881, says: "During the past few weeks the mackerel fleet have taken some good hauls during the night, as the fish have been difficult to catch by daylight but have rarely failed to show themselves on dark nights. When the moon shines it is impossible to see them, but when the night is dark or starlight they can be plainly seen from the mast-head, and sometimes from the vessel's deck. Heretofore, in night fishing, the methods have been the same as by day, but recently, owing to the difficulty of seeing the fish from the deck or the boat the lookout at the foremast-head has given directions to the men while setting the seine. In this method the seine-boat is towed astern of the vessel, and when ready to 'give 'em twine' the dory is allowed to drift astern with one end of the seine while it is being thrown out from the seine-boat. When ready to go around the school the order is given from the mast-head to 'go ahead;' the seine-boat is cast loose from the vessel and the seine brought together in the usual manner. Still another improvement in the methods is likely soon to be adopted in this night seining, and that is in the use of large lanterns to show their position to the men while setting for them. The schooner Northern Eagle tried this new method last Tuesday night and found it to work splendidly. It was probably the first attempt to use lanterns for such a purpose. Two schools of mackerel were secured, one at 10 o'clock and the other at midnight, both together yielding 160 barrels. The lantern was the ordinary large signal light used by fishing vessels."

† We hear of one vessel with a catch of 100 barrels in one week, and of several with catches ranging from 30 to 60 barrels. Another vessel made a good haul in a seine, one moonlight night recently, a new feature in this fishery. (Cape Ann Advertiser, October 19, 1877.)

night or day previous. When a school of fish is seen by the lookout, he at once shouts "I see a school!" If it is the skipper who first descries them, he gives directions to the man at the wheel how to steer in order to approach them. If not, the man who first reports the school is asked in which direction it bears from the vessel. He also directs how the course shall be laid in order to approach close to the body of fish. In the mean time the men below, having been hurriedly awakened, rush on deck and quickly take their places in the seine-boat and dory which are towed alongside or astern. If the mackerel "show up" well and can be plainly seen by the men in the boat, the latter is cast off as soon as the vessel approaches close to the school, and the seine is set and pursed up in the same manner as has before been described; though it frequently happens that, owing to the darkness of the night, it is quite difficult to bring the ends of the net together with such a degree of certainty and success as it is generally done in the day-time. Of late, however, the custom of carrying a light in the dory has been adopted in order that the skipper, who steers the boat, may determine the position of the end of the seine first put out and therefore be enabled to make a circle with a great deal more accuracy than he otherwise could. It often happens that fish can only be seen by the man at the mast-head, and in such cases the vessel is usually hove to near the mackerel, and the lookout directs the men in the boat how to row in order to surround the school. Another method, we are told, has been occasionally adopted when the chance for its success is promising. If the wind is sufficiently moderate the lookout at the foremast-head may direct the course of the vessel in such a manner that nearly a complete circle may be made round the school of fish. In this case the seine boat remains fastened to the stern and is towed along by the vessel while the men in her throw out the seine in obedience to the order given by the man at the mast head. At the proper time she is cast off and proceeds to close up the circle by bringing together the ends of the seine. The dory is cast off and allowed to remain at the end of the seine as usual until the other end is brought around to her. An evolution of this kind, of course, requires the most skillful seamanship for its success, and also remarkable qualities of adaptability in the vessel.

Night fishing, says Capt. Joseph Smith, can only be carried on in reasonably moderate weather. The boat is usually towed alongside of the vessel, the painter being fastened to the outrigger. When a school is seen, the men jump into the boat, each taking his station, and at the proper time the boat is cast off and proceeds to set the seine if the fish "show up" in a promising manner. Sometimes, however, the school of mackerel may sink suddenly after the boat leaves the vessel's side, and, in consequence, the fishermen are not able to set their seine. As a rule the man on the lookout aloft reports the school of fish and indicates the direction in which it is and tells about how far it is distant. After the boat leaves the vessel's side, however, the captain, or seine-master, who steers, takes charge of her, and when the boat approaches near the fish, which may be seen by the phosphorescence in the water, he gives the order to put out the seine as his judgment may direct. On special occasions this method may be somewhat varied, but the usual practice of setting a seine in the night is the one described above. Sometimes a portion of the net is set from the boat while towing astern of the vessel; or, again, even while the boat is towing alongside. In the latter case the towing rope is fastened to the boat some distance aft from the stem, so that she will keep from the schooner's side some 10 or 15 feet. The oarsmen have out their oars ready to pull whenever the man aloft gives the order for them to cast off. These methods of setting the seine, however, are only adopted when the fish do not *show* plainly, so that they can be seen by the men on the vessel's deck, or in the boat; it therefore becomes necessary for the man on the masthead to give the requisite orders for throwing out the seine as well as to direct the wheelsman how to steer the vessel until the boat leaves the side.

Captain Smith has never known a vessel to make a complete circle around a school of mackerel while towing the seine-boat from which the net was being thrown out, but thinks it probable that it may have been done.

A lantern is carried both in the seine-boat and dory, the one in the former always being kept darkened or out of sight until the seine is set, since a light would so blind the men in the boat that it would be difficult for them to perform successfully the work of setting the net.

When a school of mackerel has been taken in the seine and the net is *pursed up*, a signal is made by the crew of the seine-boat, who have a lantern, so as to attract the attention of the men on board of the vessel, who immediately bring the latter near the seine-boat. The skipper and three or four of the crew then go on board the vessel in the dory and bring the schooner alongside the seine-boat, performing this evolution in the same manner as it is done in the day-time. The lantern, which is always carried in the seine-boat, enables the skipper to find her without any trouble. Much vexatious delay and difficulty, however, sometimes occurs in consequence of the light carried by the seine-boat's crew being extinguished. In such case it is not only hard, but sometimes impossible for the men on the vessel to find the seine-boat, since on a dark, windy night she cannot be seen more than a few rods distant.

It is claimed that the practice of using a large lantern to attract the fish nearer to the surface of the water than they usually come, so that they can be more plainly seen, has met with decided success, and it is believed that there is reason for anticipating considerable improvements in this respect hereafter. In alluding to this matter a writer in the Cape Ann Advertiser, November 4, 1881, says:

"It would not greatly surprise us if the mackerel fleet, next year, were supplied with powerful calcium lights, to be carried at the masthead, and that the fishery will be extensively prosecuted in the night-time. Surely the signs of progression are manifested in almost every branch of the fisheries, and brains are rapidly coming to the front and making themselves manifest. A year ago who would have dreamed of catching mackerel in the night-time? Now it is fast becoming a reality."

As may be readily inferred, this practice of night fishing is one which calls for great endurance and hardihood on the part of the fishermen who engage in it. It frequently happens, when good catches are made for days and nights in succession, that the men get no rest whatever until they are thoroughly worn out by their constant labors and vigils and are scarcely able to refrain from falling asleep even when engaged at their work. Nor is the work on the fishing ground all they have to do. When a fare is obtained, all sail is made upon the vessel and she is driven as swiftly as possible for the home port, where the fish are landed, new supplies taken on board, and again the men go to sea without, in the mean time, having an opportunity of visiting their homes or of securing the rest they so much stand in need of. So sharp is the competition in this fishery, and so eager are the fishermen to "make hay while the sun shines," that is, to improve every opportunity during the short season while the mackerel can be taken, that the only limit to their labors is when nature is no longer able to sustain the extraordinary drafts that are made upon it. The following notes written by Capt. S. J. Martin will serve to give an idea of the continued labor and consequent fatigue which the fishermen endure:

"Our mackerel fishermen have 'drove business' this season. I know a number of cases where vessels have arrived in the morning with 300 barrels of mackerel, have landed the fish and gone out again the same night. The schooner Fleetwing caught 210 barrels of mackerel; came into Gloucester with them all on deck; hired twenty men who had the fish all dressed and salted at two o'clock the following morning. The vessel's crew went home to sleep; went out again the same morning at eight o'clock.

"Schooner William M. Gaffney came in here with 450 barrels of mackerel, of which 150 barrels were fresh on deck. The men had not been to sleep for two days and nights, and were nodding while putting the mackerel in the barrels. They got the mackerel all salted at four o'clock in the afternoon. Captain Smith then told the men to go home and rest till morning, but to be down the first thing after breakfast, as he wanted to get the mackerel out and go to sea in the evening. This they did."

The success of the night fishing was quite marked in the fall of 1881, as has been indicated above, and as the following newspaper paragraphs will show:

"Several of the mackerel fleet have made night hauls recently, some of them securing as high as 200 to 300 barrels at one setting of the seine. The operations are conducted by a lookout stationed at the foremast-head of the vessel, who gives the orders to the boat's crew in charge of the seine, as in the night-time the motions of a school of mackerel cannot be seen from the boat in pursuit of the fish, nor from the deck of the schooner."

"Schooner Henry Friend took 140 wash-barrels of mackerel at one haul Sunday night October 16."

"Schooner Phantom went out Sunday morning, and about 11 o'clock p. m. discovered a school of mackerel on Middle Bank, and getting her seine out secured ninety wash-barrels. The night was very dark, and lanterns were found necessary to conduct the seining operations and find the way back to the vessel."

In regard to the night fishing for mackerel in the fall of 1881, Captain Martin writes as follows:

"Seven-eighths of the mackerel taken since the 10th of September have been caught in the night. Catching mackerel in the night is done with great difficulty. Sometimes the vessel goes away from the boat. There were two such cases this fall. Schooner Everett Pierce's boat went out and set around a school of mackerel, and the seine was full of fish. At this time a squall of wind came and blew the lantern out, and the two men on board of the vessel lost sight of the boat. The men were in the boat from 11 o'clock at night until 5 o'clock the next morning. They were obliged to cut holes in the seine in order to let the mackerel go out so as to save the net, for if the mackerel died the seine would have been lost. The crew of the Minnehaha, of Swampscott, had a similiar experience the same night. The darker the night the better it is for seining, since the water will 'fire' more. When watching for mackerel one man is on the mast-head. He can see a school from the mast-head when he could not see it from the deck of the vessel. Sometimes the fish may be seen from the deck, but when the men get in the seine-boat they are not able to see them. A man on the mast-head can see them all the time. He gives orders to the men in the boat which way it is best for them to go. Captain Martin, of the schooner Northern Eagle, saw a school of mackerel one night. They could not see them plainly, so the lantern was held up, when the mackerel could be seen from the boat. They then set their seine and got 150 barrels of mackerel. When the fish saw the light they came nearer the surface. Sometimes when the mackerel are close to the surface it is not necessary to have a man on the mast-head since they may be seen from the deck and seine-boat. It is not very often that the mackerel come to the surface during the fall of the year. Sometimes on a calm night in summer you can hear them rushing, but not often. Catching mackerel in the night is hard work. Say, for instance, you get 200 barrels a night, and perhaps it is the latter part of the night, it will take all day to dress and salt them, head them up, and get them below. Thus if another dark night follows, all of the men are on the lookout for another school. After looking for, perhaps, two hours, some one (most likely the man on the mast-head) gives the alarm, telling those on deck where the fish are. The vessel is then kept in the direction of the school, and as soon as they can be seen from the deck the men jump into the boat, shoving off from the vessel,

while the captain stands up with the steering oar in his hand, looking for the school. Soon he espies the fish, or the man on the mast-head sees them, and tells the men in the boat which way to go. When the captain sees them he sings out: 'I see them, boys! Pull away! Pull hard, the mackerel are going fast.' When the boat is in the right position the captain shouts, 'Give 'em twine,' and away goes the seine, three men heaving it out as fast as they can. When they are nearly around the school they sing out: 'Give them twine.' Sometimes they make a good circle so that the seine-boat and dory will meet, but it is difficult to do this in the night. When the seine comes together they haul in on the purse-line, and when the net is pursed up and they see the mackerel, signs are made for the vessel, which comes alongside. The lines are hove from the boat and the mackerel are 'bailed in' on deck and dressed."

SETTING A SEINE AROUND A VESSEL.—The following description of the manner of setting the seine round the vessel is quoted from the Cape Ann Bulletin:

"It is a well known fact that at times, for days and sometimes weeks, no mackerel are to be seen 'schooling' at the surface of the water, although that they are present on the fishing ground can be easily proven by heaving a vessel to and 'throwing bait' for a short time, when the fish will rise from the depths and remain alongside of the vessel as long as the operation of feeding is continued. Again, when making their passage, in coming North or in returning to their winter haunts, the fish are sometimes very difficult to catch, even though swimming near the surface of the sea, for the reason that they generally travel at a rapid rate; but by scattering bait across their line of travel and heaving the vessel to they can be stopped, though sometimes but for a few moments. At such times seiners take care to keep the seine-boat in readiness on the port side of the vessel (the leeward side when hove to), hauled up snug to the vessel, that no delay may be had if mackerel rise in sufficient quantities to warrant the setting of the seine. It requires but a word from the master, if they do rise, when away go the men into the boat, followed by the skipper a spare hand or the cook taking the place at the bait-box, and continuing to throw the 'food for the fishes.' The boat is in the meanwhile dropped around on the starboard quarter, and when about 20 fathoms off overboard goes the end of the seine, with buoy attached, which is picked up and held by two men in the seine-dory, and the boat is pulled to leeward, at right angles with the vessel, as fast as the seine can be got out, as much depends on getting to leeward as far as possible, as the vessel is constantly changing her position, driven by wind and wave. When the middle of the seine is reached (usually marked by a double canvas covered cork), the boat is turned short around and all possible speed made up to and across the vessel's bow, and, with another sharp turn, straight to the dory. As soon as the operation of 'pursing,' or drawing the bottom of the seine together, is commenced, the man in charge of the vessel quickly scatters several buckets of bait into the water, in order to keep the unsuspecting victims of man's wants busy; then springs to the fore sheet and hauls it in; up goes the jib; the wheel, which has been hard down, is righted; the vessel pays off, and, gathering headway, is soon speeding over the cork-ropes out of the center of the seine, the ropes and seine sinking and going beneath the vessel at right angles to the keel, leaving the mackerel behind. If the operation of getting headway on the vessel is not skillfully done, and she be allowed to drift broadside to the ropes, there is danger of catching the seine, and then good-by to the fish, for that time at least, with a prospect of mending to be done to repair damages. When once outside of the seine the man in charge of the vessel has only to keep clear of the boat and sail at his own sweet will and pleasure until the fish are 'dried up' (all the slack twine being in the boat and the fish in close quarters in the bunt), which fact is learned by observing an oar upheld by some one on board of the boat. Perhaps at the last moment, before the complete closing of the seine, the fish have escaped; with sore hands and tired body, we, remembering

the old adage, prepare to 'try, try, again,' or mayhaps, as I have seen the case, from one barrel to over two hundred of the shining beauties are secured, and are soon tumbling over the rail from the big dip net, and the hearts of the fisher lads are made glad, even though the prospect of an all night and day job at dressing and salting be in prospect."

THE MACKEREL POCKET OR SPILLER.—In 1877 the schooner Alice, of Swan's Island, had a bag-net made of haddock ganging-line, into which the fish were transferred when there were too many to be cared for at once. This vessel began the season in the Gulf of Saint Lawrence, but caught only 200 barrels of mackerel there, and later fished on the coast of Maine, where, up to October, she had caught 1,400 barrels.

A development of this idea is the mackerel pocket or spiller, patented in April, 1880, by H. E. Willard, of Portland, Me., an article long needed in the mackerel seine fishery, and which has received from the fishermen the name of "mackerel pocket" or "spiller." It was first used by the patentee in 1878; and Capt. George Merchant, jr., of Gloucester, Mass., invented and put into practical operation an improved spiller in 1880, though it was not until the succeeding summer that the advantages of its use was known to the majority of the mackerel fishermen, who have hastened to adopt it, and now all of the mackerel vessels sailing from this port are provided with one of the pockets.

The apparatus is a large net-bag, 36 feet long, 15 feet wide, and 30 feet deep. It is made of stout, coarse twine, and is attached to the side of the vessel, where it is kept in position, when in use, by wooden poles or "outriggers," which extend out a distance of 15 feet from the schooner's rail.

When distended in this manner, a spiller will hold over 200 barrels of mackerel, which can thus be kept alive, as in the well of a smack, until the crew, who have captured them in the great purse-seines, have time to cure their catch. As is well known, it frequently happens that several hundred barrels of mackerel are taken at a single haul. Heretofore, when such a large quantity of fish were caught, but a comparatively small portion of them could be cured by the crew of the vessel to which the seine belonged. The result was, that when a large catch was made a considerable percentage of the fish were generally "given away" to some other vessel, since if only a part of them were removed from the seine to the vessel's deck, the remainder being left in the net until the first lot were cured, the chances were nine to one that the fine twine of which the purse-seines are made would be bitten in many places by the swarming dogfish (*Squalus americanus*), that *bete noir* of the mackerel fisher. In addition to the injury to the net, the inclosed body of fish were thus allowed to escape, and went streaming out through the numerous holes made by the keen teeth of these voracious bloodhounds of the sea, which, in their fierce and ravenous pursuit of the imprisoned mackerel, usually succeeded in robbing the fisherman of a large portion of the fruits of his labors.*

The "spiller" is made only of coarse twine, and though not entirely exempt from the ravages of the dogfish and sharks, is rarely injured by them; and now when a large school of mackerel are caught in a seine the fish are turned into the bag, from which they are "bailed out" on to the schooner's deck only as fast as they can be dressed, and in this way it frequently happens that a full fare may be secured in a single set of the net.

* Capt. S. J. Martin writes, that in the summer of 1881 the crew of one of the mackerel schooners endeavored to save their seine from the depredations of the dogfish by hauling the staysail underneath it, thinking that if they could thus prevent the dogfish from seeing the mackerel inclosed in the net the latter would not be harmed. But this did not succeed fully, since the sail was badly bitten and much injured by the dogfish, making this experiment a rather costly one.

The introduction of this simple net-bag undoubtedly saves to our fishing fleet many thousands of barrels of mackerel each season.

The "spiller" invented by Mr. Willard is simply a sheet of netting 540 meshes square, bound around with rope; it is made of five sheets of twine, each 108 meshes deep and 540 meshes long. These sheets are laced together. This net, when in use, is suspended from its four corners to the side of the vessel and the outriggers, mentioned above, and hangs something like a hammock. From its shallowness, however, it was not so well adapted to the purpose for which it was designed as was the deeper bag-shaped net subsequently devised by Captain Merchant, and which has been described above.*

The mackerel pocket is hung to 1¼-inch rope, and on the portion of this which comes next to the vessel are strung egg-shaped wooden floats. These are only for the purpose of securing the edge of the net-bag firmly to the rail of the vessel. The border of the pocket being drawn over the rail, a board is laid on top of it and held in position by wooden pins passing through both board and rail, the net being thus fastened between the two.

To the outer edge of the mackerel pocket, either Willard's or Merchant's, is attached a rope bridle, the ends of which are fastened at a distance of about 9 feet from each outrigger; a thimble is seized into the upper part of this bridle, and when the mackerel have been turned into the pocket the fore and after staysail halyards are bent into this thimble, and the outer edge of the pocket is supported thereby so as to take as much strain as possible off the outriggers, which are only 4 inches in diameter. The outer and upper corners of the "spiller" are supported by ropes which run through single blocks attached to the farther ends of the outriggers. By means of these ropes the outside edge of the pocket may be raised or lowered. When a school of mackerel has been caught in the seine the pocket is slacked down to the surface of the water, and its outer edge having been fastened to the cork rope of the seine, the fishermen gather in on the twine of the latter, and, by dextrous management, turn the whole body of fish into the bag provided for their reception, and where they can be kept alive, as previously mentioned, until such time as they can be properly cared for. The mackerel having been transferred to the pocket, its outer edge is usually raised slightly above the water. When the vessel is rolling and there are many fish in the pocket there is often considerable strain brought to bear on the outriggers, which, however, being supported by guys or tackles to the standing rigging, rarely break. It may be assumed, perhaps, that the enormous catches of some of the mackerel schooners in the summer of 1881 and succeeding years are due very largely to the use of this implement. Never within the previous history of the fishing business of New England have so many fish been caught or so much money made by a single vessel in the mackerel season as was the case in the season of 1881. The schooner Alice, of Swan's Island, Maine, is reported by the secretary of the Boston Fish Bureau to have taken 4,000 barrels of mackerel, the value of which exceeded $28,000. The schooner Edward E. Webster, of Gloucester, caught 4,500 barrels of mackerel, stocking more than $26,000. A long list of other large catches might be added in proof of the efficacy of the mackerel pocket, but for obvious reasons they are omitted here.

5. THE CARE OF THE FISH.

The manner of caring for the fish is very similar to that upon the mackerel schooners fishing in the old way with jigs (described below), excepting that a larger quantity is likely to be taken at once, necessitating much more haste in salting or dressing them. When haste is necessary, the process of "plowing" is usually deferred until after the fish have been salted.

* The "mackerel pockets" constructed by Capt. George Merchant are 36 feet long, 30 feet deep, from 15 to 18 feet wide across the mouth; 2-inch mesh, and knit of 12-21 half-patent twine.

The common method of dressing on a seining schooner is as follows: The men engaged in dressing are divided into gangs generally of three men each. Each gang has two wooden trays about 3 feet square and 6 or 8 inches deep; these are placed on the tops of barrels; one is called a 'gib-tub,' the other a 'splitting-tub.'*

Except on the seiners, the mackerel, when caught, are put into the barrels, and the splitting is done upon a board laid across the top of the barrel, rather than in a splitting-tub. One man of each gang splits, the other two gib, or eviscerate, the fish. The tub of the man who splits, of course, contains the fish to be split. With a scoop-net the splitter, or one of the "gibbers," from time to time, fills the splitting-tub from the pile of mackerel lying upon the deck. On the side of the splitting-tray next to the "gibbers" is a board about 6 to 10 inches wide, called a "splitting-board," on which the splitter places the fish as he cuts them open. He takes them in his left hand (on which he has a mitten) round the center of the body, head from him, and with the splitting-knife splits them down the center of the back. As fast as he splits the fish he tosses them into the tray of the "gibbers." The "gibbers" protect their hands with gloves or mittens. As fast as the "gibbers" remove the viscera, with a peculiar double motion of the thumb and fingers of the right hand, they throw the fish into barrels, which are partially filled with water; these are called "wash-barrels." If the men have time they "plow" the fish before salting them, making a gash in the sides of the fish nearly to the skin with the peculiar knife, "the plow," provided for the purpose.

Before the fish are salted the dirty water is poured out and clean water is added. About one barrel of salt is used for every four barrels of mackerel. This is the first salting. When the fish have been salted they are placed in unheaded barrels until the weather is unfit for fishing, or the deck is filled with them, when they are carefully headed up and stowed away below.

The speed with which a large deck-load of mackerel can be disposed of by the crew is something marvelous. A good splitter will handle from forty-five to sixty mackerel a minute. In one well-authenticated case a man split sixty-seven mackerel a minute for three consecutive minutes.† A good "gibber" can handle a barrel of large mackerel in from five to seven minutes. A smart crew of fourteen men can dispose of a deck-load of large mackerel in from fifteen to eighteen hours, salting them away properly in the barrels. The smaller the mackerel the longer it takes to dress a barrel of them, the time required to handle a small or a large mackerel being precisely the same.

When the fish are to be iced and carried fresh to market they can be disposed of much more rapidly, it being simply necessary to stow them away in the hold without splitting. They are usually washed before being placed in ice, and occasionally gibbed without splitting, the viscera being drawn through the gill openings.‡ The most rapid way of caring for the fish is to place them in barrels of ice-water. This is done for the most part in the spring or fall.

---

*Also called, especially in Gloucester, "gib-keelers" and "splitting-keelers."

†An expert can split mackerel nearly as fast in the darkest night as at any other time. The sense of touch becomes so acute from long practice that the fisherman can tell (without seeing it) when he grasps a mackerel whether its head is in the right direction or not, and also which side should be laid to the board in order to bring the fish's back in proper position for the knife. The splitter holds the knife with his fingers, letting the thumb slide down along the upper side of the fish, thus guiding unerringly the keen and swiftly moving blade. Whether the fish be large or small it is almost invariably split with the utmost precision, the edge of the knife glancing along on the left side of the vertebra, and scarcely a hair's breadth from it, while the point goes *just* deep enough and no farther. But one must witness the operation of splitting mackerel in order to fully appreciate the skillfulness of the performance.

‡Fresh mackerel are never gibbed for the New York market in spring, but a law of Massachusetts compels the fishermen to eviscerate all mackerel taken to Boston. In the first named port the cargoes of fresh fish are sold by commission merchants, while in Boston the captain sells directly to the dealers.

6. RUNNING FOR THE MARKET.

Those mackerel schooners engaged in market fishing find it desirable to make their passages with the utmost speed, but rapid passages in summer are, of course, much less dangerous than those made in winter by the haddock and halibut vessels. Great expedition is used by all mackerel vessels, since the season is short, and they feel obliged to take advantage of every opportunity. In the case of salted fish, however, there is no such anxiety to sell, and the chief desire of the skipper is to land his fish and to return to the fishing ground with no unnecessary loss of time.

It often happens that mackerel catchers who are not engaged in the fresh-fish trade take a big haul, 200 barrels or so, when they have but few barrels to put them in and scarcely any salt. In such cases it is of the highest importance to reach home if possible, or at least some large fishing port where barrels and salt can be obtained, and all the sail that can be spread or that the vessel will carry is set.

7. LANDING THE CARGOES.

The mackerel are hoisted out on the wharf by a horse, the duty of the crew being to hook on the barrels and to roll them to the proper places on the wharf, after they are landed, where the barrels are generally stowed on their heads, ready to be opened. In seasons of abundance, and when the men have become exceedingly fatigued from their labors in catching and dressing a fare of mackerel, it is often the case that the skipper will hire a number of longshoremen to take the fish out of the vessel. At such times, too, the shoresmen are employed to plow the fish, and also to assist in packing them, since the fishermen find it more profitable to hire men to do this than to remain ashore and do it themselves. For in the mean time they may be fortunate enough to catch a fare of two or three hundred barrels of mackerel.

In the days of hook-and-line fishing, the landing and packing of mackerel was carried on much more leisurely than at present. At first it was customary for the men composing a crew to hoist the mackerel out on the wharf by tackles; but within the last fifteen or twenty years it has been found more profitable to employ a horse for this purpose, since the work of discharging can be carried on much more rapidly than before and with less tax upon the strength of the men. The several processes of unheading the barrels, culling, weighing, and packing the mackerel are fully described in another chapter, and need not be repeated here.

8. FINANCIAL PROFITS OF SEINING.

The following tables, copied from the annual reports of the Boston Fish Bureau, show the large catches and "stocks" by the mackerel fleet in New England waters for the seasons of 1880 and 1881:

Vessels.	Barrels cured.	Amount of stock.
1880.		
Schooner Alice Capt. H. B. Joyce, Swan's Island, Me	3,700	$19,548 75
Schooner Edward E. Webster, Capt. S. Jacobs, Gloucester, Mass	3,969	19,485 00
Schooner Alice C. Fox, Captain Rowe, Portland, Me		12,432 00
Schooner Louis and Rosa	2,709	12,492 00
Schooner Frank Butler	2,036	11,600 00
Schooner Mary Greenwood	1,700	11,035 00
Schooner Kate Florence	2,500	11,000 00
Schooner Addie F. Cole	1,900	10,500 00
Schooner Cora Lee	1,875	10,250 00
Schooner Cora Smith	2,150	10,000 00
Schooner M. O. Curtis	2,000	10,000 00
Schooner Mary Snow	1,852	9,261 00
Schooner F. P. Nickerson	2,350	9,730 00
Schooner Dictator	1,652	9,213 00
Schooner Morning Star	1,527	8,987 00

Financial profits of seining—Continued.

Vessels.	Barrels cured.	Amount of stock.
1881.		
Schooner Alice, Swan's Island, Me	4,965*	$28,055 23
Schooner Edward E. Webster, Gloucester, Mass	4,500†	26,570 00
Schooner Isaac Rich, Swan's Island, Me	3,276	15,500 00
Schooner Frank Butler, Boston, Mass	2,680	15,000 00
Schooner Mertie and Delmar, South Chatham, Mass	3,905	14,138 00
Schooner A. E. Herrick, Swan's Island, Me.‡	2,280	13,674 00
Schooner Robert Pettis, Wellfleet, Mass	2,580	12,410 18
Schooner Roger Williams, North Haven, Me	2,450	12,000 00
Schooner R. J. Evans, Harwichport, Mass	3,600	12,000 00
Schooner Louis and Rosa, Boothbay, Me	3,028	11,557 46

* 3,665 barrels pickled and 1,240 barrels fresh.
† 1,600 barrels pickled and 2,900 barrels fresh.
‡ The Herrick did not sail until July 22.

When it is taken into consideration that these vessels are employed in fishing barely eight months at the longest, and some of them only four to six months, it will be seen that the business is an exceedingly profitable one for many of the fleet, while the greater portion make fair returns.*

9. HISTORY OF THE USE OF PURSE-SEINES.

The earliest record of the use of the purse-seine is the following, obtained from Capt. E. T. Deblois, of Portsmouth, R. I.:

"The first purse-seine that was made, so far as I know, was made by John Tallman the first, and Jonathan Brownell and Christopher Barker, in the year 1826. It was 284 meshes deep and 65 fathoms long. The purse-weight was a 56-pound weight, and the blocks were the common single blocks, and they had to reeve the end of the purse-line through the blocks before they put the purse-weight overboard. The first time the seine was set there were fourteen men to help; they set around what they called a 500-barrel school of menhaden, and while they were pursing, the fish rushed against the twine so hard that they twisted and snarled the net around the purse-line and weight to that extent that the men could not gather the seine up or get her into the boat again as they were, and after they had worked six hours, and quarreled over the matter, they decided to tow or warp the seine ashore at high water, and when the tide left the seine they would be able to unsnarl it, which they did the next day. It was a number of days before they could muster courage to set her again, and when they did they set around a small school with better success."

There is a general impression among the fishermen of Northern New England that the purse-seine was a development of the "spring-seine," elsewhere referred to, but this would seem to be a mistake, since the spring-seine, which really appears to have been nothing but a large sheet-net

*Among the "fishing items" in the Cape Ann Advertiser of October 21, 1881, we find the following mention of catches of mackerel made by some of the seiners, which may serve to show the energy and activity with which this fishery is prosecuted: "Schooner Moro Castle sailed from this port on Thursday morning of last week, and returned in the evening of the same day with 140 wash-barrels of handsome mackerel. Schooner Dreadnaught sailed from Portland after mackerel the other night, was gone twenty-one hours, and returned with 205 barrels. Schooner David A. Osier sailed from Hull Friday evening, and was at this port next morning with 105 wash-barrels of mackerel. Schooner Wildfire, Captain McLain, has landed and sold $3,200 worth of mackerel in the past fortnight, and has enough fish on board to add another $1,000 to her stock. Schooner Fleetwing took 210 barrels sea-packed mackerel at one haul of the seine off Plymouth on Saturday. Schooner Wm. M. Gaffney took 140 wash-barrels at one haul Sunday, and schooner Henry Friend 140 wash-barrels at one haul Sunday night. Schooner Madawaska Maid left Gloucester Sunday, turning Eastern Point at 11 o'clock a. m., and arrived at Boston at 5 o'clock Monday morning, with 225 barrels sea-packed mackerel. In five weeks the Madawaska Maid has landed 1,000 barrels of mackerel. The schooner Wm. M. Gaffney landed 900 barrels of mackerel in twenty-one days."

with special appliances adapting it for use on board of a vessel, was not used in New England until 1853 or 1854. There is also another tradition to the effect that the purse-seine was invented about the year 1837 by a native of Maine who had for some years been employed as a hand on a Gloucester schooner, and who conceived the idea of capturing mackerel in large numbers, and invented a seine substantially like the one now in use, which, finding the Gloucester fishermen unwilling to enter into experiments, he carried to Rhode Island, where it was used in the vicinity of Seaconnet for seining menhaden. This would appear to be a conglomeration of errors, partly imaginary, partly based upon the circumstances already narrated by Captain Deblois.

Reference has already been made to the claim that the purse-seine was invented in Rhode Island as early as 1814. Another early allusion to this new instrument of capture is given in the following paragraph, quoted from the Gloucester Telegraph of Wednesday, July 21, 1839:

"*New Fishing Tackle.*—We noticed, a week or two since, the fact that Capt. Isaiah Baker, of Harwich, had recently commenced fishing with a seine of entirely new construction and with remarkable success. It was stated in the Yarmouth Register that he had cleared about $3,000 in one week by taking shad. A correspondent writes us from West Harwich that the fortunate captain still continues to make equally 'glorious hauls.' He is now in Provincetown with his seine catching mackerel, and recently took 60 barrels at one 'shoot.' This new mode of fishing bids fair to create an entire revolution in the mackerel and shad fisheries. Our correspondent says that the Vineyard Sound will soon become a great fishing ground. It is well known that all the shad, bass, mackerel, &c., which are found in Block Island Channel early in the spring pass through the sound, and it is now ascertained that with proper seines they may be caught in great abundance. With a purse-seine, when mackerel are schooling or shoaling, the fishermen may run around them and inclose 100 barrels. They will not bite at bobs, as in years past, but Cape Cod ingenuity has devised something to outgeneral them."

The purse-seine was undoubtedly a development and extension of the idea of the drag-seine supplemented by that of the gill-net used at sea in sweeping around schools of fish.

The first seine used north of Cape Cod was that carried by Capt. Nathaniel Adams, of Gloucester, in the schooner Splendid, in the year 1850. Capt. Nathaniel Watson, of the Raphael, began using one the same year. According to Mr. Luther Maddox, the earliest experiments were at Chelsea Beach. It is claimed by some that Gorham Babson, of Gloucester, had one in use as early as 1847.

The early seines were about 200 yards in length, 22 fathoms in depth, and of 2½-inch mesh, the bunts being about 250 meshes square. The twine was much heavier than that used in the present seine; the whole net weighed 600 or 700 pounds. The seine in its present form did not come into general use until about 1860.

The rapidity with which this expensive form of apparatus has come to be generally employed in our fisheries seems almost marvelous. At the present time the total number of these nets used in the mackerel fishery is not far from four hundred, valued at $160,000; in the menhaden fishery, three hundred and sixty-six, valued at $138,400. The total value of the purse-seines with the value added of the seine-boats, which really are parts of the same apparatus, cannot be less than $440,000.

Capt. W. H. Oakes states that in early days a certain kind of net was used in catching menhaden which reached to the bottom in shallow water and which was pursed by means of ropes. Capt. George Blatchford used to go for menhaden in an old pinkey, and used one of these nets.

Captain Oakes is of the opinion that Capt. William Ratcliff, of Rocky Neck, Gloucester, was the first man who caught mackerel in deep water off-shore. He used some kind of a purse-seine,

and with it in two hauls caught about 90 barrels of mackerel off Monhegan in 90 fathoms of water. Capt. George Merchant, jr., of Gloucester, writes as follows regarding the early attempts to seine mackerel in deep water. He says: "Previous to 1862 the only mackerel caught in deep water in seines were taken with the schools of pogies. From one to ten or twelve hundred in number were often caught in this way, the seiners supposing that their being with the pogies prevented them *from trying to escape, since pogies seldom* leave the seine after it is around them; but we never set the seine for mackerel when in deeper water than 10 fathoms, our seines not being deeper than that at that time. One day in July, 1862, I lay at anchor near Boone Island, it being calm at the time. While lying there a school of mackerel came up and began to play around at the surface not far from us. Knowing that the water was 25 fathoms deep where the fish were, I did not go after them right away, but after they had been schooling some time I concluded to go out and look at them. I found the water to be as I had expected—25 fathoms deep. I thought, however, that I would try just to see what would come of it, although the men said it would be no use, as the fish would soon disappear; but we threw out our seine and went around them with as little noise as possible, and commenced to purse up, the men saying that the mackerel would soon go; but they did not go, but continued to school in the seine until the latter was pursed up and the rings on the boat. Then we thought we had done something never before heard of. We took 50 barrels of large mackerel that time.

"After securing the fish I weighed anchor and ran to Richmond's Island. When I arrived there I found fifteen fishing vessels at anchor. I told the skippers and crews that I had taken 50 barrels of mackerel in deep water, but they would not believe it, saying that if I had it would never be done again. But it set them to thinking, and they soon found that mackerel could be caught in deep water. The fleet of seiners began to increase from that time, and has kept growing until the present, when it amounts to about two hundred sail.* I date the catching of mackerel in deep water from the time and occurrence I have mentioned above. I was in one of the first seven vessels that sailed on seining voyages from Gloucester, Capt. Samuel Blatchford and Capt. Nathaniel Watson being the two first to try the business, and they both gave up seining, as it did not pay them."

Wellfleet, Mass., had fifty-two mackerel seiners in 1877. Seines were first carried by the Wellfleet vessels about 1857, but their use was soon abandoned. In 1863 to 1865 the Mary B. Dyer had a seine, and since that time more or less seines have been in use. In 1873 all the vessels went into this business.

The first purse-seine brought into Central Maine, writes Mr. Earll, was bought by Mr. Amherst Spofford and taken to Damariscove in 1859, and used with rather indifferent success until 1861; it was 130 fathoms long and 12 fathoms deep; the parties kept it on the island and took it out in small boats whenever fish were seen schooling in the vicinity. It seems that Mr. Spofford did not thoroughly understand setting it and caught but few fish.

In 1861 he sold it to Messrs. William Gray and Miles Pierce, and it was taken to Cape Newagen, where it was successfully used by carrying it out in a small boat and landing the fish on a dressing stage on shore in the same way. The next year it was put aboard a small schooner, the Leon, and the fish landed as before in small boats to be dressed, the vessel being only large enough to carry the seine.

In 1863 the seine was put aboard the schooner Dawning Day, 73 tons (old measurement), and the fish were dressed aboard. This was really the commencement of deep-water seining in this section, and the vessel did so well as to induce others to go into the business the following year.

*Sailing from Gloucester.

The schooner Niagara was the first to provide herself with a seine in 1864, and another was bought and owned by two small vessels, the Wild Rose and the Neptune, one carrying the seine and the other salt and barrels for curing the fish. This plan did not work well and was soon abandoned. The schooner Niagara did well from the start, and has always been high line of the seiners for this region.

Georgetown sent one seiner, the Coquimbo, in 1865, and a little later the schooner Sunbeam, Captain McMann, but they met with poor success, and no seiners have been sent since from that port.

Westport has made two attempts at introducing seining, the first in 1872, by schooner Jennie Armstrong, Capt. B. F. Jewett, and the second a three-masted schooner of 350 tons, the George W. Jewett, Capt. A. M. Jewett, carrying two seines and crews, in 1875. Both vessels did very poorly and gave up the business after the first season.

10. THE ATTEMPTED USE OF THE PURSE-SEINE IN NORWEGIAN WATERS.

In 1878 a Gloucester vessel essayed fishing for mackerel with a purse-seine on the coast of Norway. In April the schooner Notice, Capt. Knud Markuson, departed on this mission, taking a crew of twelve men and the most approved seining apparatus. It was remarked by a writer in the Deutsche Fischerei-Zeitung of July:

"The mackerel fishermen, who have till now been in the habit of plying their trade in open but suitable boats, are, however, greatly agitated at the present moment in consequence of the arrival at Risor, some three weeks ago, of an American fishing smack, direct from Gloucester, in North America, understood to be followed by a whole fishing fleet from New England, to take part in the mackerel fishery outside the Norwegian fishing territorium. As all these American smacks are reported as provided with bag or purse nets, by means of which they are enabled to catch more fish upon one single haul than ten Norwegian boats during a whole day, it is obvious that the Norwegian fishermen will have to discard their old mode of fishing, and to have recourse to the American fishing method, if they do not want to lose all the advantages enjoyed till now. The mackerel fishery has always been of great importance to Norway, some 7,000,000 of these fish being on the average caught annually, of which number about 70,000 centners, at a value of from 600,000 to 700,000 crowns, are exported. The Government is well aware of the danger threatening the public weal, and has consequently taken every possible measure in order to prevent such disastrous results as the loss by the Norwegian fishermen of the mackerel fishery. A most accurate description of the nets used by the Americans has been printed, and, with a great number of nets of this kind, made to order by the net manufactory at Bergen, distributed among the fishing population. Models of the different sorts of the fast-sailing American boats have also been obtained through the Norwegian consul at Gloucester, Mass., direct from the manufacturers of such boats. The well-known industry and activity of the Norwegian fishermen, combined with the efforts of the Government, will, no doubt, enable them not only successfully to hold but to improve their own prospects as regards the mackerel fishery by the timely adoption of the American methods and arrangements of fishing."*

The venture was, however, not a successful one. On his return home Captain Markuson stated that he had been unable to use the seine advantageously, owing to the fact that the mackerel did not in those waters school together in large bodies, as they do along the New England shores.

* Cape Ann Advertiser, August 9, 1878.

2.—THE SPRING SOUTHERN MACKEREL FISHERY.

The spring mackerel fishery is in reality a branch of the mackerel-seine fishery, and the methods employed in it are identical with those described in the previous section of this chapter. In this place it is necessary only to add a history of this fishery, a description of the grounds frequented by the southern fleet, and a few statistical notes.

1. FISHING GROUNDS.

The fishing grounds frequented by the southern mackerel fleet lie between Cape Hatteras and the South Shoals of Nantucket. The fishing season is in the months of April and May. The first vessels go south about the middle of March or soon after; but until 1878 no mackerel were ever taken before the 1st of April.*

2. EARLY CATCHES OF MACKEREL, 1878 TO 1881.

The earliest results of the southern fishery in the years 1878 to 1881 were as follows:

FIRST CATCHES IN 1878.

March 30.—Schooner Lilian, of Noank, Conn., Captain Latham, off Chincoteague.

April 16.—Schooner Sarah M. Jacobs, of Gloucester, Capt. Solomon Jacobs, caught her first mackerel in latitude 36° 10′ N., longitude 74° 45′ W.

April 18.—Schooner Alice, of Swan's Island, Me., Capt. Hanson B. Joyce, master, caught her first mackerel 25 miles southeast from Cape May.

April 25.—Schooner John Somes, of Swan's Island, Me., Capt. J. S. Staples, master, caught her first mackerel 50 miles southeast from Cape May.

FIRST CATCHES IN 1879.

April 12.—Schooner Sarah M. Jacobs, of Gloucester, caught first mackerel in latitude 36° 35′ N., longitude 74° 50′ W.

April 13.—Schooner Augusta E. Herrick, of Swan's Island, Me., Capt. William Herrick, caught first mackerel (130 barrels) in latitude 37° 37′ N., longitude 74° 23′ W.

April 13.—A few fish taken by schooner S. G. Wonson, of Gloucester, 75 miles south-southeast from Cape Henlopen.

April 14.—Schooner Charles Haskell, of Gloucester, caught first mackerel in latitude 38° 08′ N., longitude 73° 57′ W.

April 19.—Schooner Alice, of Swan's Island, Me., caught first mackerel (140 barrels) in latitude 37° 50′ N., longitude 74° 03′ W.

FIRST CATCHES IN 1880.

April 1.—Schooner Edward E. Webster, of Gloucester, Capt. Solomon Jacobs, caught the first mackerel of the season in latitude 35° 30′ N., longitude 74° 15′ W.

FIRST CATCHES IN 1881.

March 20.—Schooner Edward E. Webster, of Gloucester, caught the first fish of the season, and the earliest on record, in latitude 37° 10′ N., longitude 74° 05′ W. A second trip was caught by the same vessel on April 18 in latitude 38° 38′ N., longitude 74° 00′ W.

May 16.—The schooner Alice, of Swan's Island, caught 30,000 mackerel off Block Island.

3. THE VESSELS, APPARATUS, AND METHODS OF FISHING.

The southern mackerel fishery is participated in by thirty or forty of the Gloucester mackerel schooners and a number of vessels from Cape Cod and Maine. The total number of vessels

*Schooners Edward E. Webster, Nellie N. Rowe, and Ivanhoe sailed for the south on Saturday (March 11) in pursuit of mackerel, the Webster getting the start by sailing at 4 o'clock a. m., and the others following at 4 o'clock p. m. This is the earliest start ever made in the mackerel fishery. Last year the Edward E. Webster sailed March 15, which was unusually early, and obtained a fare within a week thereafter. (Cape Ann Advertiser, March 17, 1882.)

engaged in this fishery in 1879–'80 was sixty-four, of which twenty-three were from Maine ports and the remainder from Massachusetts. These are among the swiftest and best of the fleet, and are provided with the fullest amount of canvas for making a quick passage to and from the fishing grounds. Nearly all of them have ice-houses arranged in the manner already described.

The apparatus is in every respect identical with that used in the summer fishery; the vessels, however, carry, as has been stated, a much smaller number of barrels than when engaged exclusively in salting the fish. The manner of fishing is the same as that already described, except that the fish being much scarcer and their movements less regular than in summer on the more northern fishing grounds, a greater amount of vigilance and perseverance is required on the part of the fishermen. This is the season of the migration of the mackerel, and it is necessary that the fishermen should understand how to follow the schools of fish as they make their way northward, even if they are out of sight for days at a time. They cruise sometimes for weeks off the capes of the Delaware and Chesapeake, sometimes venturing farther south to the latitude of Cape Lookout, though they rarely find mackerel south of the mouth of the Chesapeake. Sometimes weeks elapse before they find the fish. After the schools have made their appearance they follow them, and when they are not visible, usually allow 5 to 15 miles a day for their northern progress, trying to keep among them as they make their way northward. When among the fish it is a common practice of the vessels to heave to and "jog" all night long in a northerly direction, to keep pace with the movements of the fish.

As soon as the first fare of fish is obtained, even if only a small one, the vessels make their way to New York with all possible speed, for the earliest fish command much higher prices than those brought in later in the season. After mackerel become more plenty the vessels seldom go to market with less than 75 or 100 barrels, and it is not unusual for 250 to 300 barrels, the results of one day's catch, to be taken in. The successful vessels often run into New York two or three times a week, especially when the fish are most abundant off Sandy Hook.* This method of fishing and marketing the fish is kept up until the schools have reached the shoals of Nantucket and the spawning season in that locality begins. At the close of the spawning season, when the fish again rise to the surface, or when the other schools are found on George's Bank and in the Gulf of Maine, the vessels resort to the ordinary method of salting their fish, only a few continuing the practice through the summer of carrying their fish fresh into the markets of New York and Boston. Occasionally, cargoes of fresh mackerel are taken in the spring and summer into Philadelphia, and also, later in the season, to Portland.

The spring mackerel fishery, as just described, is of comparatively recent origin, not dating back much before 1870. Twenty to thirty years ago New York was supplied with fresh mackerel chiefly by Connecticut smacks, which caught the fish with hook and line and carried them to New York alive in wells. A peculiarity of this smack fishery was that the men fished with lines fastened to poles, as anglers fish for trout. The object of having poles was to enable the fishermen to drop the captured fish alive, and without injury, into the smack's well.

Vessels belonging north of Cape Cod at that time rarely if ever sold their fish fresh, although they often went as far south as the capes of Delaware. Their fares were salted and carried to Boston or other ports in the ordinary manner.

---

* Dispatches received here yesterday announce the arrival of schooner J. J. Clark at New York on Monday with 150 barrels fresh mackerel, which sold at from 6 to 18 cents apiece according to size, and later of the arrival at the same port of the schooners Seth Stockbridge, A. M. Terry, Smuggler, and T. M. Cromwell, each with 200 barrels; Moses Adams, 300; Maud and Effie, 250; Golden Hind, 75; Fleetwing, 65; H. A. Duncan, 20; and James A. Stetson, 50 barrels, which were sold at from 8 to 12 cents apiece. (Cape Ann Bulletin, April 17, 1878.)

The southern mackerel fishery was undoubtedly first prosecuted by vessels from Cape Ann at least we have been unable to obtain reliable accounts of any fishermen from other ports engaging in this fishery at an earlier date.

"Capt. John Parsons, of Rockport," writes Mr. A. Howard Clark, "says that he was one of the first to go south after mackerel from that port. He went in 1817 in the schooner Defiance, of 35 tons. They went as far south as Cape May, and caught 60 barrels of mackerel, all of which were taken by drailing. They had outriggers for towing their lines, and the lead sinkers weighed from 4 to 6 pounds."

An item in the Cape Ann Advertiser of May 20, 1859, says:

"The practice of going south for mackerel has almost died out of late years, and this year there are but three or four vessels in the business. Some of the vessels which go in quest of bait take mackereling apparatus with them."

"The practice of going south for mackerel in spring," writes Mr. Earll, "was first begun in Maine by a Georgetown vessel, the Queen of the West, Capt. Francis Low, in May, 1851. She was gone but a short time (four to six weeks), and returned with a full fare, after which she proceeded to the bay. The next year the schooner Arcola, Capt. Warren Low, of Georgetown, joined the Queen of the West on her southern spring trip, and in 1853 three went. Booth Bay sent none south until 1867, when the Cynosure went, and Southport sent her first vessel south in 1868. In 1879 five or six went from this section."

3.—THE MACKEREL HOOK-FISHERY.

The mackerel fishery at the time of its highest development, from 1820 to 1870, was carried on almost exclusively by the use of small hooks with heavily weighted shanks, known as "mackerel jigs." For many years there were from six hundred to nine hundred vessels, chiefly from Cape Cod and northward, engaged in this fishery, and in the year 1831 the total amount of mackerel salted in Maine, New Hampshire, and Massachusetts was 450,000 barrels.

As will be seen by an examination of the diagram showing the yield of the mackerel fishery from 1804 to 1881, elsewhere published in this report, the quantity of fish taken from year to year has been extremely variable, but has at no other time approached the enormous quantity on record for the years 1831 and 1881.

The jig has now been almost entirely superseded by the purse-seine, and this radical change in the method of catching mackerel has caused the desertion by the mackerel fleet of the Gulf of Saint Lawrence, and the practical futility—to benefit our fishermen—of the fishery clauses of the Treaty of Washington. All attempts, with a very few exceptions, to use the purse-seine in the Gulf of Saint Lawrence have been failures.

In 1880 the schooner Alice, of Swan's Island, caught 700 barrels by the use of a purse-seine in the gulf, but not 10 per cent. of the other vessels which visited this region, then or within the four or five previous years, paid their expenses.

The mackerel hook fishery is of the past, and this chapter must be regarded, in large part, as historical. It is by no means impossible, however, in years to come, that the old method of fishing, which had many undoubted advantages over that at present employed, will be revived.

1. FISHING GROUNDS.

The grounds frequented by the mackerel-hookers, as the fishermen call them, were as follows:

THE GULF OF SAINT LAWRENCE.*—In the early part of the season the favorite fishing grounds were in the southwestern part of the Gulf of Saint Lawrence, from Cape Gaspé to the North Cape of Prince Edward Island, especially off Point Escuminac, Pigeon Hill Ground, or the west shore lying along the coast from Miramichi to Point Miscou, Bank Bradley, Bank Orphan, and Bay of Chaleur. Later in the season, in July, August, and September, the principal fisheries were carried on upon the grounds just mentioned, also around the Magdalen Islands and along the north side of Prince Edward Island. Occasionally, too, in August and September, vessels fished on the south side of Prince Edward Island from Georgetown to East Point. In September and October fishing was carried on at the Magdalens, Prince Edward Island, in the Bay of Saint George, between Cape Saint George and Port Hood, and on the northwest shore of Cape Breton, from Port Hood to Cape North. Favorite localities were about Margaree Island and Cheticamp; also, on the east side of Cape Breton, in Aspee Bay, and about Sydney. About 1858 and 1859 several successful fares were made in the estuary of the Saint Lawrence, from Cape Gaspé to Cape Chatte, and about the Seven Islands and Mingan Islands on the coast of Labrador. In the year 1877 a Gloucester schooner obtained 200 barrels of mackerel at Port au Port, on the west coast of Newfoundland.† Bird Rock, situated east of the Magdalen Islands, has occasionally been a favorite ground, since the mackerel taken there were almost always very large.

GULF OF MAINE.—From June to November there was excellent fishing in various parts of the Gulf of Maine. Early in the season mackerel were taken all the way from Cashe's Ledge to the Bay of Fundy; from the middle of June to September the favorite localities were in the vicinity of Monhegan Island, Matinicus Rock, and Mount Desert Rock. From about 1830 to about 1845 some fishing was done in the Bay of Fundy, north of the island of Grand Manan. When the autumnal migration of the mackerel begins the vessels follow them as they proceed southward. Favorite fishing grounds are then off Portland; later, about Boone Island, off Cape Ann, and the waters of Massachusetts Bay, and along the outside of Cape Cod, the latest catches being generally obtained off Chatham and the eastern part of Nantucket Shoals. Fishing here continues sometimes until the latter part of November.‡

GEORGE'S BANK.—Mackerel were in some years very abundant on George's Bank, especially on the southern portion from June to September. Later in the season the weather was generally unfavorable for fishing in this region. The mackerel caught here were recognized, as now, to be of very fine quality.

---

*Mr. Daniel Cameron, of Southport, Me., thinks the first American vessels went to the bay in 1832. This year four went, among others the schooner Galen, Captain Pate, of Freeport. These schooners averaged 60 to 70 tons, carried about 250 barrels, and filled up in four or five days. The first vessel going to the bay from this section of which we learn was the pinkey Olinda, Capt. Joseph Maddocks, of Southport, in 1837. Captain Atwood states that in 1834 the New England fleet in the Gulf of Saint Lawrence consisted of six vessels, three of them from Provincetown. The Cape Ann Advertiser of May 13, 1859, refers to "the custom which has grown up within a few years of going to the Gulf of Saint Lawrence for mackerel, where already the supply is lessening."

†A LUCKY STREAK.—The schooner William T. Smith, Capt. Henry O. Smith, the last of the baymen, arrived home on Monday, bringing a good fare of mackerel, of which about 200 barrels were caught off Newfoundland, as already mentioned in our columns. These fish are of good size and prime quality, and will command a ready sale. Captain Smith struck a streak of luck when he ventured into untried waters in pursuit of mackerel, and his voyage will prove a profitable one, which is an anomaly in this branch of the fishing industry the present season. (Cape Ann Advertiser, November 23, 1877.)

‡In the fall of 1849 one of the authors had the opportunity of seeing a fleet of mackerel schooners fishing off Chatham. The number of vessels in the fleet was variously estimated from 500 to 700 sail—a beautiful and interesting sight.

SOUTH COAST OF NEW ENGLAND.—Of late years a small quantity of extraordinarily fine mackerel have been caught in the vicinity of Block Island in summer and fall. In previous years the mackerel fishery in this vicinity was chiefly carried on in the spring.

THE COAST OF THE MIDDLE STATES FROM MONTAUK POINT TO DELAWARE.—This fishery was chiefly carried on in May, and in many respects corresponded to the spring mackerel fishery described in another section of this chapter; this is now prosecuted with seines on the same grounds, and the fish are mostly taken to New York for sale, principally in a fresh condition, though formerly they were generally salted.

THE EASTERN COAST OF NOVA SCOTIA.—In this region, although great quantities of mackerel are sometimes taken in pounds, nets, and seines, in the early summer and fall, they are very rarely taken on the hook. About 1854 and 1855 several fares of extremely large mackerel were caught at Sable Island by Cape Cod vessels.

2. THE FISHERMEN.

The men engaged in the mackerel hook fishery, especially in the period of its culmination, were almost exclusively natives of New England. From 1850 to 1870 the provincial element in the fleet gradually increased. When this fishery was most prosperous not less than 10,000 men and boys were employed on board the vessels belonging to the American fleet. The vessels engaged in this fishery carried very large crews; in fact, larger than have ever been carried by other vessels. Not infrequently a schooner of 80 to 100 tons would carry twenty men, and, in some instances, twenty-four. Among the crew were generally three or four boys, sometimes five, from ten to seventeen years of age. These boys fished from the extreme ends of the vessel; they were frequently very successful, and by the training in this fishery fitted themselves to assume responsibilities in the fishing fleet at a much earlier age than otherwise would have been possible. At sixteen or seventeen years of age many of the boys ranked among the first of the crew to which they belonged, and it sometimes happened that the command of a schooner was given to the most enterprising before they were out of their teens.

3. THE VESSELS.

Prior to 1848 the mackerel fleet was made up exclusively of the old-fashioned square-stern schooners registering from 25 tons to 80 or 90 tons, old measurement, and of pinkies registering from 20 to 60 tons. Newburyport had a large fleet of pinkies, registering, old measurement, from 40 to 60 tons. Most of them carried a flying jib.

From 1848 to 1850 the necessity for swifter vessels was felt, and various experiments, which are described in the chapter on the schooner, were made. From this time on, all the vessels added to the fleet were of improved model, approximating, more or less closely, to the modern type of the fishing schooner. These vessels were in those days known as "sharp-shooters." As early as 1855 the character of the fleet had become very much modified, there being a large percentage of modern-built vessels, and the pinkies and square-stern schooners were retained only by conservatives and at the smaller ports, especially those on the coast of Maine. Many of these old vessels had by this time been withdrawn from the mackerel fishery and employed in other branches of the fisheries. As early as 1870 the old square-stern vessels and pinkies had entirely disappeared from the fleet, most of them long before that date.

The mackerel-hookers, when fitted out for fishing, had the decks clear. Upon the starboard side of the vessel were arranged line-cleats. These were in early times small narrow cleats of pine nailed to the inside of the waist, but after the introduction of finer vessels the fishermen became

more careful, and substituted a complicated, ladder-like arrangement, consisting of two long horizontal strips, which were crossed by from eight to twelve shorter vertical strips or cleats, with projecting ends, an arrangement of this kind being secured between each pair of the top timbers. On the top of the rail was nailed the bait-board, in which were cut grooves arranged for the reception of a supply of jig bait, which was cut into bits ready for use; these grooves cannot be easily described. Upon the bait-board, or upon the edge of the rail, were fastened so-called "snapper cleats," ingenious contrivances, of elastic wood or of metal, by which the lines were kept in their places while the men were fishing.

The bait-boxes were fastened on the starboard side; these were wooden troughs, holding from one to seven or eight buckets of bait apiece. There were three of these bait-boxes, the largest placed outside of the rail at the foot of the main rigging, one on the quarter near the davit, the third was placed at the fore-rigging. The forward and after bait-boxes were usually less than half as large as the one amidships. The bait-mill was placed on deck, on the port side of the vessel, near the main rigging. During the later years of this fishery many of the vessels carried on the deck at the foot of the main rigging on the starboard side a bait-chest divided into two compartments, the smaller one for the clam bait and the larger one for the ground menhaden bait. On such schooners as were not provided with a bait-chest, the ground bait, or chum, was kept in barrels. Two of these barrels were generally kept near the starboard main rigging, so that those who threw out the toll-bait could refill the boxes with as little loss of time as possible.

The hold was left unobstructed by bulkheads; the ballast was usually gravel or pebbles and was not covered by a platform. Some vessels carried part of their ballast in barrels, throwing it overboard when the barrels were needed for fish. The number of barrels carried by a vessel would vary, according to her size, from one hundred to six or seven hundred, part of these being filled with salt and bait. The mackerel-hookers usually carried a single boat (of the yawl pattern) at the stern. Occasionally vessels going to fish on the coast of Labrador, or at the mouth of the Saint Lawrence, or even on the coast of New England, carried a number of dories or other boats, which were used by the men when they fished in the harbors.*

4. APPARATUS AND METHODS OF FISHING.

THE MACKEREL JIG.—The mackerel jig is said to have been invented about the year 1815, by Abraham Lurvey, of Pigeon Cove; according to other authority by Mr. Thurlow, of Newburyport.† It is simply a hook, round the shank of which has been cast a plummet of lead, pewter, or tin, somewhat globular at its upper end and tapering down toward the bend of the hook. At the upper end is a hole, through which a fishing line is bent. The weight of a mackerel jig has varied from a quarter of an ounce to three or four ounces at different times during the history of the fishery. At first they were made much heavier than they have been in later years. At present many fishermen, when using jigs, prefer them very small. It has been stated that each fisherman has from

*In certain localities the mackerel could only be taken to good advantage among the rocks close to the shore, and the men fished from small boats rather than from the side of the vessel.

†According to Captain Merchant, the "mackerel jig" was introduced at Cape Ann about 1815. Mr. Abraham Lurvey, of Pigeon Cove, was one of the first to use them, and was supposed to have invented them. The advantages of this new invention immediately brought it into general use. Before "jigs" were devised, the "gangings" of the mackerel lines would frequently break when the fish was jerked or "slatted" off the hook; when the jig is used this rarely occurs. Before the time of the jig it was customary to bait the hooks, when mackerel were plenty, with pieces of pork "as big as a four-pence-ha'penny."

According to Captains Daniel Cameron and John Grey, of Southport, Me., Edward Caiss, a fisherman of Hingham, Mass., invented the mackerel jig between the years 1810 and 1814, and by 1829 it had come into general use on the coast of Maine. It was introduced into Maine some time before 1829, but by whom no one knows.—[EARLL.]

seven to twelve fishing cleats in his berth at the rail. On these cleats are fastened an assortment of lines with jigs of various sizes, the heaviest being used when the mackerel are biting fast or when the wind is blowing fresh; the lightest, when the water is very smooth, or when the mackerel are "picking," or nibbling daintily.

The fishermen always made their jigs in molds of metal or soap-stone, this operation being similar to the old-fashioned method of making bullets. In former days these molds were made of iron, but many of the fishermen, being dissatisfied with the shape, constructed them for their own use of lead. At present the soap-stone jig molds and the lead and pewter constitute a part of the outfit of a vessel.

When jigs were first introduced, however, it was customary for fishermen to cast them for themselves in molds improvised in buckets of sand or ashes, afterwards beating into shape the rough castings, and boring the hole for the line. This custom was prevalent on some vessels as late as 1850. In the later years of this fishery the fishermen became very critical in the matter of jigs, and were not satisfied unless they were elegantly shaped and brilliantly polished. The lines were six or eight fathoms in length, of cotton, being either hawser or shroud laid. Of later years these have always been of cotton. In early days, when the heavier jigs were in vogue, much larger lines were used than at a later period. Since 1860 it has been customary to use a kind of snood, called "snapper-line," made of strong linen thread, and usually colored blue. The "snapper-lines" are from 15 to 18 inches long, one end being bent to the jig, and the other fastened to the fishing-line with what is called a "water-knot." During the voyage the lines are generally coiled up and hung upon the fishing-cleats on the waist when not in use. Besides each man's stock of lines, with jigs of different sizes, fastened to the cleats at his berth, a quantity of extra lines and hooks are carried by the vessel.

THE MACKEREL FLY-HOOK.—The mackerel fly-hook, formerly very popular and introduced before 1850, has been discontinued since 1860. This is an extra hook, on a ganging from 12 to 15 inches long, fastened to the jig-line 8 or 10 inches above the jig. Not being weighted, this hook floats at an angle when the jig is sinking, and by using it two mackerel are sometimes caught at once, one biting at the jig and one on the fly-hook. The fly-hook went out of favor because it was liable to become entangled with the other fishing gear.

THE MACKEREL-GAFF.—The mackerel-gaff is an iron rod a quarter of an inch in diameter, 3½ feet long, having at one end two recurved sharp points about 2 inches long, and separated at the extremities by an interval of one-half to three-quarters of an inch, returning in a line parallel with the direction of the rod. The mackerel-gaff is fastened to a wooden handle about 10 or 12 feet long, and was used when the mackerel were schooling thickly alongside of the vessel and were not inclined to take the hook. The gaff was thrust among the fish and rapidly drawn back, often impaling one and sometimes two mackerel at a time. This implement has not been used since the introduction of seines and but rarely during the last twenty years.

THE MACKEREL "BOB" OR "BOBBER."—This is an instrument resembling the mackerel-gaff in the manner of its use. In its rude form the bob was a stick of wood, around the end of which three or four cod hooks, with their barbs filed off, were fastened. The same idea has since been developed in various ways. The bob is fastened to a string and drawn through a school of fish, impaling them in the same manner as the gaff. This instrument was discontinued long before the gaff, and, in fact, has never been so popular. These bobs were used only when the mackerel were schooling in great numbers alongside of the vessel and refusing to bite.

BAIT AND APPARATUS FOR ITS PREPARATION.—Bait used in the mackerel fishery is of two kinds, (1) that put upon the hooks and (2) that thrown into the water to attract the fish.

The method of baiting the jigs which has been adopted by mackerel fishermen is somewhat peculiar, and a description of the process may be of interest in this place.

As a rule, when a mackerel schooner first arrives on the fishing ground and is about to begin fishing with hook and line, the jigs, which are to be immediately used, are baited with small circular pieces of pork rind, two or three of these being put on each hook. Sometimes, however, no one but the skipper uses pork-rind bait, the other members of the crew preferring to wait until some mackerel are caught from which they can procure a supply of bait for their hooks. The favorite way of baiting mackerel hooks is as follows, namely: Several thin strips, about a half inch wide and 3 to 5 inches long, are cut either from the belly of the mackerel or from the lower portion of the body on either side of the anal fin.* When a sufficient number of these slices have been obtained they are cut into sections, each of which is, approximately, a half inch square. A large number of these pieces are put on the hook, completely filling the bend, after which the baits are scraped with the back of a knife in such a manner as to remove everything but the tough white skin, which, when distended in the water, forms a soft pulpy mass about the size of the end of one's forefinger; but this can be contracted into a very small space, and thus afford the eager fish ample opportunity to secure a good hold of the hook while seeking the tempting but yielding morsel upon it. A bait of this kind will last more than an hour without being renewed, even when mackerel are biting sharply. When the fish are "picking" or less inclined to take the hook, a fisherman is often not obliged to bait his jigs more than once in a whole day. Sometimes the fishermen cut out a small circular piece from the throat of the mackerel, which they place on their hook above the scraped bait. This throat piece is quite firm, and for awhile prevents the soft skins composing the bait below it from being entangled on the point of the hook and thus preventing the latter from easily catching the biting fish.

In the early days of the mackerel hook fishery the toll bait chiefly used was made of small mackerel, and sometimes of large ones too when small fish could not be obtained. The viscera of the mackerel were also frequently used in the absence of better. From 1835 to 1840 menhaden came into general use, and were subsequently always in high favor. They had, however, been in common use by Gloucester fishermen at the very commencement of the century. They were caught in gill nets. It was the custom of the Gloucester people to leave home a little after tea, set their nets off Kettle Island, and lie there till about midnight. They would then haul their nets, pick out the fish, and start off to the mackerel grounds.†

There can be no question that the custom of chopping up small mackerel for bait was detrimental to the mackerel fishery in succeeding years, and that the introduction of menhaden was a benefit to the fishery in more ways than one. As a "toll bait" for the mackerel, menhaden is believed to be better than any other fish; the mackerel seem to prefer it; and the presence in its flesh of a quantity of oil renders it especially convenient for the use of fishermen, since in the process of "chumming-up," presently to be described, a small quantity of ground menhaden bait will spread over a large area of water. In the Report of the Commissioner of Fisheries, Part V, pp. 143 to 147, may be found a discussion of the comparative merits of herring and menhaden as a bait for mackerel.

The quantity of menhaden bait carried by a mackerel schooner on a trip of two and a half to three months to the Gulf of Saint Lawrence varied, according to the size of the vessel, from 25 to

*Strips for bait cut from near the anal fin are usually preferred, since they cannot so easily be torn from the hook as can the fatter and tenderer strips taken from the abdomen.

†Mr. Earll writes: "Daniel Cameron, of Southport, states that pogies were first used in Maine about 1844, and by 1846 had come into general use. People of this section claim to have introduced the menhaden or pogy, *Brevoortia tyrannus*, as mackerel bait, but with whom the practice originated I was unable to learn."

40 barrels. In addition to this they were accustomed to carry 5 to 10 barrels of clams. Capt. Sylvanus Smith, of Gloucester, stated to the Halifax Commission that a vessel fitting out for a four months' trip to the Gulf of Saint Lawrence would need to be supplied with 40 barrels of pogy bait, worth $6 a barrel, making $240, and 10 barrels of clam bait, worth $8 a barrel, making $80.*

Colonel Low's statement, copied from the trip-book of the schooner Oliver Eldredge, which sailed to the Gulf of Saint Lawrence August 5, 1875, arrived at Gloucester November 2, 1875, having been absent two months and twenty-eight days, obtaining 224 barrels of mess mackerel, worth $1,771.83, shows that she fitted out with 55 barrels of slivered pogies, at $6.50 per barrel, making $357.50, and 7 barrels of clams, at $6, making $42.

In 1867, when almost the entire mackerel fleet fished with hooks, the amount of menhaden bait consumed by Gloucester alone amounted, by the estimate of Mr. Joseph O. Proctor, to 6,500 barrels, and the total consumption by the United States of mackerel bait must have exceeded 25,000 barrels. In addition to this more than 1,000 barrels of clams were used. In 1877 another estimate was made of the quantity consumed by Gloucester. The purse-seiners were then in a large majority. The whole amount consumed by a seining vessel does not exceed 5 or 6 barrels in a season. Gloucester had, in 1877, about 50 "mackerel-hookers," using about 2,400 barrels of slivers, while the seining fleet used about 600 barrels more. The entire amount of menhaden bait consumed by the mackerel fleet of the United States in 1877 did not probably exceed 8,000 to 9,000 barrels of slivers, or 24,000 to 27,000 barrels of round fish.

The menhaden used for bait in the mackerel fisheries was formerly, when a larger quantity was in demand than at present, obtained to a considerable extent from Gloucester vessels fishing expressly for menhaden in the vicinity of Cape Ann and in the Gulf of Maine.

Capt. F. J. Babson, of Gloucester, whose account of the bait fishery of Cape Ann is quoted elsewhere, states that in 1873 there were over 60,000 barrels of round menhaden taken in his district, while in the same year vessels belonging to the Maine Oil and Guano Association sold of bait 2,977 barrels; in 1874, 10,400; in 1877, 10,795. From the bait fisheries about Marblehead and in the vicinity of Provincetown, according to Mr. Lowry, from 1,000 to 2,000 barrels of bait were taken in 1873. At Chatham, from 1872 to 1877, the average catch was about 5,000 barrels. A large portion of all of these fish, however, was sold to the vessels engaged in the George's Bank cod fishery. Considerable quantities also were obtained about Salem, and in the Merrimac River, a portion of which went to the mackerel fishery.

It was the custom of many of the vessels belonging to the spring mackerel fleet to devote a considerable time to obtaining a supply of bait for their own use during the summer fishery. In addition to this quite a number of vessels were fitted out each spring to go to Seaconnet and other places in that vicinity for the purpose of securing cargoes of menhaden slivers to sell to the early fleet going to the Gulf of Saint Lawrence. Cape Cod vessels were accustomed to dress their bait in a peculiar manner. They did not sliver them in the ordinary way, but salted them down "round," simply eviscerating them, cutting off the heads and the thin parts of the belly, and making slits in the sides.

These vessels obtained their bait from the pound-net fishermen at various points on the coast of southern New England, especially in the vicinity of Seaconnet, Rhode Island, and also from the various fishing gangs connected with the oil and guano factories.

In addition to the vessels which thus obtained supplies of bait for their own use, there was a fleet of bait vessels which annually proceeded to the same localities in the spring to obtain bait for

* Proceedings of the Halifax Commission, 1877, Appendix L, p. 334.

sale to the vessels of the mackerel fleet not otherwise supplied. The number of baiters was five or six.

The price of menhaden for bait varied with their abundance. In Gloucester, in 1873, according to Captain Babson, 60,000 barrels of round-fish made 20,000 barrels of slivers, worth $4 a barrel to the producer. At Marblehead the price in 1876 averaged $1 for fresh and $6 for salt bait; at Chatham, $1.50 fresh; at Nantucket, 50 to 75 cents; and at Martha's Vineyard, 50 cents. In Narragansett Bay bait sold in 1871 for $1 to $1.50 per barrel, fresh. The regular price from 1867 to 1877 at the mouth of the Merrimac River was $1 per barrel; probably 1,000 barrels of slivered fish were prepared in 1876, which sold for $5 a barrel. Boston and Gloucester vessels were accustomed to anchor at the mouth of the river and wait there for supplies of bait. At one time in 1877 there were probably twenty-five schooners waiting.

The process of slivering and salting menhaden is described in the chapter on the menhaden fishery.

The manner of preparing the slivered menhaden or other fish for toll-bait is very simple, and is essentially the same as that employed in early days, when it was the custom to grind up small mackerel for bait. Captain Atwood remarked in his testimony before the Fishery Commission at Halifax: "We now use menhaden for bait, but when I first went fishing we did not do so; our practice then was to grind up small mackerel for the purpose. Any quantity of these mackerel were at that time to be had for the cost, and plenty are to be met there now. These fish were of no account then, and so we ground them up for bait. And when we could not obtain them we ground up what we call gurry, the inwards of the fish with the gills attached. American fishermen, when they fish with hooks, use menhaden bait almost exclusively. The superiority of this over any other is proved by the fact that when they can't get menhaden they won't take any other. At first mackerel fishermen were afraid of this bait; it was a very bony fish, and they even thought that if it was cut up for bait the mackerel would get sick of it owing to the number of bones. There is a species of fish belonging to this family found on our coast which is exceedingly fat; we call them blue-backed herrings;* and some prefer this fish for bait, as it is not so bony as menhaden, but when the mackerel got to be worth having, about everybody adopted menhaden for bait; it is the cheapest bait."†

To prepare menhaden for use in the mackerel fishery, the slivers are ground up into a mush which is called "ground bait." The slivers are passed through a bait-mill, which is a machine somewhat resembling a farmer's feed-cutter. The fish are thrown into the hopper, and, by the agency of a roller operated by a crank at the side of the mill, are passed through a complicated array of sharp knives arranged upon the sides of the mill, and in spiral rows upon the roller. The bait is usually ground at night by the watch on deck. As a rule, the bait is run through the mill twice in order to make it fine enough. When the vessel has no bait-mill, which at present is rarely the case, the fish are cut up with a hatchet or scalded with boiling water in a tub. Bait-mills were first introduced about the year 1822. Prior to the introduction of the bait-mill all the bait was cut up at night with the hatchet, by the watch, upon a chopping-block, which was a large flat-topped piece of wood resembling a butcher's meat-block. The veterans of this fishery relate with great glee how they used to be kept awake all night by the pounding of the bait-cutter over their heads, and contrast the present usages with those of former days. When there was leisure in the daytime, three or four men would work at the block together, each chopping with his own hatchet.

* The Glut-Herring, Saw-belly, or Kyack, *Clupea aestivalis* Mitchill.

†N. E. Atwood, Proceedings of the Halifax Commission, Appendix L, p. 42, September 19, 1877.

In this way a constant supply was kept on hand. Bait which had been ground was packed in barrels full of pickle and covered up.

The earlier bait-mills were very rude affairs, the teeth being common nails driven into the barrel and into the sides of the mill and broken off, leaving jagged ends which tore the bait into pieces. Later these were filed down to a point, while at the present time the teeth are arrow-shaped, made of steel, and are attached to the wood by means of shanks made especially for the purpose. Bait-mills are now manufactured by various mechanics at the different ports, those made by Adolph Voss, of Gloucester, being considered among the best. The cost of a good bait-mill is from $8 to $15.

According to Col. D. W. Low, the first bait-mill was made in 1820, of nails driven in lines across two wooden cylinders and then sharpened. The first one made for grinding or cutting with knives was made in 1822 by Gorham Burnham, and they were driven into cylinders in the same manner. In 1823 he commenced putting in the knives in spiral form, which form has continued in use ever since. He has made and sold in one year $1,600 worth at $10 each, besides making anchors and other work.

The first bait-mill taken to Southern Maine was bought in Gloucester in 1827 by Mr. John Cameron, of Southport, for use on the schooner Echo.*

The manner in which the labor of grinding bait was distributed among the different members of the crew after bait-mills came into general use varied upon different vessels. Sometimes each man had his "bait-day," upon which, in addition to his regular labor of fishing, he was expected to grind bait for the use of the vessel.

When fish were abundant the quantity used might be as great as 5 or 6 barrels a day. The bait-cutter was expected to have a supply of bait ready, and when there was promise of good fishing the next day would grind what he thought would be needed for the next day's fishing during his watch at night. When he was not forehanded and the fish were abundant he suffered considerable loss, since he was obliged to work at grinding the bait while the others were fishing, and thus failed to obtain his share of the fish.

On some vessels, in order to obviate this difficulty, it was customary for each man to grind a barrel in his turn, the boys doing their share of the work by cutting the clam bait. The order of their succession was determined by their position at the vessel's rail, the man farthest forward taking the first turn. On other vessels, if a man was not on deck in the morning to help hoist the sails, the penalty for his absence was the grinding of a barrel of bait, a task which required about an hour and a half for its performance.

When the bait has been ground it is placed in barrels or in the bait chests. The ground bait is an oily mass of yellowish color, resembling in consistency sausage meat. Before it is used water is added to it, and it is then reduced to the consistency of porridge. It now becomes a yellowish slushy liquid with an oily smell, and in this condition occupies about twice to three times the space that it did before water was added. In this condition it is sometimes called "chum" or "stosh."

Mode of fishing.—The present method employed by mackerel schooners of fishing with hook and line while the schooner lies adrift was first practised in Massachusetts at the beginning of the present century, and the use of toll-bait began about the same time. According to Capt. Epes W. Merchant, the first man to introduce this method of fishing in Massachusetts Bay was John Story, of Rockport, about the year 1804.

The method of "tolling" or "chumming up" the fish by the use of this ground bait resembles

*Statement of Daniel Cameron and Capt. John Gray, of Southport, Me., obtained by R. E. Earll.

the process of calling up a flock of fowls by scattering corn over a large piece of ground. The oily bait is thrown over the side of the vessel, and as the latter drifts along and the bait spreads the fish are attracted by the floating particles most remote from the vessel, and swim up toward the source of supply.

The use of toll-bait originated with the shore fishermen, who crushed the oily menhaden under foot with their heavy fishing boots, washing the pulpy mass of flesh and the oil with buckets of water out through the scuppers of the vessel. Another statement, and perhaps the correct one, is that at first the fishermen made toll-bait by boiling a codfish or haddock until it was nearly cooked, when it was taken by the tail and beaten over the sides of the boat or vessel, causing the fibers of the fish to separate in small pieces, which, because of their whiteness, made a very attractive bait. This practice was still in vogue among the boat-fishermen of Maine as late as 1849 and 1850.

The process of throwing toll-bait, of late in practice, may now be described. Several buckets of the ground bait are put into the boxes, the positions of which have already been described, and to it several buckets of water are added, the mass being thus reduced to a proper consistency by stirring it up with the bait-heavers, which are scoop-shaped contrivances made of tin on the ends of wooden handles 2 or 3 feet in length. The vessel is "hove to" under mainsail and foresail, or sometimes under mainsail, making a square drift to leeward. One man—generally the skipper—stands forward of the main rigging with the bait-heaver and throws out the bait, something in the manner of a man sowing seed broadcast, by a sweeping motion of his right arm, scattering it over a space of 15 or 20 feet along the side of the vessel. The oily particles slowly sink and spread out under the influence of the whirling eddies caused by the receding vessel. As the vessel drifts away and one scattering of bait is on the point of disappearing from sight, another lot is thrown, and so a succession of waves of bait is left in the wake of the vessel. In the mean time the man who is throwing the bait puts out two lines and thus ascertains whether the mackerel have been attracted to the sides. As soon as the fish begin to bite, the man sings out, "Here they are!" or "Here they gnaw!" and the crew rush to their places and begin fishing.

When the fish appear, they are sometimes in small numbers and bite daintily, but often they come in immense schools and bite as fast as the hooks touch the water.*

On these occasions the deck of the vessel presents a scene of great activity and excitement.

Let us try to imagine a scene in the Gulf of Saint Lawrence. We are on the deck of a clipper schooner from Gloucester, standing along with the four lower sails and the main gaff topsail set, a fresh breeze blowing from the southwest; the sky is overcast, and the sea comparatively smooth; within the plane of vision are the white sails of some 250 schooners, most of which are hove to, a few tearing along under press of sail seeking new positions; here and there among the fleet is a vessel with flag set at her main peak or at her main topmast head; this is to indicate that she has

---

* "*Jigging mackerel.*"—"Jigging mackerel" is a method peculiar to mackerel catchers that superseded the old way, called "trailing," or taking them while the vessel was under headway. The manner of jigging is peculiarly interesting to new beholders. The vessel is kept comparatively motionless; a large quantity of poor mackerel, chopped into mince-meat, is thrown upon the water, which brings them to the surface. So much of this has been done that it has, in a great measure, destroyed their appetites, and sharp-pointed hooks of a sufficient length to reach the fish have been resorted to.

A line of the color of the water, called the jig-line, attached to a lead of a finger's length, say one-half inch in diameter, diminished at the end towards the hook, which is solid in the lead called a "jig-lead." Bait of such as is thrown overboard is put on the hook and thrown also among the "floating bait," or more properly the floating fish. Thus prepared, the fisherman has little else to do but to draw in the line and snap off the fish in a tub, prepared for that purpose, a little faster than can be easily imagined by the land fisherman. From 50 to 80 barrels have often been taken on a good "fishing day" in this way by a crew of six or eight hands; oftentimes several boys comprise a portion of the company. (Barnstable Patriot, November 15, 1836.)

completed her fare and is homeward bound. Some of these are lying to, and are still fishing, while others have all sail set, and are heading for the Strait of Canso on their homeward way. A few miles to the northeast looms up the rugged shore of the Magdalen Islands, its high outline here and there broken by long stretches of sandy beach; a train of great white gannets crosses our bow, five or six of them rapidly flying close to the water; suddenly the leader disappears beneath the water, and his companions rise up for a moment and then plunge down head foremost after the fish which they see. The movement is perceived by other gannets, and they flock in from all directions and share the feast. As we speed along two or three of these birds, which have filled themselves to repletion, are swimming in our course, unable to rise, and, in order to escape, they disgorge their stomach-loads of fish and flap away just before the vessel reaches them. We now approach the fleet, and pass by the leeward vessels which are hove to, the starboard rails of which are lined with men excitedly plying their lines. Our skipper stands on the quarter with his glass to his eye, trying to determine which portion of the fleet is meeting with the best success. He selects a berth near the middle of the fleet, and thither he directs the course of the vessel by word to the steersman. We thread our way in a zigzag course among the drifting vessels, sometimes escaping by a few inches only the thrust of a jib-boom, and again almost snapping off the main boom of some other vessel. At length we approach the selected position and heave to, coming up sharply to the wind with the mainsail hard aback. The skipper takes his position at the main rigging and begins throwing bait, at the same time putting out his lines for trial. After the vessel is hove to, the men are lounging about the deck, yet in expectant attitudes. At a little distance from the rail stands a row of barrels, one opposite the berth of each man. These are called "strike" barrels. The lines, with the jigs attached, are coiled upon the cleats or lie upon the rails, each man having examined his own and prepared them for immediate use. At last the skipper is seen to rapidly haul in his line, pulling a glittering mackerel over the rail, and, by the peculiar motion known to the fishermen as "slatting off," the fish is jerked over his right shoulder into the barrel, while the drumming of the mackerel against the bottom of the barrel announces to the men that the fish have struck. The men rush to their positions, and a scene of great activity and excitement begins. The fish are now within 4 or 5 fathoms of the side of the vessel, but they soon come much nearer; looking over the rail we see their mottled backs as they swim to and fro alongside the vessel. The lines are shortened up as the mackerel rise, and now the time required for throwing over the jig and jerking it back with a mackerel fast to it is only a few seconds. The men throw out their lines, pull them in, and, without glancing at the fish, dexterously "slat" them into the barrels, the jigs being torn out of their mouths by the same motion which casts the line back into the water; two twists of the wrist are sufficient to accomplish this feat. The mackerel are large—"No. 1's"—and in fifteen or twenty minutes the best fishermen have their barrels full. When a man's barrel is filled he springs from the rail, rolls it back towards the center of the deck, and puts an empty barrel in its place. The fish may continue actively biting for ten minutes or for several hours, but usually the sharp biting is over very soon, and the mackerel begin to "pick." Now the work is less exciting, though much more exacting upon the skill of the fishermen. When the fish are "picking," a high-line fisherman will catch quantities, and the greenhorn will catch none, and even among the most skillful fishermen there is a great difference in their success at this time.

It should be stated that all the time mackerel have been biting, four men have been actively employed in throwing bait over the side, at the same time attending to their lines like the remainder of the crew. The cook heaves bait in the position farthest forward, and one of the boys in the

position farthest aft, while amidships the skipper and one of the most experienced of the crew are similarly engaged.*

When the fish begin to "pick" the skipper reconnoiters for a better position, and finding that other vessels are having good fishing, orders the crew to coil in their lines and to make sail; away we go in search of another "spurt of mackerel."

The excitement among the crew, when the mackerel are biting fast, can hardly be described. When the fishing begins, the drumming of the mackerel in the empty barrels is inexpressibly cheering to the fishermen, especially if they have been unsuccessfully hunting for fish on previous days, and adds to their excitement. This sound ceases as the barrels begin to fill up, the resonance of the wood being deadened by the accumulation of fish; it is, however, from time to time repeated as empty barrels are substituted for those which have been filled. Every man is striving to the top of his bent to catch as many mackerel as possible while the "spurt" continues, and, if possible, to catch a larger share than any of his comrades. The emulation to be "high-line" for the day and for the season is extreme. The number of barrels caught by each man is carefully noted, for upon his relative success depends his proportion of the proceeds of the voyage and his reputation as a fisherman. In a single day a high-line fisherman has caught from 10 to 15 barrels, and since each barrel contains from 150 to 200 mackerel, the rapidity of the men's movements throughout the day may be estimated. In seven or eight hours' fishing he has probably lifted over the side 2,000 to 3,000 fish, to say nothing of throwing over his jig and bringing it back empty almost as many times more. Such cases as this are exceptional, since mackerel rarely continue biting long enough to allow such a number to be taken. At the same time, when a much smaller number is caught, the activity of the fishermen is something to be wondered at.†

The confusion and excitement are increased by the frequent snarling of the lines and the attempts to straighten them out again. As has been stated, each expert fisherman has ten or twelve lines in his berth, and changes from one to the other according to the rapidity with which the fish are biting or the strength of the wind. Much experience and skill are necessary to enable the fishermen to make these changes understandingly. Little is said while the fishing is going on; the men lean far over the rail in strange attitudes of expectancy with one or two lines in each hand, the hands moving up and down and constantly hauling in and throwing out one of the lines at a time. When it is necessary to haul in one of the lines the others are allowed to drop upon the rail.

We have described one phase of the life of a mackerel fisherman, but experiences like this may occur only a few times during a season. Mackerel vessels are constantly under sail, cruising hither and thither over great areas of water on the lookout for fish, heaving to and trying more frequently without than with success, except in extraordinary seasons. At night they are hove to, or when mackerel are scarce are making long passages from one ground to another. Information as to the location of the schools of mackerel is passed from vessel to vessel. As they meet, the vessels almost invariably speak each other and compare notes upon the position and abundance of fish.

When a vessel is seeking fish, and heaves to for the purpose of tolling them up, she will continue in this position, as a rule, for about an hour, sometimes longer, when there is any prospect

* On the mackerel "hookers" the cook stood to fish just aft of the fore-rigging. The large schooners sometimes had a boy forward of the fore-rigging, but this was not the rule by any means. Each man or boy had a certain number of inches measured on the rail and assigned him as his berth. The length of a berth at the rail varied from 2½ to 3 feet.

† LARGE CATCH OF MACKEREL.—Schooner Bloomer, of Hingham, with a crew of ten men, caught on Thursday last, between 10 a. m. and 2 p. m., 5,700 mackerel with the hook and line. (Barnstable Patriot, May 28, 1861.)

of success. Sometimes the mackerel, however abundant, will not rise to bait; they are very capricious; at other times in the same day they will be exceedingly voracious. One of the common tactics of the mackerel fishermen was that of running round a school; when the fish could be seen, the vessel would make a complete circle, surrounding them at the same time with the line of toll bait. The effect of this maneuver was to keep the fish from moving away by placing the bait in such a manner that whichever course they took the fish must invariably meet with and be attracted by it to the vessel's side. It frequently happened, however, that the schooling fish took no notice whatever of the toll bait, either because they were not hungry, or were engaged in feeding upon some form of crustacea, of which they are exceedingly fond.

The practice of "lee-bowing," the method of which, so far as the management of the vessel is concerned, has been described in another place, was simply to "heave to" to the leeward of another vessel which was lying to and had a school of fish alongside, and, while so doing, to throw a quantity of bait overboard; this bait passing under the bottom of the first vessel would attract the fish, which would then follow the course of the new bait, passing to leeward under the first vessel and appearing alongside and close to the vessel which was executing the maneuver of lee-bowing. The success of this maneuver is sometimes thwarted by the crew of the first vessel throwing over such a quantity of bait that the bait thrown by the second vessel is not noticed by the fish. In this act it is frequently the custom to use a considerable quantity of chopped clams, these being considered better to "hold" the fish alongside than the menhaden bait. The clam bait is also used on other occasions to "hold" the fish, or induce them to bite more rapidly when they are supposed to be tired of the ordinary bait.

A maneuver sometimes executed by the mackerel schooner is called "springing up." This is done when the mackerel are so close to the shore that the vessel cannot lie to and drift for them. It is accomplished by bringing the vessel to anchor and then putting a "spring" on the cable, the latter, which is a stout rope, being taken to the port quarter, and the cable veered out so that the vessel lies with her port side to the wind. The fishing is then carried on on the starboard side in the same manner as with vessels lying to.

In former years, when an extensive mackerel fishery was prosecuted in the vicinity of the Seven Islands and at the mouth of the Saint Lawrence River, much jig fishing was carried on by small boats sent out from the vessels. Each of the boats carried a small quantity of ground bait, which was used in the same manner as on the vessels. This method of fishing has also been practiced to some extent on the coast of Maine even as late as 1879.

Vessels occasionally returned home from the Gulf of Saint Lawrence to land their catch, leaving a portion of their crew to fish from small boats until their return.*

The above description of jigging mackerel has been written with special reference to the fishery in the Gulf of Saint Lawrence, since it was there that the jig fishing was most extensively prosecuted. The methods are the same, however, as those practiced on the New England coast.

5. THE CARE OF THE FISH.

CLEANING AND SALTING.—The manner of caring for the fish is essentially the same as that described in the preceding chapter, except that (the quantity of fish taken being much smaller, there was, of course, much more time for handling them) greater care was taken, and the fish were

*Schooner B. D. Haskins lately arrived from Bay Saint Lawrence with mackerel; left five of her crew to continue the fishery in dories until her return on her second trip. (Cape Ann Advertiser, August 17, 1860.) Instances of this kind were rare.—AUTHORS.

uniformly of better quality. Many of the Gloucester mackerel-hookers were accustomed to divide their crew into dressing gangs of two each instead of three, as at the present time on the seining vessels, one of these men splitting and the other gibbing. It was the duty of the splitter to get the barrels, fill them with water, and, when he had split more fish than the gibber could take care of, to aid the latter in his work.*

On the seining vessel, as we have seen, the mackerel are, in most cases, heaped on the deck; on the mackerel-hookers, the fish were already in barrels, and the order of proceeding was slightly different. The splitting-board was placed on the head of one of the "strike" barrels; the fish were taken out of the barrels, split, and thrown into the gib tub, where they were handled in the ordinary manner. The process of gibbing having been completed, the fish were "plowed" and put into the second barrel, which was filled with clean water. From this barrel they were changed into the barrel in which they were salted. The process of salting is as follows: A barrel of mackerel is emptied out on deck; a "gib-keeler" is filled with salt; one of the men now throws the mackerel into the "gib-keeler," while the other man "rubs" them in the salt by taking one in each hand; the back of one is then placed to the flesh of the other, and they are thrown into the barrel with the flesh side down. They are thus salted and packed away into barrels in successive layers, each (with the exception of the bottom tier) with the flesh side down.† A barrel of large mackerel can be salted in from five to ten minutes.

In order to cure mackerel successfully very fine salt must be used, and every part of the fish must be touched or it will spoil.‡ Careless salters sometimes leave "thumb-marks" where their thumbs touch the fish during the process of salting, preventing the access of the salt. These fish do not keep well.

It was customary on the "hookers" to let the mackerel remain on deck for several days after being salted, the length of time varying to a considerable extent, as it depended very much on the amount of fish taken. When the mackerel were well struck, or after they had been salted from two to five or six days, the barrels were "topped up" with fish, to make up for the shrinkage from the first salting, after which they were carefully headed up and stowed in the hold. If the men kept their catch separate, each one cut a private mark on the head of the barrel containing his fish. As a rule, the mackerel were "stowed down" whenever 40 or 50 barrels had accumulated on deck, but when fish were abundant and took the hook freely for several days in succession it often happened that more than a hundred barrels of fish would be caught before any were put below.

Capt. Epes W. Merchant, of Gloucester, informs us that the practice of salting mackerel was inaugurated at Gloucester in 1818. Scituate fishermen had begun this practice somewhat earlier. The methods of salting have not materially changed since that time. Previous to 1850 the vessels

---

*The most general custom, perhaps, on the Gloucester vessels was to have two men in a gang, though this was varied a good deal on different schooners. Some crews preferred dress gangs of three men each, while others sometimes had four men working together, one of them "passing up" the mackerel to the splitter.

†The early method of packing them flesh up has been abandoned.

‡This is the case when the mackerel are "rubbed," Liverpool salt being almost wholly used, since Cadiz salt, owing to its coarseness, has a tendency to tear or "ruck up" the flesh of the fish and give them a ragged appearance. Many of the Cape Cod fishermen, however, preferred to use Cadiz salt, believing it to be better for curing the fish than Liverpool. Their manner of applying it was quite different from that which has been described. Each man salted his own catch. Placing a wash-barrel of mackerel at his left hand, an empty barrel in front of him, and with a bucket or basket of salt at his right, the fisherman rapidly transferred the fresh fish into the proper barrel, placing each flesh up, and scattering over it with the right hand a sufficient quantity of salt. An expert can thus take care of many more fish than any one unacquainted with the method would believe possible, though it is safe to say, mackerel can be handled more expeditiously by the process of rubbing, and for this reason the Cape Cod style of salting has never come into favor at Cape Ann and on the coast of Maine.

engaged in mackerel fishing were generally accustomed to carry butts, in which the fish were salted.

Capt. Chester Marr tells us that in the early days the mackerel fishermen made a practice of salting the mackerel in hogsheads, which were placed in the hold, standing on end, with stone ballast stowed in the "spaces" between them. When a vessel was loaded she would hold about 10 butts, or about 50 "wash-barrels." These butts were used until about 1850.*

MACKEREL PLOWS.—The mackerel plows, to which frequent allusion has been made, are also known to the fishermen by several other names, such as rimmers, reamers, fatters, and fatting-knives, in the same and in different localities. The original object of using these instruments may be said to have been a "trick in the trade," although the fact of their being employed at the present time is so well known that no one considers it any longer a secret, neither has it been for many years. The quality of mackerel is determined not only by their size, but also by the richness or fatness which they acquire as the season advances, and the opportunities for obtaining food are better than during the spring. In the spring, when they approach the coasts of the Middle States and Southern New England, they are in a poor and lean condition, and remain in such a state until after they have deposited their spawn. After the spawning season is over the schools then seek their favorite feeding grounds, and the fish soon begin to exhibit much improvement in their condition. During the month of June this improvement is first noticeable, and by the last of August, and sometimes even at an earlier date, the mackerel have arrived at their finest condition and remain so until they leave the coast in the fall. As the fish fatten, the belly, or that portion which covers the abdominal cavity, increases in thickness, and the quality of the mackerel can be more easily and certainly determined by noticing this particular portion of it than in any other manner. The mackerel are invariably split along the back from the snout to the tail in such a manner that they will lay open and flat after the viscera has been removed. It is a fact well known to persons familiar with this fish that when they are in a fat condition the sides of the abdominal cavity will crack open along the entire length when the fish are opened for the purpose of removing the viscera. The depth of these cracks or "breaks" shows the relative fatness of the fish. As these cracks occur about half way from the backbone to the center of the abdominal cavity, it will be readily seen that by using an implement for making the cracks a little above or nearer to the backbone than where it would naturally be and where the belly is considerably thicker, it will give the fish the appearance of being much fatter than it really is. As previously stated, the depth of the

*The largest of the mackerel schooners had sufficient capacity for stowing 20 or 25 butts, besides a number of barrels alongside of them in the wings on each side of the hold.

When salting mackerel in these casks, the salters worked in the hold. A gib tub was filled with salt and set on top of the butts near the hatchway, and one man threw down the mackerel from the deck into the salt box (or gib tub) while two others standing alongside of the butts did the salting—one "rubbing" the fish and the other packing them away in the proper place. When the cask was full a large stone was placed on top of the fish to keep them beneath the brine so that they would not get rusty. Each man usually had a hogshead of his own for the reception of his fish; that is, if each of the crew kept his catch separate. At that time, however, it was quite generally the custom to "go on shares." This term, as then understood, differed radically from what is now meant by the same expression, and may be described as follows: The crew were shipped as much upon their merits of good seamanship and steady habits as for their skill as fishermen. Each man was provided with a "strike tub"—a half hogshead—and for the first few days' fishing the skipper would note the catch of each of the men, and from this comparison would decide what share every one should receive. Thus some half dozen, perhaps, in a crew of 12 or 14 men would be assigned a full share. Though there might be some difference in the relative catch of these men, it was thought fair to consider a capable and reliable man a full sharesman, though he caught somewhat less fish than another who might not be so well experienced in other matters. The remainder of the men were allowed three-fourths or one-half of a share, as the case might be, their expertness in catching fish and other qualifications always being taken into account in settling their relative standing. Thus, if a vessel had a crew of twelve men, six of whom were full sharesmen, four three-quarter sharesmen, and two half sharesmen, there would be ten full shares, and a sharesmen would receive one-tenth of the crew's half of the proceeds of the voyage, while those having a smaller "lay" would be paid accordingly.

"break" is the test of the fatness of the fish, and is the guide by which the inspectors cull them into the different grades for market, provided always that they are of suitable size. Stringent laws have in past years been enacted in most of the New England States to regulate the method of inspecting mackerel, and the use of any artificial means to fatten them was for many years strictly prohibited. The introduction of the mackerel plow, like that of many other inventions, was the direct result of a need long felt by fishermen. Previous to its adoption it was the custom for the fishermen to attempt to improve the looks of their fish by increasing the natural break with their thumb-nails drawn along its entire length. This method was called "rubbing the mackerel." Later, a few began to use the back of the point of their bait-knives or splitting-knives for this purpose, by degrees venturing to place the cut a little higher than where it naturally belonged. The use of knives led to the introduction of plows, which soon came into general use, though the fishermen at first felt some hesitation about revealing the fact that their fish had been plowed.*

A comparatively poor mackerel would not open sufficiently in a natural way to pass for a No. 2, *but the fishermen give them an inviting appearance to the buyer by the use of the plow, which* they handle with remarkable dexterity, running the blade longitudinally along each side of the abdominal cavity with great swiftness, laying the sides of the fish open in such a manner that it may pass for a No. 2, and, perhaps, if it is of large size, a fairly fat fish may be culled as a No. 1 mackerel. It is but fair to say here, that, since the general adoption of the mackerel plow as a means of "fattening" the fish, the subject is so well understood by the dealers that they demand a finer looking fish than formerly, and the consumer, therefore, actually gets as good an article as before, and one that is much more attractive. This is especially the case when the size of the mackerel is not sufficient to pass for the best quality, or No. 1. A fish whose length is 13 inches and "of suitable fatness" is required for a No. 1, but it is easy to see that a fish of fine quality, though not exceeding 12 or 12½ inches, is just as good for food, notwithstanding the fact that it must pass for a lower grade and be sold for a much less price. For the past few years a very large portion of the mackerel caught on our coast have been "undersized," that is, not long enough to pass for the best quality, according to the inspection laws of New England; nevertheless they are in all respects quite as good as the larger and rarer grades.

As previously stated, the fishermen no longer make a secret of using the plow, and during the summer season, when the wharves on the eastern coast are filled with mackerel, the operators may be seen in the open air busily running the fish almost as fast as they can pick them up and throw them into another barrel. There are many styles of this type of knife, their patterns and designs being as varied as the fancies of those who make them. They are, with but few exceptions, made by the fishermen; some of them are exceedingly plain and rough, while others are artistically and elaborately decorated, often with imaginary uncouth figures or with fancifully carved leaves, wreaths, &c.

There are several knives of this character deposited in the fisheries collection of the United

* From a circular addressed to the masters and crews of mackerel vessels by Hon. James Barry, inspector-general of pickled fish for Massachusetts, dated May 2, 1832, we quote the following in relation to the use of the mackerel plow: "It is a mischievous error that fishermen have fallen into by salting their fish too slack, as has been often the case; and another by using the plow, which has given to the fish a false appearance, and has been a source of mortification to the fishermen, and they have in a great many instances found fault with the inspectors when the fault belonged to themselves in not taking care of the fish, which it was their duty to do, and which in many cases has been a ruinous business to purchasers. By a law of the commonwealth the inspector is required to throw into an inferior quality all mackerel which have been plowed, cut, or mutilated for the purpose of deception. It can be of no advantage to the fishermen, and I trust will never again be done."

Capt. N. E. Atwood says that some of the fishermen made mackerel plows with "the ends tipped with pewter and fine teeth on the edges so as to make the crease look rough, as though it were broken naturally; others had a knife in the end which cut the mackerel smoothly."

States National Museum, and among them is one factory-made rimmer, with a polished walnut handle and a curved iron shank about one-quarter inch in diameter; into the forward end of the shank is fitted a small cutting blade about 1½ inches in length, tapering to a point at the heel, and with a square-cut forward end. There are also other styles made by the fishermen, some having steel and others having copper blades, and one specimen made of wood, in the form of a human leg, the extreme end terminating in a thick-set flat foot, in the bottom of which is inserted or driven a silver three-cent piece, ground to a sharp edge, to be used as the knife or plow.

6. HOMEWARD PASSAGE AND DISPOSITION OF THE FISH.

When one of the vessels in the fleet has obtained a fare of fish, or the skipper decides to go home, sometimes with a partial fare, the flag is usually set at the maintop-mast or on the main peak. This custom was not so common on our coast as in the Gulf of Saint Lawrence. The fish being salted, the homeward passage was usually performed in a leisurely manner, unless, indeed, the return was made during the fishing season, and the skipper expected to make another trip, in which case the utmost expedition was used, and rapid passages were made. For several years it has been a common practice for vessels fishing in the Gulf of Saint Lawrence to land their fish at the Strait of Canso, or sometimes at Prince Edward Island, sending the fish home by steamer or freight vessels. This was only done when the vessel had obtained a large fare and there was a prospect of one or two more successful trips for fish that season. By this means vessels sometimes filled up three or four times in the course of the summer, obtaining, in some instances, as many as 1,100 to to 1,200 barrels.*

7. FINANCIAL PROFITS OF THE MACKEREL HOOK FISHERY.

Old-fashioned vessels were employed as seiners for a number of years from Gloucester, it then being thought by many of the fishermen that swift sailers were not so necessary for this branch of the fisheries as for some others. In this respect, as in many other things, there has been a radical change.

The expense of fitting out with seine, boat, &c., deterred many of the owners from sending their vessels seining, and the more conservative clung to the old method of jigging until the failure of mackerel in the Gulf of Saint Lawrence compelled them to adopt the seine or abandon the business.

* The influence exerted upon the settlements in the Strait of Canso in the period between 1850 and 1870, by the trade thus derived from the mackerel fleet, was very remarkable. In many of the coves, on either side of the strait, small villages sprang up, and large store-houses and wharves were built where the American vessels could secure storage for their fish until they could be shipped, and also at the same time obtain supplies of salt, bait, provisions, &c., which they required for the prosecution of their voyages. This, of course, brought a great deal of money to the people of Canso, and many of the merchants who were not slow to take advantage of the circumstances became quite wealthy. Those were lively times in the strait, and it was not an unusual thing to see ten or twenty sail of mackerel schooners lying at Port Hawkesbury or at McNair's or some of the other coves discharging their cargoes and taking on board outfits for another trip. This afforded much employment to local residents and remunerative returns. Most of the people who owned wood lands devoted their time in winter to cutting and preparing for use a lot of fuel which they could readily dispose of the following summer to the American fishermen at good prices; and whoever was fortunate enough to have a small stream or brook running through his land near the coves usually derived quite a revenue from the American fishermen by charging 5 or 10 cents per barrel for the water which they were obliged to fill there.

Of late years, however, since the general introduction of the purse-seine in the mackerel fisheries, and the consequent failure of our fishing fleets to resort to the Gulf of Saint Lawrence during the mackerel season, a great change has taken place in the prosperity of the settlements at Canso. So much so, indeed, that many of the wharves and store-houses have been allowed to fall into decay and become nearly worthless from disuse. Most of the coves which were formerly the scene of busy life and activity during the mackerel season now have a comparatively deserted and forlorn appearence. Many of the merchants have moved away to Halifax and other business centers of the Provinces, while those who remain find their business much less remunerative than it was at the time when the Strait of Canso was frequented by a large fleet of American mackerel schooners, which were engaged in fishing in the Gulf of Saint Lawrence.

As a matter of course such large stocks and enormous profits were not obtained by the seiners years ago as they have made for the past few years, 1880, 1881, and 1882. Nevertheless, many of them did well. But a vessel's "fit out" for jigging costs comparatively little, and with a much *smaller stock more clear money would be left than if she went seining.* This, together with the fact that more or less risk is attached to seining—such, for instance, as losing the apparatus altogether, having the net torn, the boats stove, &c.—served to deter the timid ones from engaging in it until compelled to.

Rapid advances in the knowledge of using the purse-seine have been made within the past few years, which no doubt has had a strong influence in changing the hook fishery into seining. For a number of years it was believed that mackerel could not be taken except in shoal water, where the seine would reach bottom, and as a result of this but comparatively little could be done. More recently, the practice of seining in the night, tolling the fish alongside of the vessel and then surrounding them, &c., have added much to the profits of the fishermen.

The large net profits which were sometimes made by the mackerel hook fishermen previous to 1870 bore no mean comparison to the money cleared by the seiners of the present day, though, of course, the latter frequently get higher stocks. This, as mentioned above, is due to the difference in the cost of fitting out a vessel for hooking and for seining, the expense for the latter often being twice or three times as much as it would be for line fishing. The following account of some of the large mackerel stocks made by vessels engaged in fishing with hook and line we copy from the Fishermen's Memorial and Record Book:

"The largest stock made in the Bay of Saint Lawrence mackerel fishery was that of schooner Colonel Ellsworth, Capt. George Robinson, in 1865. She was absent about five months, her net stock amounting to $13,728.* The high-liner's share was $558; cook's, $582.

"Schooner General Grant, Captain Coas, in 1864, stocked in two trips to the Bay of Saint Lawrence $11,254.94 clear of all expenses.† The high-line made $502.24; cook's share $638.17.

"Schooner Nor' Wester the same year stocked $9,721.74 net in one bay trip; the high-liner making $308.60 and the cook $486.61.

"Schooner General Sherman, in a three months' trip to the bay in 1864, packed 612 barrels of mackerel, her net stock amounting to $9,696. High-liner's share, $575.06.

"Schooner Kit Carson, 1865, brought in 591 barrels of mackerel, having been absent about ten weeks. He net stock amounted to $6,542. High-liner's share, $260.

"Schooner James G. Tarr, in 1866, stocked $5,824 in a nine weeks' trip to the bay. Cook's share, $331.76.

"Schooner Seddie C. Pyle, in 1871, packed 1,070 barrels of mackerel caught off this shore,‡ in addition to 18,000 southern mackerel sold fresh in New York in the spring. Her net stock for the year was $10,561.66. High-liner's share, $491.38; cook's share, $708.52.

"Schooner Eureka, in six months' mackereling off this [American] shore in 1868, packed 935 barrels, her stock amounting to $10,748.33. High-liner's share, $440.82; cook's share, $473.70."

8. ITINERARY OF A MACKEREL VOYAGE TO THE GULF OF SAINT LAWRENCE.

By Colonel D. W. Low.

We go to Essex, a neighboring town on Cape Ann, 6 miles from Gloucester, or to the shipyards of Gloucester, where we see on the stocks, ready for launching, a schooner of 60 or 70 tons.

* Her gross stock—the amount her fish sold for—was doubtless about $16,000.
† Her gross stock would be between $13,000 and $14,000.
‡ New England coast.

built in that thorough and stanch manner which makes the American fishing schooner celebrated for her sailing and seaworthy qualities required in the hazardous business she was built for.

We next find the schooner alongside of the wharf in Gloucester, where she is made ready or "fitted" for a voyage to the Gulf of Saint Lawrence, called a "bay trip." Fifty-five barrels of pogies and 7 barrels of clams, with 50 hogsheads of salt in 115 barrels, and 16 barrels of water, are stowed by her crew in her hold, on top of which are stowed 335 barrels more with their heads taken out and put inside, both head and barrel being numbered. After the provisions, lines, hooks, &c., are on board the flag is hoisted and she is ready for sea, having cost to that time $7,700 for the vessel and $2,075 for her outfits. Had she been fitted for seining her outfits would have cost $750 more, making her total cost with outfits $10,525.

Leaving Gloucester August 5, 1875, we proceed to the Gulf of Saint Lawrence with seventeen hands, shipped "by the berth," according to their experience as fishermen, the best fishermen getting the best berths, which are nearest to and on each side of the master. The master's berth is forward of the main rigging on the starboard side, nearly in the center of the vessel. Formerly the berths to fish, with exception of the master's and cook's, were sold at auction on board the vessel after she had started, as high as $50 or even more being paid for first choice. The amount of the bids, called "berth money," was equally divided among the sharesmen, they paying the amount of the excess of their bid over the average share. The cook fishes forward, so as to be handy to his cooking. After each man's berth is decided upon, each one prepares the cleats for his lines on the bulwarks under the rail at his berth. "Jigs" are run in the "jig molds," and the lines, eight to twelve to each man, are neatly put upon the cleats ready for service. After passing through the Gut of Canso (stopping there for a little wood) the vessel is ready for fishing. Lashed on the "port" side of the schooner, opposite the skipper, stands the "bait-mill," at which each of the crew, excepting the master and cook, take turns, commencing with the youngest, in grinding bait. The slivers of pogies are ground up fine and clams are chopped with a long-handled chopper, which are mixed with the pogy bait, and some of it put into a box called the "bait-box," which is hung outside of the bulwarks, to the right of the master's berth, and water is added to it. After the vessel is "hove to," and she commences to drift to leeward, the master, with a "bait-heaver," throws the bait from the bait-box into the water fore and aft the vessel, to attract and draw the mackerel alongside. Some of the crew are below and others looking on, or perhaps put out a line with the skipper's to try for them. Soon the peculiar tapping of a mackerel's tail is heard on the bottom of a barrel, which, with the cry of "Here they are!" from the skipper, brings every man to his berth, and for a time the "strike barrels" standing a little in the rear and at the right of the fisherman, in which the mackerel are slat from the hooks, resound with the lively occupants. The best fishermen fish with four and sometimes six lines each. The "spurt," however, is soon over, and after "picking" one once in a while the master orders, "Take in your lines;" after which we haul in our mainsail, hoist the jib, and go on. The mackerel are then dressed, generally by gangs of three, comprising a "splitter," one to pass up the mackerel to him, and the "gibber;" the mackerel, after being split, are thrown into a "keeler," which is a shoal square box about two by three feet square, which are put on board in nests of three; the "gibber," with mittens on to prevent getting his hands sore from the bones, opens the mackerel, takes out the gills and entrails (which are thrown overboard after dressing the catch), and throws the mackerel into a barrel partly filled with water to soak the blood from them, which is called a "wash barrel"; after soaking, they are thrown into a keeler of salt, a few at a time, rubbed all over in the salt, and packed in a "sea barrel," 1 barrel of salt (3½ bushels) being used in packing 4 sea barrels. After the barrel is filled and the fish allowed to shrink it is filled up (sometimes there is not time

enough to allow it to shrink before heading up). The head of the barrel is put in reversed, on which the private mark of the catcher is cut in to identify it when landed, after which the barrels of mackerel are stowed in the hold. Frequently, when mackerel are scarce and time hangs heavy, industrious ones will "mess" their mackerel by scraping the blood from the backbone and cutting off the heads and tails, losing by the operation 13 pounds on a hundred, but making the mackerel bring more in the market for the labor.

During our voyage we sometimes tried for mackerel with others of the fleet one or two miles from shore, and being "hove to" together, and occasionally "picking" a mackerel which, as it glistened in the sun coming over the rail, no doubt led those on shore to suppose we were getting a good catch of fish, when 15 wash barrels would cover the whole catch for the fleet in several hours' fishing. The latter part of October finds us on the way home, at Georgetown, Prince Edward Island, where we put in for a harbor, paying $1 for harbor dues, and on 2d of November arrived at Gloucester, having been absent two months and twenty-eight days, and caught 250 sea barrels of mackerel.

The mackerel are hoisted out by horse-power, the crew paying for the horse in preference to doing the work by hand as formerly. After being landed each man's lot is stood upon the head together, with the marked head up. One of the crew unheads them, another pitches the mackerel as wanted into a "culling crib," which is made about 3 feet wide and 4 feet long, with slat bottom, at each end of which stands an experienced and careful "culler," who tosses the mackerel according to their grade into "culling tubs," which hold a half-barrel each; two of the crew then place the tubs, when full, on the platform of a beam scale, where the "weigher" weighs them off, crying out "barrel of one's," or whatever the weight or grade requires; two of the crew empty them into the "packing cribs," while the master places the account of it under the name of the catcher, and the packer, with a piece of red chalk, marks the head of the barrel or whatever package is used with the grade of the mackerel. Half a bushel of salt to the barrel is used in packing, after which the cooper takes it, and after putting in the head it is rolled out on the wharf by a laborer and there bored and pickled off by the "pickler." After being pickled off and bunged they are stood upon their head and branded with the deputy inspector's name and the grade of the fish; the trip is sold by the owner with the master, he acting for himself and crew; the voyage is then made up in the ordinary manner. When the mackerel are delivered to the packer the vessel and crew are done with them as producers.

4.—THE MACKEREL GILL-NET FISHERY.

1. APPARATUS AND METHODS.

Considerable quantities of mackerel are sometimes caught in gill-nets at various points along the New England coast, from Vineyard Sound to Eastport. For the most part, however, they are taken west of Mount Desert. This fishery is carried on in two ways: The gill-nets may be anchored and left out over night, as is the custom about Provincetown, or they may be set from a boat or vessel. The latter method is called "dragging"; the vessels are called "draggers," or "drag-boats," and the fishermen "mackerel draggers."

The mackerel gill-nets are 20 to 30 fathoms long, 2½ fathoms deep, with a mesh varying from 2½ to 3 inches. In Provincetown Harbor they are set in the following manner:

About the middle of November the fishermen of Provincetown Bay begin to put out nets for

the large mackerel on its return. On one occasion Captain Atwood had twelve nets out, 5 miles from land. On the last night of November he had taken nothing, but on visiting the nets the next day he found they had sunk to the bottom filled with mackerel. He, however, succeeded in getting up eight, and the nets as they came to the surface looked like a sheet of silver. Three thousand three hundred and sixty mackerel were taken from these *eight nets by nightfall. The next day* the remaining nets were dragged in and 1,700 more taken, making 5,000 fish netted at a single catch. On another occasion a catch lasted three nights, when he alone caught mackerel enough of the best quality to make 16 barrels when packed.*

In Gloucester Harbor and at other points on the coast of Massachusetts and Maine they are set in shallow water, one or both ends being anchored and their position marked by buoys on each end of the gang. When set thus in protected harbors they are ordinarily placed across the direction of the tide, usually in a cove or bight of the harbor where the mackerel are known to occur, and where they are out of the track of vessels.

The most extensive "drag net fishery" is carried on by the vessels of Portland and Friendship, Me. The method employed by these fishermen six years ago was somewhat as follows: The vessels are small schooners of *15 to 25 tons. They usually run out from the harbor near the close* of the day, timing their departure so that they will be upon the fishing grounds about sunset, except when it is necessary to go a long distance out to sea, in which case, of course, the time of starting is earlier. Reaching a locality where mackerel are supposed to be abundant the vessel is hove to, and a gang of ten to twenty nets is paid out. The nets are fastened together at top and bottom, and the outer end is marked by a buoy, other buoys being distributed along the gang at intervals, the junction between each pair of nets being generally marked by a *keg or spar. To* the last net is fastened a rope called a "net swing," corresponding to the "fleeth-rope" used by the herring fishermen of Europe. This is a rope of 3 inches in circumference and 60 to 70 fathoms long. It is paid out to its full length and made fast at the bow of the vessel. The foresail is then *lowered and furled,* and the vessel lies head to the wind, drifting to leeward and dragging the nets as she goes. If the wind is moderate the whole mainsail is kept up, but if the breeze is fresh, or what is called a mackerel breeze, it is reefed. Under favorable circumstances the nets are allowed to remain out all night, but the fishermen in the two dories row constantly along the nets back and forth noticing the movements of the fish, and especially looking out for the approach of dogfish. When a school of dogfish approaches the nets after any number of mackerel have been gilled it is at once necessary to take them in less the dogfish should devour the mackerel, tear *innumerable holes in the twine, and roll themselves up in it until it is so twisted and tangled that* it takes the labor of days to get it in proper condition for setting again. If the fishermen are not annoyed by dogfish the nets are allowed to remain down, as has been stated, all night long, and the men in the dories constantly pick out the fish, frequently carrying their catch back to the vessel. When the dogfish attack the nets they haul them in with the utmost expedition and bundle them as hurriedly as possible into the bottom of the dory, and after they have lifted them to the deck of the vessel take out the fish from among the meshes.

It is part of the duty of the men in the dories to keep a vigilant lookout for approaching vessels. The gang of nets may be more than half a mile in length, and the keel of a large vessel passing over it would be almost certain to cut it in two. When it is still weather they row toward any vessel which they may see coming and ask the men on watch to steer clear of the nets; otherwise they are obliged to stand by the nets and repair the damages as best they may. Sometimes the approaching vessels are induced to steer clear of the nets by the dorymen, who hold up a lan-

* Captain Atwood, Proc. Bos. Soc. Nat. Hist., x, 1865–'66.

tern for that purpose. The mackerel caught in this manner are always carried fresh to the shore, and are intended chiefly for the supply of the markets of the large cities. They are packed in barrels, and may or may not be gibbed through the gills before reaching shore. A vessel setting a long string of nets may catch as much as 50 barrels of mackerel in a night, but ordinarily not more than 5 or 10 barrels, frequently less. The barrels are carried on deck, and the fish are put in them as soon as they are removed from the nets. When the weather is warm the barrels are filled with ice-water. Besides the mackerel caught, considerable quantities of shad and alewives are taken in these nets. On an excursion made by one of the authors from Portland in 1873, besides 6 barrels of mackerel there were caught with a small string of nets about 40 fine shad, averaging 2 pounds each, and 300 or 400 of that species of alewives known to the Portland fishermen by the names of "kyack," "cat-thresher," "saw-belly," or "blue-back," probably identical with the glut-herring (*Clupea æstivalis*) of the Chesapeake basin, the summer alewives occasionally taken in New England rivers. On this occasion the mackerel were feeding extensively on various entomostraca, with which the water was filled, and which imparted to it a vivid phosphorescence all night long. The presence of these animals, and of others more minute, causes the water and the nets to "fire" in such a manner as often to render them so visible to the fish that they successfully avoid contact with the twine.

The mackerel caught at Provincetown in gill-nets are brought in by the boats, and shipped by the fishermen to Boston in vessels devoted specially to this business, the owners of which receive a percentage upon the amount of their sales.

The crew of a Maine mackerel-dragger consists generally of two to four men, the vessels being usually owned by the fishermen.

2. HISTORY OF MACKEREL GILL-NETTING.

The custom of dragging for mackerel, though practiced for centuries in Europe,* appears to have been first used in this country at Provincetown about the year 1841, where it is still prosecuted to a considerable extent in addition to the stationary gill-net fishery which has been

* For convenience of comparison the following description of drift-net fishing for mackerel on the coast of England is quoted from Yarrell's British Fishes:

"The most common mode of fishing for mackerel, and the way in which the greatest numbers are taken, is by drift-nets. The drift-net is 20 feet deep by 120 feet long; well corked at the top, but without lead at the bottom. They are made of small fine twine, which is tanned of a reddish brown color to preserve it from the action of the salt water, and it is thereby rendered much more durable.

"The size of the mesh is about 2½ inches, or rather larger. Twelve, fifteen, and sometimes eighteen of these nets are attached lengthways by tying along a thick rope, called the drift-rope, and the ends of each net to each other. When arranged for depositing in the sea, a large buoy attached to the end of the drift rope is thrown overboard, the vessel is put before the wind, and, as she sails along, the rope with the nets thus attached is passed over the stern into the water till the whole of the nets are thus thrown out. The nets thus deposited hang suspended in the water perpendicularly, 20 feet deep from the drift-rope and extending from three-quarters of a mile to a mile, or even a mile and a half, depending on the number of nets belonging to the party or company engaged in fishing together. When the whole of the nets are thus handed out, the drift-rope is shifted from the stern to the bow of the vessel, and she rides by it as at anchor. The benefit gained by the boats hanging at the end of the drift-rope is that the net is kept strained in a straight line, which, without this pull upon it, would not be the case. The nets are 'shot' in the evening, and sometimes hauled once during the night; at others, allowed to remain in the water all night. The fish roving in the dark through the water hang in the meshes of the nets, which are large enough to admit them beyond the gill-covers and pectoral fins, but not large enough to allow the thickest part of the body to pass through. In the morning early preparations are made for hauling the nets. A capstan on the deck is manned, about which two turns of drift-rope are taken; one man stands forward to untie the upper edge of each net from the drift-rope, which is called casting off the lashings; others haul the net in with the fish caught, to which one side of the vessel is devoted; the other side is occupied with the drift-rope, which is wound in by the men at the capstan." (The History of British Fishes, first edition, 1836, vol. 1, pp. 126, 127.)

mentioned.* At first small open boats were used, such as the one described and figured in the another part of this report under the name of "Provincetown drag-boat." About 1845, Provincetown fishermen with their boats and nets essayed dragging for mackerel in the vicinity of Monhegan, Me., and by their example this practice was introduced into Maine, and since that time it has been carried on at various points on the coast. In 1873 twelve or fifteen vessels from 15 to 25 tons each were employed at Portland; at present the number at this port is eighteen, and quite a fleet of the mackerel-draggers also belongs to the vicinity of Friendship, Me.†

Along the southern coast of Nova Scotia, and about the vicinity of the Straits of Canso, there is an extensive gill-net fishery for mackerel carried on with stationary nets, and, in a smaller degree, a similar fishery is prosecuted in some parts of the Gulf of Saint Lawrence.‡ This fishery on the Nova Scotia coast is prosecuted when the mackerel are traversing the coast line in the spring and fall.

"During the mackerel fishing season," remarks Mr. J. Matthew Jones, "the people along shore appear to live in a state of much excitement, expecting every hour the 'runs' to come into their bays. The traveler who may desire a horse and wagon to get on from place to place will find hard work to prevail upon the people to hire one out to him with a driver. Lookouts are kept on some elevated spot so that the schools may be seen some distance off, in order to give time for the fishermen to get off in their boats with the net." As at Provincetown, these nets are anchored only at one end, the other end being left free to swing with the current. They are sometimes set as far as 10 or 12 miles from the shore, in water 20 to 50 fathoms in depth, care being taken to put them as nearly as possible in those localities which are known to lie in the "track" of the mackerel.

The mackerel gill-nets are usually set with their upper lines close to the surface; sometimes, however, as much as 2 or 3 fathoms below. The position of the net in the water is regulated by the length of the buoy-ropes and the weight of the sinkers. As a rule, especially on the coast of Nova Scotia, they are, however, set close to the surface.

In this region, also, there has been for many years an extensive seine fishery for mackerel, corresponding to that which is elsewhere referred to as having been formerly carried on, two hundred and fifty years ago, on the shores of Cape Cod Bay. The principal points for the seine fishery are at Margaret's Bay, west of Halifax, and at Chedabucto Bay, at the eastern part of Nova Scotia.

* Capt. N. E. Atwood, at Provincetown, writes as follows in regard to the introduction of the method of dragging for mackerel at Cape Cod: "As early as I can recollect most of the mackerel taken along our coast were caught with hook and line. A few gill-nets were set at moorings in our harbor and along the Truro shore during the first part of the mackerel season, or as soon as the fish came in. The mackerel which were then taken in nets were sent to Boston market and sold fresh, sometimes bringing good prices. As the mackerel would not bite at the hook when they first struck in, we would often get two weeks' fishing before a sufficient quantity of mackerel were caught on the hook to glut the market. Boston market being at that time small and no ice used in packing, only a few fresh fish could be sold there at any one time.

"In 1841 I went to Monomoy Bay (Chatham) to fish for shad; we went out in the bay and put out our gill-nets and drifted with them all night if the weather would permit that mode of fishing, which we then and have always since called 'dragging.' On my return home to engage in the mackerel net fishery, very few had been caught in nets in our harbor, but large schools of mackerel had been passing in by Race Point and Wood End, and were going up the bay. I took my mackerel nets in the boat and went out in the bay toward Plymouth, some 2 or 3 miles, and put them out and drifted all night; next morning I found I had a good catch. This occurrence took place about the 15th of June, 1841.

"It did not take the other fishermen long to get into this new way of fishing, and since that time this method of drag-fishing has been adopted along the coast of Maine and elsewhere."

† Friendship has twelve vessels, Cushing five, Waldoboro' two, and Booth Bay and Bremen one each; the total from Maine, including those from Portland, being thirty-nine; the tonnage is 559.47; number of men, one hundred and thirty-three.

‡ Schooner Yankee Lass, of Boston, arrived home last week from a season's mackereling trip around the Seven Islands of Saint Lawrence River, with 300 barrels, all large No. 1 mackerel, taken in [gill] nets. (Cape Ann Advertiser, September 30, 1881.)

Perley, writing in 1852, remarked: "In those harbors of Nova Scotia which are within the Straits of Canso mackerel have of late years been taken in seines capable of inclosing and securing 800 barrels, and in these seines 400 and even 600 barrels have been taken in a single sweep."*

In the same locality Perley refers to the use of the drift-nets, undoubtedly meaning the set gill-net just described, remarking, however, that this mode of fishing is probably not so well understood on the coast of Nova Scotia as in England. He however quotes from Yarrell an account of drift-net fishing in England, which is altogether different from that used in Nova Scotia, and corresponds precisely with the drag-net fishing also described in the beginning of this chapter.

It is worthy of mention that mackerel as well as herring, on the coast of Europe at the present time, are almost exclusively caught by the use of the drag-net, the only other method in use being the equally old-fashioned one of "drailing," which was abandoned by our fishermen sixty-five years ago.† The antiquated method of drailing was, however, kept up by the fishermen of the Gulf of Saint Lawrence until 1860, or perhaps even to the present time, for the purpose of obtaining mackerel for bait to be used in the cod fisheries.

5.—THE EARLY METHODS OF THE MACKEREL FISHERY (1620 TO 1820).

1. CATCHING MACKEREL WITH DRAG-SEINES.

The method chiefly practiced by the colonists of New England for the capture of mackerel was that of drag-seining, and we find as early as 1626 a record of the establishment, by Isaac Allerton, of a fishing station at Hull, where mackerel were seined by moonlight. There can be little doubt that the practice of fishing with baited hooks was also early introduced, and that in the seventeenth and eighteenth centuries groups of boats might have been seen, as at the present day, clustered together in the harbors or near the outer shores, their crews busily engaged in hauling in the tinkers, and, occasionally, larger mackerel which, during the summer season, found their way into these protected waters. It is not known when the custom of drailing for mackerel was first introduced, but it was beyond question the common method at the close of the last and the beginning of the present century.

In July, 1677, the records of the Plymouth colony show that the Cape Cod fishery was let seven years, at £30 per annum, to seine mackerel and bass, to certain individuals who are named. They were restricted to take in the Plymouth colonists with them; and, if none offer, to admit strangers. The profits of the hire which accrued to the colony were sometimes distributed to the schools.

A writer in the Massachusetts Historical Society's Collections gives the following description of these fisheries (vol. iv, 2d series, p. 232): "The aboriginal name of this fish (the mackerel) is Wawunnebeseag, a plural term signifying fatness—a very descriptive and appropriate name. The mode of taking these fish is while the vessel is under quick way and the helm secured, when all are engaged at the long, veered lines, of which it is said that one man will attend three, and it may be more. The first manner of taking mackerel was by seining by moonlight. This perhaps was first

* Fisheries of New Brunswick, 1852, pp. 13–16.

† Though drailing was abandoned so long ago by the professional mackerel fishermen of New England, we are, nevertheless, told by Capt. Joseph Smith, of Gloucester, that this method of fishing is still practiced by the Block Island boat fishermen.

practiced by Mr. Isaac Allerton and his fishing company at Hull as early as 1626. After half a century the mode of fishing was changed to that of drailing with long lines while the vessel was under easy way; and this mode has been changed within these last twenty years (1811–1831). The mode of fishing generally practiced now is to invite the fish around the vessel while lying to by throwing out great quantities of fish cut in small pieces, and to take them with short lines held in the hand and drawn in with a single motion of the arm. By this method it is thought that thrice as many fish may be taken in a given time as by any other method. They are a capricious and sportive fish. In cloudy and even wet weather they take the hook with most avidity. They are very partial to the color of red; hence a rag of that hue is sometimes a bait. A small strip of their own flesh taken from near the tail is used with most success."

Seining mackerel with drag-seines is still practiced extensively in the British Provinces. That the practice was in vogue in Massachusetts less than fifty years ago is shown by the following item from the Gloucester Telegraph of June 30, 1838:

"Last week twenty barrels of mackerel were seined at one haul at Sandy Point by Captain Baker. His seine is 500 yards long. A few weeks ago he inclosed a multitude of fishes, principally menhaden shad. It is estimated that their number was 200,000."

In his History of Scituate, pp. 25–27, Samuel Deane writes: "In early times the shores of our bays were skirted with forest trees quite near to the water's edge. In the month of June, when all nature is in bloom, the volatile farina of the forest trees then floats in the air, and occasionally settles on the smooth surface of the seas. Then it is that this playful fish, attracted by this phenomenon, leaps and bounds above the surface of the water. So again at a later season, in July and August, winged insects, carried away by the southwest winds, settle and rest on the bosom of the ocean, a welcome herald, it is said, to the mackerel catcher. Such are the habits of many fishes, and hence the use of the fly as a bait by the angler of the trout streams."

Douglas, in 1747, says: "Mackerel, split, salted, and barreled, for the negroes in the sugar islands are caught either by hook, seines, or meshes. Those by hook are the best; those by seines are worst, because in bulk they are bruised. Mackerel will not take the hook unless it have a motion of two or three knots. If quicker, they will take the hook, but their jaw, being tender, gives way, and the mackerel is lost. There are two seasons of mackerel—spring and autumn. The autumn mackerel are the best. Those of the spring appear about the middle of May, very lean, and vanish in two or three weeks."

2. DRAILING FOR MACKEREL.

Captain Atwood writes: "In my boyhood, when I caught my first mackerel, nobody thought of jigging them. We then took them in the same way as bluefish are caught. My first experience in mackerel fishing took place, when I was a little boy, about 1815. I went out with two old men. One of them fished in the stern of the boat, and when it did not sail fast enough the other and myself—I was eight years old at the time—had to row, in order, by the more rapid motion of the boat, to induce the fish to bite. They would not bite unless the line was towed. Two great long poles were run out, one just forward, in such a manner that our vessel had the appearance of a long-armed spider. The poles were straight, and one line was fastened at one part and another line on the end of the pole, in order to have them separated. This style of fishing continued until about the time when I began to go to sea, about 1820. Jigging for mackerel then commenced, bait being thrown overboard, and the fish being thus attracted alongside of the vessel, and this soon came into general use."

Capt. James Turner, of Isle au Haut, Maine, who assures us that as late as 1815 the fishermen drailed for mackerel, gives the following account of this method of fishing:

"While drailing, the sails were trimmed in such a manner that, when the helm was partly down, the vessel would 'jog' along slowly, making a little leeward drift, so that the lines would trend off at a slight angle from the weather side. Each man had one line, the end of which was attached to the end of a pole that was fastened to the vessel's rail, projecting out about 8 feet at right angles with the side of the vessel. The fisherman held in his hand a hauling-line, which was attached to the middle of the one fastened to the pole, so that he might know when a fish took the hook and be able to haul it in.

"About a pound of sheet lead was wound around the line, a foot above the hook. When the vessel was engaged in fishing, the man standing forward threw over a small amount of fine bait (which had previously been chopped with hatchets) occasionally, scattering it along in order to attract the fish and keep them near the vessel."

The following paragraphs are quoted from an essay in the *Fishermen's Memorial and Record* Book:

"Trailing was one of the means used to catch mackerel in the olden time, and one of our old fishermen informs us that when a lad he distinctly remembers of being out in Boston Bay one day in a boat with his father, when he saw a vessel which looked very strangely to his young eyes, and, boy-like, he asked his father what sort of craft it was.

"'That's a trailer, my boy, and we'll speak with him,' was the reply.

"They sailed quite near, and they observed that the vessel had outriggers of long poles on each side, commencing forward at about seventeen feet and tapering off to five feet aft. At the ends lines were fastened, about twenty fathoms long, with a sinker of four pounds, and hook below. To each of these lines was attached a bridle, reaching to the side of the vessel, where the fishermen stood to feel the bites. This particular vessel was from Hingham, and had been out four weeks without receiving even a bite, and the skipper said he was going to give it up and go home.

"The present mode of catching mackerel by drifting and tolling with bait did not come into general use until after 1812. The gear for catching previous to that was a white hempen bob-line, as it was called, and the style of fishing was termed 'bobbing' mackerel. These lines were some seven fathoms in length, with a leaden sinker two inches long, and shaped like a thin pea-pod. At one end was a ganging about a foot long for the hook. Every few minutes off would go the hook, and extra hooks were always in readiness to replace those lost. This mode continued until the year 1816, when Abraham Lurvey, of Pigeon Cove, discovered a method of running lead around the hooks, and which were afterward called jigs. This he kept secret for many months. The hooks then in use were nearly as large as the haddock hooks of to-day. The small lines and fly-lines did not come into use until about 1823. About this time the gaff was introduced, and was abandoned after being used some ten years."*

It seems scarcely necessary to discuss more in detail the methods used during the first two centuries of the mackerel fishery of North America. In the Report of the U. S. Fish Commission for 1881 there is given a chronological history of the mackerel fishery from its inception to the present time.

*The mackerel gaff was used to some extent, by the hook and line fishermen, as late as 1865, and possibly even since that time.

6.—LEGISLATION FOR THE PROTECTION OF MACKEREL.

1. LEGISLATION IN THE SEVENTEENTH AND EIGHTEENTH CENTURIES.

At an early day in the history of the United States a failure of the mackerel fishery was apprehended. The following notices of legislation, copies of laws, and newspaper extracts will serve to give an idea of the state of public opinion at different periods from 1660 to the present time:

1660.—*Early regulation of the mackerel fishery.*—"The commissioners of the United Colonies recommended to the several General Courts to regulate the mackerel fishery; conceiving *that* fish to be the most staple commodity of the country. Few who have not investigated the subject have at the present day an adequate conception of the importance of this branch of productive industry."*

1670.—*Prohibition of early mackerel fishing by laws of Plymouth Colony.*—"Wheras wee haue formerly seen Great Inconvenience of taking mackerell att vnseasonable times wherby there encrease is greatly deminished and that it hath bine proposed to the Court of the Massachusetts that some course might be taken for preventing the same and that they have lately drawne vp an order about the same this Court doth enacte and order that henceforth noe makerell shallbe caught except for spending while fresh before the first of July Annually on penaltie of the losse of the same the one halfe to the Informer and the other halfe to the vse of the Collonie; and this order to take place from the 20th of this Instant June."†

1684.—*Prohibition of mackerel seining.*—"In 1680, Cornet Robert Stetson, of Scituate, and Nathaniel Thomas, of Marshfield, hired the Cape fishery for bass and mackerel. In 1684, the court enacted a law 'prohibiting the seining of mackerel in any part of the colony'; and the same year leased the Cape fishery for bass and mackerel to Mr. William Clark for seven years, at £30 per annum.

"Subsequently to 1700 it is certain that the mackerel were very abundant in Massachusetts Bay. It was not uncommon for a vessel to take a thousand barrels in a season. The packing, as it is called, was chiefly done at Boston and Plymouth."‡

1692.—*Repeal of prohibitory laws in Massachusetts.*—"And be it further enacted and declared, That the clause in the act, entituled 'An Act for the Regulating and Encouragement of Fishery', that henceforth no mackeril shall be caught (except for spending whilst fresh), before the first of July annually, be and hereby is fully repealed and made void, anything therein to the contrary notwithstanding. [Passed February 8, 1692–'3.]"§

1692.—AN ACT for the regulating and encouragement of fishery.

"Upon consideration of great damage and scandal, that hath happened upon the account of pickled fish, although afterwards dried and hardly discoverable, to the great loss of many, and also an ill reputation on this province, and the fishery of it—

"*Be it therefore enacted by the Governor, Council and Representatives, convened in General Court or Assembly, and it is enacted by the authority of the same,*

"[SECT. 1.] That no person or persons whatsoever, after the publication hereof, shall save or

* Freeman's Hist. of Cape Cod, Boston, 1862, vol. i, p. 239.
† Plymouth Colony Records, vol. xi, 1623–1682 Laws, p. 228.
‡ Deane's History of Scituate, Mass.
§ *Acts and Resolves of the Province of Massachusetts Bay, vol. i, 1692–1714, p. 102.*

salt any sort of fish (that is intended to be dried) in cask or fattes, or any other way than what hath formerly and honestly been practised for the making of dry fish, on penalty of forfeiting all such fish so salted and pickled, whether it be green or drye; the one moiety thereof to the use of the poor of the town where the offence is committed, and the other moiety to the person that shall sue for the same.

"And it is further enacted by the authority aforesaid,

"[SECT. 2.] That henceforth no mackrel shall be caught (except for spending whilst fresh) before the first of July annually; and no person or persons whatsoever, after the publication hereof, shall at any time or place within this province take, kill, or hale ashore any mackrel, with any sort[s] of nets or sa'ens whatsoever, on penalty of forfeiting all such mackrel so taken or haled ashore, and also all such nets or sa'ens which were so imployed; the one-half thereof to their majesties towards the support of this their government, and the other half to him or them that shall inform and sue for the same. And all justices are hereby impowered, and required to grant their warrants for the seizing of the same and the aforesaid forfeitures, or the receiving of the like value in current money of this province. [Passed November 26, 1692.]"*

1702.—*Re-enactment of prohibitory laws.*

"AN ACT for the reviving and re-enacting a clause in the act intituled 'An act for the regulating and encouragement of fishery' that hath been for some time repealed by the General Assembly.

"Whereas, in the second paragraph of the said act it is enacted 'that henceforth no mackerel *shall be caught (except for spending whilst fresh) before the first of July annually*'; and whereas the said clause, by an act afterwards made and passed by the general assembly [1692–3 Feb. 8.], was repealed and made void, which said repeal and the unseasonable catching of mack[a]rel thereupon *hath been experienced to be very prejudicial to this province*,—*Be it therefore enacted* by His Excellency the Governour, Council and Representatives [convened] in General Court or Assembly, and it is enacted by the authority of the same, That the said clause above-recited shall be and is hereby revived and re-enacted, and that henceforth no person or persons whatsoever shall presume to catch or cause to be caught any mack[a]rel, (except for spending whilst fresh,) before the first of July annually, on penalty of forfeiting all the mack[a]rel so caught contrary to the true intent and meaning of this act, and twenty shillings per barrel over and above for each barrel of the same; the one-half of the said forfeiture to be to her majesty for and towards the support of this her government, and the other half to him or them that shall inform and sue for the same in any of her majesty's courts of record within this province. [Passed November 11, 1702; signed by the Governor and published November 21, 1702.]"†

2. PROTESTS AGAINST GIGGING AND SEINING IN THE PRESENT CENTURY.

1838–9.—*Protests against gigging.*—"The Boston Journal protests strongly against the barbarous method of taking mackerel called 'gigging,'‡ and urges that it is not only liable to censure on the score of humanity, but it is also *impolitic*, and that if this destructive method of fishing is generally continued a few years longer it will break up the fishery. We have for a year or two past entertained a similar opinion, and probably the complaints now so frequently made by the fishermen that, though mackerel are plenty, they 'will not bite,' is owing to the custom of 'gigging.'

* Acts and Resolves of the Province of Massachusetts Bay. Vol. 1, 1692-1714, p. 71. Province Laws, 1692-3. Chap. XXXII.

† *Ibid.*, p. 507.

‡ The method of capture called "gigging" here is undoubtedly gaffing, since a fish-gaff is even yet called a "gig" by some of our fishermen.

There is hardly anything which possesses life that has so little instinct as not to become very shy under such barbarous inflictions. It is obvious that all which are hooked in this manner are not taken on board; the gig frequently tears out, and thousands, millions of these fish are lacerated by these large hooks and afterwards die in the water."*

The following protest appeared in the Gloucester Telegraph, Wednesday, August 7, 1839, it being a quotation from the Salem Register:

"All the mackerel men who arrive report the scarcity of this fish, and at the same time I notice an improvement in taking them with nets at Cape Cod and other places. If this speculation is allowed to go on without being checked or regulated by the government, will not these fish be as scarce on the coast as penguins are, which were so plenty before the Revolutionary war that our fishermen could take them with their gaffs? But during the war some mercenary and cruel individuals used to visit the islands on the eastern shore where were the haunts of these birds for breeding, and take them for the sake of the fat, which they procured, and then let the birds go. This proceeding finally destroyed the whole race. It is many years since I have seen or heard one except on the coast of Cape Horn. In 1692 the General Court passed an act prohibiting the taking of mackerel before the first day of July annually, under penalty of forfeiting the fish so taken. In 1702 this act was revived with additional penalties—besides forfeiting the fish and apparatus for taking, 20 shillings per barrel, and none to be taken with seines or nets.

"A FISHERMAN.

"MARBLEHEAD, *August* 3, 1839."

1859.—*Protests against the use of seines.*—"A petition is now before the committee on fisheries, in the House, to abolish the catching of mackerel in seines on our coast. As mackerel can now be caught only in this way, and many of our people are interested in this business, it becomes highly important that any such stupid petition should be prostrated at once. Mr. Gifford has asked for a delay in the petition, and Mr. Atwood has written to show the nature of the business upon our coast. One thing is certain, if we do not take the mackerel in seines or nets we shall get none at all."†

1870–1882.—*Opposition to the purse-seine.*—Since the general adoption of the purse-seine no year has passed without a considerable amount of friction between fishermen using this engine of wholesale destruction in the capture of mackerel and menhaden and those engaged in fishing with other forms of apparatus. Petitions to Congress and State legislatures have been made from both sides, and in some instances laws have been passed by State legislatures prohibiting the use of menhaden seines within certain specified tracts of water, such as the Chesapeake Bay. These laws, while especially antagonistic to menhaden fishing, were aimed chiefly at the purse-seine as a means of capture, and would doubtless have been equally prohibitory of mackerel fishing with purse-seines had this been attempted within the limits. In 1878 a delegation of fishermen from Portland, Me., and Gloucester, Mass., visited Washington for the purpose of securing the passage of a law prohibiting the use of purse-seines in the mackerel fishery. In 1882 the clamors of shore fishermen, especially on the coast of New Jersey, led to the appointment of a committee of the United States Senate, which took considerable testimony regarding the effect of the purse-seine upon the menhaden fishery, and incidentally upon other fisheries of the coast. The labors of this committee will probably result in the recommendation of some form of legislation which will apply, in part at least, to the mackerel fishery.

In the summer of 1882 a serious commotion was caused among the mackerel fishermen by the

* Newburyport Herald, Gloucester Telegraph, September 23, 1838.

† Provincetown Banner, February, 1859.

announcement of the intention of a number of menhaden fishermen to employ their steamers and nets in the mackerel fishery. It was the impression among these men that the mackerel were to be used for the manufacture of oil and guano, but this has been denied by Capt. David T. Church and other representative men, who, reasonably enough, state that they could not afford to use so valuable a fish for this purpose, and who claim that they have an undoubted right to use their steamers in the capture of mackerel for sale fresh in the markets and for pickling.

As a matter of record we reproduce the following paragraphs from an editorial in the Cape Ann Advertiser, July 14, 1882:

"It is not a difficult matter to anticipate the result if this class of steamers engage in this branch of the fisheries. There is no reason to doubt their ability to catch almost or quite as many mackerel as they have formerly caught menhaden. Several of them are large, capable of carrying 2,800 barrels of fish in bulk. These carry a double gang of men, and apparatus to correspond. During moderate weather, when mackerel generally school the best, and sailing vessels find it difficult to move, these steamers can play around the fleet of schooners, catch almost every fish that shows itself, and carry them away to be used, not for food-fish as they were intended, but for oil and guano, to enrich a few men at the expense of many.

"If the steamers were to engage in the mackerel fishery, selling their catch for food, and were obliged to spend the requisite time for dressing them, which would debar them from an overcatch and carrying them to market, thus placing them on somewhat equal footing with the other fishermen, there could be no reasonable objection to their employment; but it certainly seems, in view of this startling innovation, that some decided action should be taken by 'the powers that be' to prevent the catch of mackerel for the purpose of manufacturing oil and guano. They are altogether too valuable for such a purpose, and the risk of breaking up the schools and driving them almost entirely from our waters, as has been the case with menhaden, is altogether too great.

"Unless some action is taken, and taken at once, and stringent laws enacted, we may confidently look forward to the destruction in a few years of one of the important industries of New England and the permanent and serious injury of large communities which now derive a considerable part of their support from the mackerel fishery."

7.—STATISTICS OF THE MACKEREL FISHERY.

1. STATISTICS OF THE FISHING FLEET AND PRODUCTS OF THE FISHERY IN 1880.

By R. E. Earll.

From the earliest settlement of the country the mackerel fisheries have been extensively prosecuted by a large number of people living along the New England coast, as well as by many of the inhabitants of the British Provinces. The catch has varied greatly from time to time, and seasons of extreme plenty have often been followed by those of remarkable scarcity. Various theories have been advanced to account for this fluctuation. Many have been inclined to attribute it to overfishing, or to the apparatus employed in the fishery, while others claim that the movements of the fish are affected by natural causes, such as temperature, currents, the presence or absence of food, and the like, over which man has little or no control. Whatever the causes that influence the movements of the fish the fact of great variation in the abundance of the species from time to time remains.

In 1804, according to the returns of the various fish inspectors, 8,079 barrels of mackerel were

packed in Massachusetts, while in 1814 only 1,349 barrels were put up. In 1831 the quantity was increased to 383,658, this being the largest amount ever inspected in the State. A period of scarcity followed, and between 1839 and 1845 the inspection returns show an average of only 67,674 barrels annually. About 1860 the fish were again abundant, and for eight years the quantity packed averaged 246,877 barrels. This period of plenty was in turn followed by one of scarcity, which culminated in 1877, at which time only 105,017 barrels were inspected, and the fishery was practically a failure, resulting in great loss both to fishermen and capitalists. Fortunately this condition of affairs is at an end, and the fishery is again in a prosperous condition, the catch of the New England fishermen at present, if we include the fish sold fresh, being larger than at any time since the origin of the fishery.

In 1880 the New England mackerel fishermen met with marked success, though those of the British Provinces were not so fortunate. By the middle of March a number of the Maine and Massachusetts vessels sailed for the South to engage in the spring fishery, and by the 20th of the following month the last of the fleet, which consisted of sixty-four sail, averaging 65.66 tons each, were under way. The season opened with a haul of 25,000 mackerel taken off the Virginia capes on the 2d of April. These were carried to New York, where they met with a ready sale at good figures. From that time mackerel were taken frequently, the fleet working northward with the fish as the season advanced, reaching Long Island about the last of April, and Cape Cod a few weeks later. The season was not a very satisfactory one for the Southern fleet, as the catch was small, and the fish were of poor quality, a majority of the vessels engaged making comparatively light stocks while many of them scarcely paid expenses. As the summer approached, the fishing improved greatly, the fish increasing both in number and quality, and the Southern fleet was joined by a large number of vessels from the various fishing ports. Later, as the vessels arrived from their trips to the codfish banks, many were fitted out to engage in the mackerel fishery, and by the 1st of August the fishing was at its height, the fleet numbering four hundred and sixty-eight sail, averaging a trifle over 50 tons apiece. Of this number three hundred and forty-three were provided with purse-seines for engaging in the off-shore fisheries, while one hundred and twenty-five fished with hook or net chiefly on the in-shore grounds. The value of this fleet, including the fishing gear and outfits, reached $2,122,360, and five thousand and forty-three men were employed. A little later in the season about twenty-five of the vessels proceeded to the Gulf of Saint Lawrence in the hope of meeting with better success; but few fish were seen, and the venture resulted disastrously to a large majority of them, many failing to pay expenses, while a few returned without having caught a fish. These vessels on their return at once joined the home fleet, and, meeting with good success, most of them were enabled to make good the loss which they had previously sustained.

About the 1st of July an unprecedentedly large body of mackerel entered the Gulf of Maine, many of them visiting the shore-waters, entering the various harbors and coves, where they remained for some weeks. During their stay in these in-shore waters thousands of men and boys engaged in their capture from small boats, and in many localities a majority of the male population participated in the fishery to a greater or less extent. The pound-nets along the southern coast of New England were peculiarly successful, while large quantities were taken in the traps and weirs between Cape Cod and Penobscot Bay. Probably not less than 10,000 people along various portions of the coast of Maine were engaged in mackerel hooking during some portion of the season, though many of them fished chiefly for pleasure, while others caught only limited quantities for home supply. About 3,500 followed the business regularly for some time, many of them realizing considerable profit from the work. In Massachusetts a similar condition of affairs

existed, and thousands of persons engaged in the fishery from small boats to a greater or less extent, fully 2,000 fishing extensively for profit.

Most of the fish taken by both the vessel and boat fishermen were of uniform size and of excellent quality. Few extremely large ones were secured, while there was also a notable absence of "tinkers." Over two-thirds of the catch were branded as "twos," many of them going as "extras." During the season, which lasted till the 1st of December, nearly 132,000,000 pounds of mackerel were taken. Of this quantity the Massachusetts fishermen caught 95,000,000 pounds, and those of Maine secured 31,000,000 pounds, the bulk of the remainder being taken by the citizens of New Hampshire and Connecticut. Over 75 per cent. of the entire catch was salted, about 22,000,000 pounds were sold fresh for food, nearly 5,000,000 pounds were used for canning, and the rest were sold for bait or for fertilizing purposes. The value of the catch, as placed upon the market, was $2,606,534.

A.—*Table showing the number of vessels and men employed in the mackerel fishery.*

Ports.	Total.					Vessels engaged in the mackerel fishery only.					Vessels engaged in the mackerel and other fisheries.				
	Vessels.	Tonnage.	Value.	Value of gear and outfit.	Men.	Vessels.	Tonnage.	Value.	Value of gear and outfit.	Men.	Vessels.	Tonnage.	Value.	Value of gear and outfit.	Men.
Grand total	468	23,551.64	$1,027,010	$1,694,450	5,043	235	15,489.49	$675,195	$699,900	3,134	233	8,062.15	$352,715	$394,550	1,909
MAINE.															
Eastport	*1	52.49	2,000	2,900	13	1	52.49	2,000	2,900	13					
Hancock	1	18.11	150	1,100	4						1	18.11	150	1,100	4
Tremont	2	41.79	130	2,200	14						2	41.79	130	2,200	14
Cranberry Island	4	178.43	8,200	8,000	45						4	178.43	8,200	8,000	45
Bluehill	1	10.50	250	650	3	1	10.50	250	650	3					
Brooklin	3	115.82	4,100	4,250	25	1	67.66	2,000	2,900	14	2	48.16	1,100	1,350	11
Deer Isle	18	454.01	12,485	19,150	105	5	282.61	8,900	12,000	54	13	191.40	3,585	7,150	51
Sedgwick	1	57.95	3,000	2,500	13	1	57.95	3,000	2,500	13					
Bucksport	1	11.43	600	800	4						1	11.43	600	800	4
Swan's Island	14	604.40	23,500	30,500	137	10	598.49	22,350	27,700	126	4	65.91	1,150	2,800	11
Isle au Haut	3	52.84	1,300	2,100	15						3	52.84	1,300	2,100	15
Belfast	3	66.73	1,000	2,300	17						3	66.73	1,000	2,300	17
Lincolnville	1	20.48	375	700	4						1	20.48	375	700	4
Camden	3	161.54	4,000	8,500	41	3	161.54	4,000	8,500	41					
North Haven	14	451.99	17,600	22,800	107	6	338.18	13,500	18,000	72	8	113.81	4,100	4,800	35
Vinal Haven	5	52.22	1,250	3,000	16						5	52.22	1,250	3,000	16
Rockland	1	30.84	6,000	2,000	11	1	30.84	6,000	2,000	11					
Saint George	3	85.45	4,150	4,000	26	1	41.58	2,000	2,200	11	2	53.87	2,150	2,400	15
Cushing	5	64.55	1,400	5,000	15	1	9.00	450	1,100	2	4	55.40	950	3,900	13
Friendship	13	217.02	7,625	17,000	41	1	14.16	1,500	2,500	2	12	203.46	6,125	14,500	39
Matinicus Island	4	90.64	3,650	5,150	26	1	43.96	1,600	2,000	10	3	46.68	2,250	3,150	16
Waldoboro'	2	29.59	350	2,100	5	1	12.84	200	1,050	2	1	16.75	150	1,050	3
Bremen	1	16.73	300	1,100	4						1	16.73	300	1,100	4
Bristol	6	86.25	2,950	5,650	25						6	86.25	2,950	5,650	25
Booth Bay	13	773.89	29,000	37,000	171	8	515.38	21,600	26,000	113	5	258.51	8,000	11,000	58
Southport	5	305.13	13,500	13,400	68	1	60.91	1,500	2,900	13	4	244.22	12,000	10,500	55
Wiscasset	1	53.59	800	2,800	12						1	53.59	800	2,800	12
Portland	40	1,940.56	83,000	98,100	434	18	1,105.98	45,000	55,500	229	28	834.58	38,000	42,600	205
Kennebunkport	1	6.86	250	600	2						1	6.86	250	600	2
Total	176	6,122.45	233,715	306,150	1,403	61	3,884.13	136,850	170,400	729	115	2,736.32	96,865	135,750	674
NEW HAMPSHIRE.															
Portsmouth	11	567.53	29,300	25,700	113	3	292.69	15,500	10,500	47	8	275.44	13,800	15,200	66

* This vessel, though owned at Eastport, is chartered and run by Portland capitalists, and therefore more properly belongs to the Portland fleet.

A.—Table showing the number of vessels and men employed in the mackerel fishery—Continued.

Ports.	Total.					Vessels engaged in the mackerel fishery only.					Vessels engaged in the mackerel and other fisheries.				
	Vessels.	Tonnage.	Value.	Value of gear and outfit.	Men.	Vessels.	Tonnage.	Value.	Value of gear and outfit.	Men.	Vessels.	Tonnage.	Value.	Value of gear and outfit.	Men.
MASSACHUSETTS.															
Newburyport	11	554.53	$34,150	$30,500	123	6	351.96	$11,650	$18,000	70	5	202.57	$12,500	$12,500	53
Essex	2	156.91	9,500	6,000	30	2	156.91	9,500	6,000	30					
Rockport	19	487.17	27,000	26,900	116	3	191.26	10,000	8,700	40	7	295.91	17,000	18,200	76
Gloucester	113	6,707.79	318,745	310,900	1,394	60	4,000.32	183,345	190,300	810	53	2,707.47	135,400	120,600	584
Salem	2	141.29	5,200	6,000	26	2	141.29	5,200	6,000	26					
Marblehead	3	107.13	8,300	7,800	31						3	107.13	8,300	7,800	31
Swampscott	12	559.85	30,400	31,200	142						12	559.85	30,400	31,200	142
Boston	25	1,612.28	50,700	73,400	336	17	1,267.77	41,350	54,400	245	8	344.51	9,350	19,000	91
Hingham	2	140.53	5,400	6,400	28	2	140.53	5,400	6,400	28					
Cohasset	6	443.56	22,000	19,200	86	6	443.56	22,000	19,200	86					
Duxbury	4	157.27	5,700	10,000	36						4	157.27	5,700	10,000	36
Wellfleet	34	2,569.55	109,450	102,900	470	34	2,569.55	109,450	102,900	470					
Truro	1	65.40	2,200	3,100	14	1	65.40	2,200	3,100	14					
Provincetown	5	343.19	13,600	15,000	74	5	343.19	13,600	15,000	74					
Orleans	2	150.80	7,000	6,200	29	2	150.80	7,000	6,200	29					
Chatham	6	421.77	22,900	18,400	89	5	376.82	19,800	16,000	79	1	44.94	3,100	2,400	10
Harwich	19	1,101.53	50,250	43,300	244	12	878.80	43,500	37,200	191	7	222.73	6,750	6,100	53
Dennis	18	755.24	30,500	31,200	185	12	547.42	24,850	22,800	132	6	207.82	5,650	8,400	53
Barnstable	3	142.56	5,400	6,400	28						3	142.56	5,400	6,400	28
Fair Haven	1	55.63	2,500	1,000	12						1	55.63	2,500	1,000	12
Total	279	16,673.98	750,895	755,800	3,493	169	11,625.59	508,845	512,200	2,324	110	5,048.39	242,050	243,600	1,169
CONNECTICUT.															
New London	2	187.68	14,000	6,800	34	2	187.68	14,000	6,800	34					

*B.—Table showing the mackerel fishing fleet of the United States, classified by States, according to fishing grounds.**

State.	Cape Hatteras to Gulf of Maine, inclusive.			Cape Hatteras to Gulf of Saint Lawrence, inclusive.			Block Island.		
	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.
Maine	20	1,288.70	264	3	215.07	41			
New Hampshire									
Massachusetts	38	2,513.02	528	3	178.45	41	12	201.82	59
Connecticut									
Total	58	3,801.72	792	6	394.10	82	12	201.82	59

State.	Gulf of Maine.			Gulf of Maine and Gulf of Saint Lawrence.			Gulf of Saint Lawrence.			Total.		
	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.
Maine	140	4,197.69	1,005	5	282.96	66	2	133.03	27	176	6,122.45	1,403
New Hampshire	11	567.53	113							11	567.53	113
Massachusetts	196	11,195.80	2,356	24	1,560.59	308	16	1,094.52	201	279	16,673.98	2,493
Connecticut				2	187.68	34				2	187.68	34
Total	343	15,960.22	3,474	31	2,051.23	408	18	1,142.55	228	468	23,551.64	5,043

*The figures for Massachusetts represent the condition of the fleet for 1879. The fleets for the other States are shown for 1880. During the last-named year not over twenty-five American vessels visited the Gulf of Saint Lawrence, some of these remaining only a few weeks.

C.—*Table showing the mackerel fishing fleet of the United States, classified by States, according to kind of apparatus used.*

State.	Total.			Vessels using line.			Vessels using net.			Vessels using line and purse-seine.			Vessels using purse-seine.		
	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.	Vessels.	Tonnage.	Men.
Maine	176	6,122.45	1,402	51	773.63	205	40	562.41	137	.....	.....	.....	85	4,786.41	1,060
New Hampshire	*11*	*567.59*	*113*	.....	.....	.....	.....	.....	.....	.....	.....	.....	*11*	*567.59*	*113*
Massachusetts	279	16,673.98	3,493	30	900.06	211	4	78.01	28	5	257.04	52	240	15,437.87	3,202
Connecticut	2	187.68	34	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	187.68	34
Total	468	23,551.64	5,043	81	1,673.69	416	44	611.02	165	5	257.04	52	338	20,979.29	4,410

D.—*Table showing, by States, the quantity of mackerel taken by the New England fishermen in* 1880, *and the value of the same in the condition in which they were placed upon the market.*

State.	Total.		Disposition of catch.				
	Pounds of round mackerel taken.	Value of mackerel as sold.	Pounds used for pickling.	Pounds used for canning.	Pounds used fresh for food.	Pounds used fresh for bait.	Pounds used fresh for fertilizer.
Maine	31,604,455	650,304	27,342,000	1,252,455	3,000,000	100,000	.....
New Hampshire	2,573,000	48,181	2,379,600	.....	193,400	.....	.....
Massachusetts	95,528,900	3,858,342*	72,153,900	3,705,000*	18,170,000	1,000,000	500,000
Rhode Island	89,000	1,669	.....	.....	89,000	.....	.....
Connecticut	1,303,900	24,976	1,266,900	.....	37,000	.....	.....
New York	750,000	14,062	.....	(?)	751,000	.....	.....
Total	131,939,255	$4,606,534	103,142,400	4,957,455	22,239,400	1,100,000	500,000

*Including both the fresh and salt mackerel used for canning.

As already intimated, there was a great falling off in the Canadian mackerel fisheries during the year, the bulk of the catch, which amounted to over 70,000,000 pounds, according to the Canadian Fishery Report,* being taken by the shore fishermen of Nova Scotia and Prince Edward Island. Of the entire quantity 233,669 barrels were pickled. In the Canadian report the average price of the salt mackerel is given as $9.25 per barrel, but as the fish were much inferior in quality to the American catch these figures are evidently incorrect. Statistics show that 105,739 barrels of the above, equal to nearly one-half of the catch, were marketed in the United States (and it is fair to presume that these were of average quality), where they were ordinarily sold at lower figures than the fish taken by the New England fleet. If we suppose the Canadian fish to be equal to those taken on our own shores (a supposition which is hardly warranted), the value of the catch, as given by the Canadian authorities, must still be reduced by $818,662, as the average price of the New England fish during the season was only $5.75 per barrel.

* Supplement No. 2 | to the Eleventh Annual Report of the | Minister of Marine and Fisheries | for the year 1880. ——— Fisheries Statements | for the year | 1880.———Ottawa: | Printed by MacLean, Roger & Co., Wellington street. | 1881.

The following table shows in detail the extent of the catch for the several Provinces:

Table showing the quantity and value of the mackerel taken in the Dominion of Canada in 1880, as shown by the Canadian Fishery Report.

Provinces.	Grand total.			Pickled mackerel.			Canned mackerel.			Page of Canadian Report from which the figures are taken.
	Pounds fresh mackerel required.	Value of prepared products according to Canadian Fishery Report.	Value of prepared products at New England prices.	Number of barrels put up.	Average price per barrel.	Value.	Number of cans put up.	Average price per can.	Value.	
Ontario										292
Quebec	1,505,100	40,878	28,848	5,017	8.15	40,878				pp. 53, 76, 100, 118.
Nova Scotia	37,890,080	1,270,368	721,184	126,432	10.00	1,264,320	40,320	.15	6,048	165
New Brunswick	5,994,640	206,464	119,906	19,650	10.00	196,500	66,427	.15	9,964	215
Prince Edward Island	24,781,440	661,256	475,760	82,576	8.00	660,560	6,960	.10	696	240
British Columbia										269
Total	70,271,260	$2,178,966	$1,355,441	233,669	$9.25	$2,162,258	*113,707	$0.147—	$16,708	

* In estimating the pounds of fresh mackerel required and the value of prepared products at New England prices the cans shown here are regarded as 1-pound cans.

In the tables from which the above summary has been compiled no allowance seems to have been made for local consumption. A rough estimate of the amount used in this way would be 18,000,000 pounds, making a total catch for the Provinces of about 88,000,000 pounds, worth, at prices current in the United States, not far from $1,620,000.

Mackerel are not abundant in the waters of the Newfoundland coast, and few are taken by the fishermen. The returns for the year ending July 31, 1881, show that only 181 barrels were exported. This quantity, which equals 54,300 pounds of fresh fish, doubtless represents the bulk of the mackerel taken, as few are consumed locally. Allowing an equal quantity for local consumption, we have only about 110,000 pounds, valued at $1,650, taken by the islanders.

By combining the catch of the New England, Canadian, and Newfoundland fishermen we have the total product of the mackerel fishery for the Western Atlantic in 1880. This is found to be about 220,000,000 pounds of round mackerel, valued at $4,228,000. This value represents the fish as they are first placed upon the market. If the value to the consumer is desired the figures must be nearly doubled, to include the transportation charges and the profits of the various middlemen who handle them.

2. STATISTICS OF THE NEW ENGLAND MACKEREL FLEET FOR 1879, 1880, 1881.

By W. A. Wilcox.

Statement showing the number of vessels and their catch of salt mackerel in the Bay of Saint Lawrence and American shore mackerel fisheries for the season of 1879.

[Compiled from annual report of Boston Fish Bureau for 1879.]

Ports.	Vessels.			Barrels of mackerel.		
	Bay.	Shore.	Total.	Bay.	Shore.	Total.
MASSACHUSETTS.						
Newburyport	6	2	8	721	870	1,599
Rockport*		8	8			
Gloucester	26	85	111	7,125	47,085	54,210
Boston†	4	35	39	1,310	48,103	49,413
Cohasset		6	6		4,900	4,900
Wellfleet		22	22		17,200	17,200

* Vessels packed out away from home. † Numerous vessels packed out in addition to home fleet.

Statement showing the number of vessels and their catch of salt mackerel, &c.—Continued.

Ports.	Vessels.			Barrels of mackerel.		
	Bay.	Shore.	Total.	Bay.	Shore.	Total.
MASSACHUSETTS—Continued.						
Provincetown	*	5	5		4, 354	4, 354
Chatham		7	7		5, 668	5, 668
Harwich		11	11		10, 938	10, 938
Dennis	1	10	11	240	7, 290	7, 530
Hyannis		2	2		301	301
Total	37	193	230	9, 396	146, 729	156, 125
NEW HAMPSHIRE.						
Portsmouth		9	9		6, 225	6, 225
MAINE.						
Deer Isle*		3	3			
Camden		3	3		1, 020	1, 020
North Haven†		6	6		1, 278	1, 278
Booth Bay		9	9		3, 951	3, 951
Portland	5	60	65	1, 400	50, 600	52, 000
Total	5	81	86	1, 400	56, 849	58, 249
Total for New England	42	283	325	10, 796	209, 803	220, 599

* Vessels packed out away from home. † Vessels mostly packed out away from home.

Statement showing the number of vessels and their catch of salt mackerel in the Bay of Saint Lawrence, the New England shore, and the Southern mackerel fisheries for the season of 1880.

[Compiled from annual report of Boston Fish Bureau for 1880.]

Ports.	Vessels.				Total number of crews.	Barrels of mackerel.				Remarks.
	Bay.	New England shore.	South.	Total.		Bay.	New England shore.	South.	Total.	
MASSACHUSETTS.										
Newburyport	4	5	3	12	110		738		738	3, 885 barrels packed at other ports.
Rockport	1	5	1	7	96	58	706		756	6, 269 barrels packed at other ports.
Gloucester	15	61	34	110	1, 650	2, 189	124, 477	2, 954	129, 620	Includes other than home fleet.
Boston	5	31		36	530	2, 158	51, 844		54, 002	Several vessels packed in addition to home fleet.
Cohasset	1		6	7	100	390	5, 856	600	6, 846	
Wellfleet	6	5	20	31	450	30	28, 707	500	29, 237	
Provincetown		4	3	7	105		4, 863	205	5, 068	
Chatham		1	5	6	87		6, 230	1, 000	7, 230	
Harwich		5	6	11	180		12, 838	1, 000	13, 838	
Dennis		7	3	10	160		7, 691	460	8, 151	
Hyannis		2		2	30		500		500	
Total	32	126	81	239	3, 498	4, 817	244, 450	6, 719	255, 986	
MAINE.										
Swan's Isle	2	2	6	10	145					All packed from home.
Deer Isle		2	2	4	56					All packed from home.
Camden		3		3	39		1, 421		1, 421	
North Haven		1	5	6	90			1, 400	1, 400	Vessels partly packed away from home.
Booth Bay		12	4	16	235		3, 300	700	4, 000	*Many of them packed away from home.*
Southport		5		5	70		3, 100		3, 100	Part packed from home.
Sedgwick			1	1	15					1,240 barrels packed away from home.
Portland		50		50	730	2, 484	73, 933		76 417	Many vessels in addition to home fleet included.
Total	2	75	18	95	1, 380	2, 484	81, 754	2, 100	86, 338	
NEW HAMPSHIRE.										
Portsmouth		4	4	8	110		6, 750	600	7, 350	
Total for New England*.	34	205	103	342	4, 988	7, 301	332, 954	9, 419	349, 647	Inspected barrels.

* The New England shore fleet mentioned above are only the vessels that fish nowhere else; to which may be added the Southern and North Bay fleets after they returned from their unsuccessful cruise in those waters, making the total shore fleet three hundred and forty-two sail.

[In the annual report for 1881 some corrections are made in the returns of 1880: Shore fleet, 291; Southern fleet, 92; total fleet, 327; total crews, 4,778.]

Statement showing the number of vessels and their catch of salt mackerel in the Bay of Saint Lawrence, the New England shore, and the Southern mackerel fisheries for the season of 1881.

[Compiled from annual report of Boston Fish Bureau for 1881.]

Ports.	Vessels.				Total number of crews.	Barrels of mackerel.				Remarks.
	Bay.	New England shore.	South.	Total.		Bay.	New England shore.	South.	Total.	
MASSACHUSETTS.										
Newburyport	1	.....	3	4	59	.....	.....	.....	.....	*
Rockport	.....	6	.....	6	65	.....	290	.....	290	‡Total catch 3,590 barrels.
Gloucester	1	59	46	106	1,548	40	120,597	9,000	129,637	‡
Boston	1	15	5	21	296	200	63,768	5,611	69,669	†
Cohasset	.....	7	.....	7	100	.....	8,013	.....	8,013	
Wellfleet	.....	33	3	36	508	.....	30,977	500	31,477	5 sail packed at Boston.
Provincetown	.....	8	.....	8	120	.....	6,175	.....	6,175	3 sail packed at Boston.
Chatham	.....	.....	.....	.....	.....	.....	170	.....	170	Weir caught.
South Chatham	.....	1	4	5	75	.....	8,940	1,470	10,410	
Harwich	.....	.....	9	9	146	.....	4,088	5,500	9,588	*6,100 barrels landed at Booth Bay additional.*
Dennisport	.....	.....	3	3	45	.....	2,646	900	3,546	
Fairhaven	.....	1	.....	1	13	.....	220	.....	220	1,500 barrels were caught.
Total	3	130	73	206	2,975	330	246,184	22,981	269,495	
MAINE.										
Swan's Isle	.....	10	2	12	180	.....	.....	1,700	1,700	
Deer Isle	.....	1	1	2	28	.....	2,280	223	2,503	‡Southern catch landed at New York and Philadelphia.
Camden	.....	3	.....	3	39	.....	.....	.....	.....	
Northhaven	.....	5	5	10	120	.....	500	.....	500	‡
Booth Bay	.....	4	9	13	185	.....	14,259	800	15,059	‡
Southport	.....	8	.....	8	120	.....	5,000	.....	5,000	‡6,100 barrels of those landed by Harwich sail.
Sedgwick	.....	1	.....	1	15	.....	.....	.....	.....	‡
Portland	.....	35	.....	35	499	140	91,860	.....	92,000	‡
Total	.....	67	17	84	1,177	140	113,899	2,723	116,762	
NEW HAMPSHIRE.										
Portsmouth	.....	5	3	8	106	.....	3,700	1,700	5,400	‡
Total for New England	3	202	93	298	4,258	470	363,783	27,404	391,657	Inspected barrels.

*None packed at home port. †Numerous vessels from other ports included. ‡Part of the catch landed at Boston and Portland. Amount given packed at home ports.

NOTE.—The New England shore fleet mentioned above are only the vessels that fished nowhere else, to which may be added the Southern and North Bay fleets, after they returned from their unsuccessful cruise in those waters, making the total shore fleet two hundred and ninety-eight sail.

3. STATISTICS OF THE MACKEREL FISHERY BY AMERICAN VESSELS IN THE GULF OF SAINT LAWRENCE, 1873 TO 1882.

By Col. David W. Low.

The following statement shows the extent of the mackerel fishery as pursued by American vessels in the Gulf of Saint Lawrence for the years 1873 to 1881. The number of vessels and their catch in the years 1873 to 1877, inclusive, is compiled from the reports of the collector of customs at Port Mulgrave, Nova Scotia; the number of vessels in 1878 and 1879 is from the same authority; the catch for 1878 and subsequent years and the number of vessels in 1880 and 1881 are from reports of the Boston Fish Bureau. The estimates of value and the catch within the three-mile limit are from authentic sources. The value includes the labor of crews "messing" some of the fish by soaking, scraping, and cutting off their heads, thus increasing their market value. The quantity of mackerel caught within the three-mile limit, one-third of the total catch, is considered by compe-

tent authorities to be a very liberal estimate. The unusual number of vessels in the Gulf in 1878 was caused by false reports and telegrams of great quantities of mackerel there. American vessels in the Gulf mackerel fishery must average 400 barrels of mackerel each at $10 per barrel to pay the expenses of outfit, insurance, depreciation of vessel, crew's share, and master's commission.

The mackerel fishery by American vessels in the Gulf of Saint Lawrence during the years 1873 to 1881, inclusive.

Year.	Number of vessels in Gulf.	Catch in sea-packed barrels.	Shrinkage in same, one-eighth.	Packed barrels.	Value when sold in United States per barrel, packing off.	Total value in United States of whole catch when sold.	Number of barrels caught inside three-mile limit, liberal estimate.	Value in United States of mackerel caught within three-mile limit, liberal estimate.
1873	251	88,012	11,001	77,011	$10 46	$805,535	25,670	$268,508
1874	164	63,078	7,885	55,193	6 25	344,956	18,398	114,987
1875	95	13,006	1,626	11,380	14 18	161,368	3,793	53,785
1876	64	5,495	687	4,808	11 60	55,773	1,603	18,594
1877	60	8,365	1,046	7,319	11 10	81,241	2,439	27,072
1878	273			61,923	4 15	256,980	20,641	85,660
1879	44			10,796	2 50	26,990	3,599	8,997
1880	34			7,301	7 72	56,364	2,433	18,783
1881	3			470	8 50	3,995	156	1,326
1882	1			275	8 50	2,125	95	717
Total	992			236,476		1,795,327	78,827	598,429
Average per barrel					7 59			

Yearly average catch per vessel, 238.

4. STATISTICS OF INSPECTION OF PICKLED MACKEREL.

By A. Howard Clark.

The following tables show the quantity of pickled mackerel officially inspected according to the requirements of the State laws of New England, and also a comparison with the production of the Canadian mackerel fishery. The methods employed in packing the mackerel and a discussion of the laws relating to the subject will be found in the section of this report treating of Products of the Fisheries:

*Table showing the number of barrels and value of pickled mackerel officially inspected in the United States for the years 1831, 1834 to 1838, 1851, 1864 to 1881.**

Years.	Massachusetts.	Maine.	New Hampshire.	Total quantity and value.	
	Barrels.	*Barrels.*	*Barrels.*	*Barrels.*	*Value.*
1831	283,548½	44,951½	21,450	449,950	$1,862,793
1834	252,879½	40,061	18,200	311,740½	1,437,123
1836	174,410	25,228	9,450	209,088	1,520,069
1837	138,157½	22,462	5,225	165,844½	965,214
1838	110,740¼	24,312	3,420	138,472¼	1,156,249
1851	329,244½	31,472	3,073	363,789½	2,484,679
1864	274,357¼	49,797½	300	324,454¾	7,001,098
1865	256,796½	54,215¾	45	311,056½	5,729,851
1866	231,696 7/16	44,627½	200	276,523 13/16	5,161,261
1867	210,314 1/16	39,675½	572	244,561 3/16	3,174,130
1868	180,056 11/16	28,774½		208,830 11/16	2,924,087
1869	234,210¾	37,166¼	157	271,534½	3,762,985
1870	318,521¾	52,304 1/16	3,700	374,525 7/16	4,400,563
1871	259,416¾	48,603 3/16	2,071	310,091½	2,068,851

* The figures for the years 1834 to 1838 and 1851 are from Sabine's Report on the American Fisheries; for the years 1864 to 1877, from the State inspection returns; for the years 1878 to 1881, from the annual reports of the Boston Fish Bureau.

Table showing the number of barrels and value of pickled mackerel officially inspected in the United States, &c.—Continued.

Years.	Massachusetts.	Maine.	New Hampshire.	Total quantity and value.	
	Barrels.	*Barrels.*	*Barrels.*	*Barrels.*	*Value.*
1872	181,456	22,173	1,878	206,007	$2,205,761
1873	185,748½	22,103⅓	2,398	210,350	3,167,948
1874	258,379⅓	43,741⅓	5,519	307,640⅓	3,163,701
1875	130,062⅛	9,502½	3,415	142,980⅛	1,439,315
1876	225,942⅞	22,420½	5,351	253,722⅝	1,852,103
1877	105,037	22,157¼	643	127,898	1,384,223
1878	144,205	48,263	4,000	196,468	1,408,675
1879	156,125	58,249	6,225	220,599	1,268,444
1880	255,980	86,338	7,356	349,674	2,398,044
1881	269,495	116,762	5,400	391,657	2,447,556

Statement showing the number of barrels and value of pickled mackerel produced by the fisheries of the United States and of the Dominion of Canada from 1873 *to* 1881.

Year.	United States.		Dominion of Canada.		Total.	
	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.
1873	210,350	$3,167,948	159,530	$1,615,552	369,880	$4,783,500
1874	307,640⅓	3,163,701	161,090	1,559,551	468,730⅓	4,723,252
1875	142,980⅛	1,439,315	123,654	1,236,545	266,634⅛	2,675,860
1876	253,722⅝	1,852,103	104,356	992,794	358,078⅝	2,845,897
1877	127,898	1,384,223	163,916	1,639,160	291,814	3,023,383
1878	196,468	1,408,675	183,919	1,760,226	380,387	3,174,901
1879	220,599	1,268,444	190,076⅛	1,745,490	410,675⅛	3,013,934
1880	349,674	2,398,044	233,669	2,162,258	583,343	4,560,302
1881	391,657	2,447,556	105,772	1,046,343	497,429	3,493,899
Total 1873 to 1881	2,200,999	18,531,009	1,425,989	13,763,918	3,626,979	32,294,928

Blank page retained for pagination

PART IV.

THE SWORDFISH FISHERY.

By G. BROWN GOODE.

1. The fishing grounds.
2. *The vessels.*
3. Apparatus of capture.
4. The manner of fitting the vessels.
5. Manner of capture.
6. The perils and the romance of swordfishing.
7. Landsmen's descriptions of swordfishing.
8. *The capture of swordfish by hook and line.*
9. Financial profits to fishermen.
10. History of the American swordfishery.
11. Products of the fishery.
12. Markets and prices.

Blank page retained for pagination

PART IV.

THE SWORDFISH FISHERY.

By G. Brown Goode.

1. THE FISHING GROUNDS.

In the natural history of the swordfish, in Section I of this report is printed a discussion of the dates of the appearance of this species in our waters and of its local movements.

Early in the season the swordfish are most abundant west of Montauk Point, and later they spread over the shoal grounds along the coast even as far north as the Nova Scotia Banks. They may be found wherever mackerel and menhaden are abundant, as may be inferred from the almost universal practice of carrying swordfish irons on board of mackerel vessels.

I quote the statements of three or four correspondents who have taken the trouble to interview the fishermen of their respective localities.

Mr. E. G. Blackford writes: "The season first opens early in June in the neighborhood of Sandy Hook, and continues along the coast as far east as Martha's Vineyard and Nantucket Shoals until about the middle of September. They are said to have been caught as far north as Cape Sable. At the first cold wind blowing in September they disappear, and are not found again on the coast that season. This information I received from an old New York swordfisherman, a man whose statements may be relied on."

Capt. Benjamin Ashby, of Noank, Conn., informs me that the swordfish vessels of Noank and New London are accustomed to leave the home port about the 6th of July, and throughout the month they find fish most abundant between Block Island and No Man's Land; in August between No Man's Land and the South Shoal light-ship. They first meet the fish twenty to twenty-five miles southeast of Montauk Point. In August and September they are found on George's Bank. There is no fishing after the snow begins to fly.

A little farther east is the New Bedford fleet. Capt. I. H. Michaux, of the schooner Yankee Bride, tells me that swordfish strike in about Block Island in the middle of June and stay in that vicinity until the 15th or 20th of August. North of Cape Cod they are taken up to the 20th of October.

Mr. John H. Thomson, of New Bedford, states that from May 25 to June they are found south of Block Island, approaching the Vineyard Sound and the neighboring waters through June and to the middle of July. A little later they are more abundant to the southeast of Crab Ledge, and after August 1 to the southeast of Cape Cod and George's Bank.

The schooner Northern Eagle, of Gloucester, Capt. George H. Martin, when engaged in swordfish fishing, is accustomed to leave Gloucester so as to be on the ground south of Block Island by the 10th of June, and the fish are followed as far east as Portland. Mr. Earll ascertained that the swordfish are mostly fished for on the coast of Maine from July 1 to September 1. Halibut vessels on La Have and Sable Island Banks occasionally take these fish upon their lines.

Mackerel vessels on the New England coast are always prepared for swordfish when cruising among mackerel schools. I am not aware that they are ever seen on the mackerel grounds of the Gulf of Saint Lawrence.

2. THE VESSELS.

The vessels engaged in swordfishing are sloops and small schooners of generally less that 50 tons. The crew is also small, consisting of two or sometimes three men besides the cook and a boy. Although many vessels are employed in this fishery for several successive years, there are many others which fit out for a single season or for a part of a season. Others, on the south coast of New England, divide their time between fishing for sea-bass and hunting for swordfish, all warm and quiet days being devoted to the latter pursuit. Six or eight vessels from New London are thus employed, as well as others from Noank and Bridgeport. On the coast of Maine, as has already been mentioned, many of the smaller fishing vessels fitted for the capture of mackerel and cod devote a part of the season to taking swordfish. Other vessels, among them occasionally a gentleman's yacht, enter the field for a cruise or two in the course of a summer. To do this is a favorite recreation for old swordfishermen engaged in other work. Numerous mackerel schooners carry the swordfish "pulpit" on their bows, and so do various coasters and packets.

It has therefore not been thought desirable to attempt to make a list of the vessels engaged in this fishery, or even an exact enumeration of them. In 1879 estimates by careful men engaged in the business fixed the number belonging in different ports as follows:

New York (hailing from New London)	2
Greenport sloops	2
New London	8
Newport	1
Fall River	2
Cuttyhunk	3
Westport	2
New Bedford	13
Dartmouth	2
South side of Cape Cod	5
Gloucester	1
Total	41

In 1874, according to Mr. Thompson, New Bedford had twelve vessels in this fishery. In 1877 the estimates of total number of vessels made by different men varied between thirty and forty.

To show how uncertain the continuance of vessels in this fishery may be I will refer to the annals of Gloucester. In 1876, one schooner, the Meteor, was engaged; in 1877, the schooner Champion; in 1878, the schooner Northern Eagle; while in 1879 and 1880 the field was abandoned by this port.

3. APPARATUS OF CAPTURE.

The apparatus ordinarily employed for the capture of the swordfish is simple in the extreme. It is a harpoon with detachable head. When the fish is struck the head of the harpoon remains in the body of the fish, and carries with it a light rope, which is either made fast or held by a man in a small boat, or is attached to some kind of a buoy, which is towed through the water by the struggling fish, and which marks its whereabouts after death.

The harpoon consists of a pole 15 or 16 feet in length, usually of hickory or some other hard wood, upon which the bark has been left, so that the harpooner may have a firmer hand-grip. This pole is from an inch and a half to two inches in diameter, and at one end is provided with an iron rod, or "shank," about 2 feet long and five-eighths of an inch in diameter. This "shank" is fastened to the pole by means of a conical or elongated cup-like expansion at one end, which fits over

the sharpened end of the pole, to which it is secured by screws or spikes. A light line extends from one end of the pole to the point where it joins the "shank," and in this line is tied a loop, by which is made fast another short line, which secures the pole to the vessel or boat, so that when it is thrown at the fish it cannot be lost.

Upon the end of the "shank" fits somewhat securely the head of the harpoon, known to the fishermen by the names "swordfish iron," "lily iron," or "Indian dart." The form of this weapon has undergone much variation, as is shown in the series of specimens in the National Museum. The fundamental idea may very possibly have been derived from the Indian fish-dart, numerous specimens of which are in the National Museum. However various the modifications may have been, the similarity of the different shapes is no less noteworthy from the fact that all are peculiarly American. In the enormous collection of fishery implements of all lands in the late exhibition at Berlin nothing of the kind could be found. What is known to whalers as a toggle-harpoon is a modification of the lily-iron, but so greatly changed by the addition of a pivot by which the head of the harpoon is fastened to the shank that it can hardly be regarded as the same weapon. The lily-iron is in principle exactly what a whalemen would describe by the word "toggle." It consists of a two-pointed piece of metal, having in the center, at one side, a ring or socket whose axis is parallel with the long diameter of the implement. In this is inserted the end of the pole shank, and to it or near it is also attached the harpoon-line. When the iron has once been thrust point first through some solid substance, such as the side of a fish, and is released upon the other side by the withdrawal of the pole from the socket, it is free, and at once turns its long axis at right angles to the direction in which the harpoon-line is pulling, and thus is absolutely prevented from withdrawal. The principle of the whale harpoon or toggle-iron is similar, except that the pole is not withdrawn, and the head, turning upon a pivot at its end, fastens the pole itself securely to the fish, the harpoon-line being attached to some part of the pole. The swordfish lily-iron head, as now ordinarily used, is about 4 inches in length, and consists of two lanceolate blades, each about an inch and a half long, connected by a central piece much thicker than they, in which, upon one side, and next to the flat side of the blade, is the socket for the insertion of the pole-shank. In this same central enlargement is forged an opening to which the harpoon-line is attached. The dart-head is usually made of steel; sometimes of iron, which is generally galvanized; sometimes of brass.

The entire weight of the harpoon-pole, shank, and head should not exceed 18 pounds.

The harpoon-line is from 50 to 150 fathoms long, and is ordinarily what is known as "fifteen-thread line." At the end is sometimes fastened a buoy, and an ordinary mackerel keg is generally used for this purpose.

In addition to the harpoon, every swordfisherman carries a lance. This implement is precisely similar to a whaleman's lance, except that it is smaller, consisting of a lanceolate blade, perhaps 1 inch wide and 2 inches long, upon the end of a shank of five-eighths inch iron, perhaps 2 or 3 feet in length, fastened in the ordinary way upon a pole 15 to 18 feet in length.

4. THE MANNER OF FITTING THE VESSEL.

The swordfish are harpooned from the end of the bowsprit of a sailing vessel. It is next to impossible to approach them in a small boat. All vessels regularly engaged in this fishery are supplied with a special apparatus for the support of the harpooner as he stands on the bowsprit, and this is almost essential to success, although it is possible for an active man to harpoon a fish from this station without the aid of the ordinary frame-work. Not only the professional swordfisherman but many mackerel schooners and packets are supplied in this manner.

An illustration of the swordfish "pulpit" is given in one of the plates. It is constructed as follows: The harpooner stands upon the tip of the bowsprit, outside of the jib-stay. At this point is fastened a square plate of iron as wide as the bowsprit. In the middle of this plate is a mortise 2 inches square and extended 3 or 4 inches down into the wood, forming a socket for an upright iron bar 2 inches square and 3 feet high. At the top of this bar is a bow of iron bent backward in semicircular form to surround the waist of the harpooner, the ends of the bow being separated by a distance of perhaps 2 feet. In the ends of the bow-iron are holes, through which are passed irons to hold the dart when not in use. Through these same holes are sometimes passed ropes, by which is suspended a swinging seat for the use of the harpooner when not in action. When not in use the dart is lashed in a horizontal position to the top of the "rest." The lance is usually allowed to rest against the jib-stay, to which it is secured by passing it through loops of rope arranged for the purpose. Upon the tip of the bowsprit, at the base of the "rest," is a platform of wood about 2 feet square, large enough to afford a firm foothold to the harpooner. The harpoon-line is coiled upon the bow of the vessel, the buoy usually resting upon the bulkhead or close at hand. A second harpoon-line, attached to the reserve or second harpoon, is coiled upon the other side.

The structure above described is usually called the "rest," or the "pulpit." I have been unable to learn when and by whom this peculiar piece of apparatus was devised.

5. MANNER OF CAPTURE.

The swordfish never comes to the surface except in moderate, smooth weather. A vessel cruising in search of them proceeds to the fishing ground and cruises hither and thither, wherever the abundance of small fish indicates that they ought to be found. Vessels which are met are hailed and asked whether any swordfish have been seen, and if tidings are thus obtained the ship's course is at once laid for the locality where they were last noticed. A man is always stationed at the masthead, where, with the keen eye which practice has given him, he can easily descry the tell-tale dorsal fins at a distance of 2 or 3 miles. When a fish has once been sighted, the watch "sings out," and the vessel is steered directly towards it. The skipper takes his place in the "pulpit," holding the pole in both hands by the small end, and directing the man at the wheel by voice and gesture how to steer. There is no difficulty in approaching the fish with a large vessel, although, as has already been remarked, they will not suffer a small boat to come near them. The vessel plows and swashes through the water, plunging its bowsprit into the waves, without exciting their fears. Noises frighten them and drive them down. Although there would be no difficulty in bringing the end of the bowsprit directly over the fish, a skillful harpooner never waits for this. When the fish is from 6 to 10 feet in front of the vessel it is struck. The harpoon is never thrown, the pole being too long. The strong arm of the harpooner punches the dart into the back of the fish, right at the side of the high dorsal fin, and the pole is withdrawn and fastened again to its place. When the dart has been fastened to the fish, the line is allowed to run out as far as the fish will carry it, and is then passed in a small boat which is towing at the stern. Two men jump into this, and pulling in upon the line until the fish is brought in alongside, it is then killed with a whale-lance or a whale-spade, which is stuck into the gills. The fish having been killed, it is lifted upon the deck by a purchase-tackle of two double blocks rigged in the shrouds.

The fishermen have a theory to the effect that the swordfish can see nothing directly in front of him, on account of the peculiar location of the eyes, and there are instances of their having been approached and killed by men in a skillfully-managed dory.

6. THE PERILS AND THE ROMANCE OF SWORDFISHING.

The pursuit of the swordfish is much more exciting than ordinary fishing, for it resembles the hunting of large animals upon the land, and partakes more of the nature of the chase. There is no slow and careful baiting and patient waiting, and no disappointment caused by the accidental capture of worthless "bait-stealers." The game is seen and followed, and outwitted by wary tactics, and killed by strength of arm and skill. The swordfish is a powerful antagonist sometimes, and sends his pursuers' vessel into harbor leaking, and almost sinking, from injuries which he has inflicted. I have known a vessel to be struck by wounded swordfish as many as twenty times in one season. There is even the spice of personal danger to give savor to the chase for the men are occasionally injured by the infuriated fish. One of Captain Ashby's crew was severely wounded by a swordfish, which thrust his beak through the oak floor of a boat on which he was standing and penetrated about two inches in his naked heel. The strange fascination draws men to this pursuit when they have once learned its charm. An old swordfisherman, who had followed the pursuit for twenty years, told me that when he was on the cruising ground he fished all night in his dreams, and that many a time he has bruised his hands and rubbed the skin off his knuckles by striking them against the ceiling of his bunk when he raised his arms to thrust the harpoon into visionary monster swordfishes.

7. LANDSMEN'S DESCRIPTIONS OF SWORDFISHING.

Mr. C. F. Holder, of New York, published in Forest and Stream February 17, 1876, the following description of a trip after swordfish in Block Island Sound:

"Lying all night in the harbor of Wood's Holl, we had ample time to prepare for sport, and at three o'clock in the morning our little sloop was swinging around, and, gathering herself together, headed for Gay Head. The vessel was a common sloop of about 60 tons, its only peculiarity being a stanchion with a curved top, to hold the harpooner, rigged on the extreme end of the bowsprit. At 9 o'clock we were out of sight of the Vineyard. The wind settling, I was informed that I could go aloft and look out for the game. We were slowly moving along, and I was scanning the horizon for miles around, when the man at the bow uttered a sound, which was a sort of a cross between a cluck and a groan, which I saw meant 'port,' and that something had been sighted. The sloop fell lazily away, and I then saw two dark forms with their razor-like fins out of the water slowly moving along ahead of us. The captain signaled at once for me to come down, and as I reached the deck the work commenced. The man waited until we were almost upon them, and as one of them turned, as if in idle curiosity, to see what the great shadow meant, he hurled a harpoon, and the next moment the huge fish sprang from the water and with a furious twist tried to shake out the iron. So great was the effort that it fell on its side with a crash, and for a moment was still, but it was only for a second. The line jumped into activity and rushed out so you could not follow it, now swaying to and fro, and making the water fly like rain. About 50 feet of line had gone out, when six of us managed to get a fair hold on the line. He would undoubtedly have dragged us all overboard if the rope had not been sure and fast. His struggles were kept up for about fifteen minutes, after which he perceptibly weakened, and the long rushes to the right and left grew feebler and feebler, until we ventured to haul in. At last we had the brute alongside. A rope was rigged from the peak and fastened around the long sword, and the monster was rolled on board the sloop. We measured our prize, which was 9 feet 6 inches long.

"We cruised about all day in the vicinity, and succeeded in capturing three more, varying in

length from 6 to nine feet, and as we returned to Wood's Holl I felt that I had well earned my experience."

A correspondent of the Philadelphia Times gives the following spirited account of spearing swordfish off Cape May:

"'Hey-o!' came from the man in the cross-trees.

"'Where away?' yelled the skipper, unhooking his booted leg from the wheel and glancing around.

"'Right off the weather bow,' sang out the mate, who had sprung into the rigging.

"'Aye, I see him,' replied the skipper. A moment later all eyes on board were watching a sharp glistening fin that was darting through the water in the same general direction as ourselves.

"The mate now took his place in the pulpit, and seizing the steel lily stood ready for the game, while the rope was carefully coiled and the keg made ready to toss at the right moment. For ten minutes the vessel and fish moved along gallantly side by side. The skipper, however, was gradually hauling the vessel on the wind, and the two approached each other until the swordfish was close alongside. Then came the supreme moment. The skipper wound away at the wheel, and the little vessel shot into the wind, laying the swordfish right across the bows, and as it rushed along amid the foam, the harpooner raised his weapon; for a moment the steel lily flashed, then, with a crushing sound, it entered the back of the fish.

"'Stand clear the line!' shouted the mate, as he sprang back upon deck and the schooner fell away again.

"The warning was well heeded, as the rope was rushing over the side like a 'streak of greased lightning,' as the skipper had it. It was soon exhausted, and as the end came the mate held aloft the keg, and as the last fathom of rope rushed away, tossed it over, and away it went, followed by a wave of foam and spray, to ultimately tire the gamey fish.

"We had now gained on the flying keg, and, as the dory was hauled alongside, two of the crew and the writer as volunteer, tumbled in, and in a few moments had the keg alongside. The oars were then pulled in, and in a moment later the bowman had seized the keg and the dory was rushing along—a swordfish express. The work of 'taking in' now commenced, one man steering the dory after the erratic steed, the other slowly hauling in on the rope. As the fish felt the strain it renewed its exertions and started off at a furious pace that threatened to leave the vessel far behind. But the spurt was of short duration, and the dory was rapidly hauled ahead, until finally the sharp fin was seen close by, and with a rush the fish was laid alongside, one man holding it while the rest got to the windward to prevent a capsize.

"Hauled partly out of water by the rope, the great fish gave a vicious cut to the left with its sharp weapon that caused all hands to drop as if sent for, and for some time this lowly position was the best, all things considered. The rope was kept taut, and the struggles of the game were terrific. If a head was raised it seemed immediately to become the object of attack. Finally, however, an oar was lifted and a violent blow upon the head placed the swordfish *hors du combat*. The schooner now came alongside, a block and tackle was rigged, and the gamey fish was hoisted aboard."

8. THE CAPTURE OF SWORDFISH BY HOOK AND LINE.

One or two instances are on record of the capture of swordfish upon an ordinary hand-line, and it is probable that this is much more common than has been usually supposed. Capt. George H. Martin, of Gloucester, informed me that he had seen seven caught in this manner in one day in the South Channel. They were caught in water 15 to 25 fathoms deep, on the old-fashioned

George's cod hook, with a 6-inch shank. Mackerel were used for bait. These were split down the tail so that the shank of the hook could be entirely hidden in the gash.

I have been told that they are also taken in this way about Block Island, and a similar method of fishing is described by Italian writers.

Within the past five years it has not been unusual for swordfish to become entangled in the long lines of the halibut fishermen on the northern banks. The manner in which this occurs has already been discussed above.

I have collected several instances. In 1877, in the month of August, Capt. Daniel O'Brien, of the schooner Ossipee, of Gloucester, fishing in 200 fathoms of water, between Le Have and Western Bank, caught, in one voyage, five swordfish.

At about the same time Capt. R. L. Morrison, of the schooner Laura Nelson, fishing in 275 fathoms, on Sable Island Bank, caught three swordfish. Another vessel, in August, 1877, fishing on La Have, in from 175 to 180 fathoms, caught twelve, as well as three or four more in September. In August, 1878, Captain Greenleaf, of the schooner Chester R. Lawrence, of Gloucester, fishing in 140 fathoms, caught thirteen in one trip. I cannot learn that this manner of capture was ever known before 1876, but it has since become so frequent that it excites no remark for a halibut-catcher to unload several swordfish among its halibut. This manner of taking the swordfish is of course purely accidental, and is rather a vexation than otherwise to the fishermen. It is probable that the fish take the bait when the line is being set and they are swimming near the surface, and they are involuntarily carried down by its great weight.

9. FINANCIAL PROFITS TO FISHERMEN.

I have before me record of a single schooner for the season of 1878, from which it appears that in the season of four months eight trips were made, averaging about twelve days in continuance. One hundred and sixty-three fish were taken between June 7 and September 20, weighing, in the aggregate, in round numbers, about 47,000 pounds, dressed. These were sold at an average price of 3 cents per pound. The gross stock of the season would amount to about $1,300. From this must be deducted the expense of living, the interest on capital invested, and the wages of the cook and the boy. The remainder would probably not exceed $800 or $900. It is not probable that many vessels stock as large a proportionate amount as did the Northern Eagle. And the profits are to be divided among the two or three men composing the crew and the owner of the vessel. The success of one New Bedford vessel in the season of 1878 was spoken of as extraordinary, the return being $311 to each of the crew's share.

The price of swordfish is low, and the success of the voyage is always somewhat precarious. A few small vessels with experienced skippers apparently succeed in making a fair living, but that the profits are not great is clearly indicated by the fact that there is no great increase in the number of vessels engaged, and that so many are constantly undertaking and abandoning the swordfishery.

10. HISTORY OF THE AMERICAN SWORDFISH FISHERY.

There are few data upon which to found conjecture as to the time when the swordfish were first regarded as sufficiently useful to be sought for by fishermen. The earliest record of its use for food is found in the Barnstable Patriot of June 30, 1841, in which it is stated that the fishermen of the island south of Cape Cod take a considerable number of these fish every year by harpooning them, and that about 200 pounds a year are pickled and salted at Martha's Vineyard.

Captain Atwood remembers seeing swordfish on the coast of Maine as early as 1826, although

up to the time of his retirement from active participation in the fisheries, in 1867, no effort was made by the fishermen north of Cape Cod to capture them.

The fishery apparently sprang into existence and importance between the years 1840 and 1855, upon the south coast of New England. Captain Ashby first engaged in it in 1859, when it was apparently a well-established industry. In 1861 it is recorded that some thirty vessels from New Bedford were profitably engaged in this business on the favorite ground, 15 to 20 miles southeast of No Man's Land.

Mr. Earll ascertained that little attention was paid by the fishermen of Portland, Me., to swordfish until within two or three years. This fishery is carried on at odd times by mackerel gill net fishermen, and by cod-trawling vessels when their regular industry is interfered with by the abundance of dogfish. The season for dogfish is also the time for swordfish, and at the present time, when the price of swordfish justifies it, smaller fishermen, when they are driven from their regular work by the dogfish, make trips for the express purpose of capturing swordfish. Mackerel-seiners are beginning to carry swordfish irons, and are often very successful in killing the fish.

At the present day, and for five or six years past, perhaps much longer, there has been very little change in the number of vessels engaged, this varying from thirty to forty, approximately, in different years.

Capt. Epes W. Merchant, of Gloucester, who has been familiar with the fisheries since 1804, tells me that the first swordfish ever brought to Gloucester within his recollection was caught on George's Bank about the year 1831, by Captain Pew, who brought it in and sold it at the rate of $8 a barrel, salted. Fishermen had before that been very much afraid of them, but afterwards a good many were caught.

11. PRODUCTS OF THE FISHERY.

As an example of the manner in which a season of swordfishing is passed, and of the yield of a very successful period of work, a record is here given of the trips of the schooner Northern Eagle, of Gloucester, Capt. George H. Martin:

Trips of schooner Northern Eagle, Capt. George H. Martin.

No. of trips.	Date of start.	Length of trip.	No. of fish taken.	Where sold.	Price.
		Days.			*Cents.*
1	June 7	10	16 (5,000 lbs.)	Boston	3
2	June 19	7	22 (6,600 lbs.)	do	4½
3	June 30	14	12 (3,700 lbs.)	Newport	2½
4	July 12	11	20 (5,800 lbs.)	Boston	3
5	July 27	18	37 (9,000 lbs.)	do	5
6	August 15	15	26 (6,500 lbs.)	do	3
7	September 1	16	16 (5,600 lbs.)	do	(2)
8	September 20	14	14 (4,500 lbs.)	do	(3)
			163 (46,700 lbs.)		

Capt. Benjamin Ashby went swordfishing in the schooner N. H. Dudley two successive years, in 1859 and 1860. In July and August, 1859, he took 108 fish; the next year 88.

The schooner Yankee Bride, of New Bedford, boarded in Provincetown Harbor, August, 1879, had already that season taken 60 fish.

Mr. Earll reached Portland in the progress of the fishery census investigation, July 29, 1879. On this day, he writes, 35 to 40 fish were brought in, and on the 1st of August 200 more were landed, 60 by one vessel.

Estimating the number of vessels regularly employed in wordfishing at forty, and putting estimating their annual catch at eighty fish each, which is only half the quantity taken by the Northern Eagle, as shown in the preceding paragraph, the aggregate number of fish taken would be 3,200.

Competent authorities estimate that each vessel in the mackerel fleet captures and brings in an average quantity of eight barrels of pickled fish, or perhaps eight fish each. The number of vessels in the mackerel fleet is at least four hundred. Allowing four fish to each, there is an aggregate of 1,600 fish. Estimating one for each vessel in the halibut fleet yearly, we add fifty more in the aggregate.

Mr. Earll judged that in 1878, as for several years previous, 2,000 swordfish had been brought into Portland, Me. Allowing 1,000 of these to the regular swordfishermen and the mackerel vessels, we have a remainder of 1,000 taken by the occasional fishermen of Portland already spoken of, and to be added to the aggregate, which now amounts to 5,850.

Add 150 more for the coasters, sea-bass fishermen, and pound-tending vessels of southern Massachusetts, Rhode Island, and Connecticut, and the sum is 6,000.

The average weight of a swordfish dressed is estimated by several persons, Captain Ashby, Mr. Earll, Mr. Thompson, and others, to be 300 pounds, and that this is not far from the truth may be seen by referring back to the records of the Northern Eagle. If the average weight is assumed to be 250 pounds, the aggregate weight of a year's catch of swordfish amounts to 1,500,000 pounds, valued at $45,000, the average price being estimated at three cents per pound.

To estimate the number of men employed is almost impossible, since the season continues only four months, and many are employed for a much shorter period. The crews of the forty vessels number from one hundred and sixty to two hundred; the number of men employed for shorter periods it seems scarcely necessary to estimate.

In 1874 the annual catch for the United States was estimated, by Mr. E. G. Blackford, at 2,000 fish, weighing 1,000,000 pounds.

In 1880 the yield of this fishery was 965,450 pounds, distributed as follows: Fisheries of Maine, 50,000 pounds; New Hampshire, 20,000; Massachusetts, 731,950; Rhode Island, 90,000; Connecticut, 73,500.

12. MARKETS AND PRICES.

Mr. Thomson remarks: "Previous to 1862 the market for fresh fish was limited to New Bedford, Fall River, Providence, and the adjoining towns, and a large proportion of the fish then taken was salted and shipped to the West Indies and the Southern States. This was especially the case with those taken about Noman's Land and Martha's Vineyard. Now nearly all are consumed fresh, and the average price is somewhat higher than formerly."

Mr. John H. Thomson writes: "At present the great bulk of the catch is sold fresh. Most of the fish are brought to this port, and a few are carried to New London. Until within a very few years nearly all were disposed of in this vicinity. About 1864 a few were sent to Boston on trial, and the consumption of swordfish in that vicinity has since rapidly increased. Still, the principal market for fresh swordfish may be said to lie between New London and the eastern end of Massachusetts. Providence, R. I., consumes a large quantity."

Mr. Earll writes: "About 2,000 swordfish, averaging in weight 300 pounds dressed, have been landed yearly in Portland for several years. Most of them are sent to Boston fresh, and the remainder are cut up and salted here."

Mr. Eugene G. Blackford informs me that swordfish are not much esteemed in New York market, and that in 1874 not more than 2,000 pounds in the aggregate were consumed.

Regarding the price of fresh fish at New Bedford, Mr. Thomson remarks: "When the first fish arrives here it is eagerly sought at 20 cents a pound, retail. In 1873, within forty-eight hours of the arrival of the first one, fifty-two were brought in, bringing the general retail price down to 8 and 10 cents. At this price, clear of bone, they are usually retailed throughout the season. The wholesale price is about 12 cents for the first catch, falling rapidly to 2 or 3 cents. This is for 'clean fish,' without head, tail, and viscera. Fish from George's Bank are sometimes brought here from Boston. They then retail at 15 and 20 cents."

According to the record of the Northern Eagle, the price in June, 1878, ranged from 2 to 4½ cents, in July from 3 to 5 cents, and in August from 2½ to 3.

In July, 1879, Mr. Earll found the price in Portland, Me., 4 cents, but the arrival of 200 fish on August 1 brought the price down to 1¼ cents. He estimates the average wholesale price at 2 cents.

In New London, according to Captain Ashby, the price has varied within his recollection from 3 to 8 cents, the latter high price being paid in 1877.

According to Captain Martin, the price of salt swordfish in Gloucester is always about the same as that of No. 3 mackerel. In July, 1878, there being no mackerel in the market, they were valued at $7 a barrel.

PART V.

THE MENHADEN FISHERY.

By G. BROWN GOODE and A. HOWARD CLARK.

1. Natural history and commercial importance of menhaden.
2. The fishing grounds.
3. The fishermen.
4. The vessels.
5. Apparatus and methods of capture.
6. Oil and guano factories.
7. The menhaden as a bait-fish.
8. Value of menhaden for manufacturing purposes.
9. Statistics of the fishery and of oil and guano manufacture.
10. The uses of menhaden oil; the oil market.
11. History of menhaden oil industry.
12. Protective legislation.
13. The menhaden fishery at east end of Long Island from 1793 to 1880.

Blank page retained for pagination

PART V.

THE MENHADEN FISHERY.

By G. Brown Goode and A. Howard Clark.

1. NATURAL HISTORY AND COMMERCIAL IMPORTANCE OF MENHADEN.

The menhaden (*Brevoortia tyrannus*) is a fish of the family Clupeidæ. It is known along the Atlantic coast by numerous names. In Maine the common names are pogy, bonyfish, menhaden, and mossbunker; in Massachusetts it has also the names hardhead and poggie; among fishermen of Rhode Island it is called menhaden, mossbunker, and bony-fish; in Connecticut it is known as whitefish, bonyfish, menhaden, and bunker; New York fishermen call it bonyfish, mossbunker, and menhaden; in New Jersey the common name is mossbunker; in Delaware we find the name mossbunker, oldwife, and bugfish; in Maryland and Virginia the names are oldwife, cheboy, ellwife, alewife, bugfish, greentail, bughead, and wife; in North Carolina it is known as fatback, bugfish, menhaden, and yellow-tail shad; in South Carolina the name is commonly menhaden, or mossbunker; in Georgia, menhaden, and in Florida, menhaden, mossbunker, and fatback.

In length the menhaden is about the same as the common sea herring, but is deeper and more robust in appearance. Its weight, when full grown, is from two-thirds of a pound to one pound. A large specimen, of which a cast is preserved in the National Museum, measured 20 inches in length, while the average length is from 12 to 15 inches. At the menhaden factories, in estimating the number of fish in a certain bulk, 22 cubic inches are allowed to each fish.

The geographical range of this fish is along the Atlantic seaboard from Maine to Florida, its northern limit of migration being the Bay of Fundy, while its southern limit is Mosquito Inlet, on the Florida coast. It is found in bays and rivers as far inland as brackish water extends, and it ranges oceanward as far as the Gulf Stream. Other species of menhaden occur in the Gulf of Mexico, along the South American coast, and on the west coast of Africa, but none resembling it are found in the Pacific Ocean. The fishery is limited to the Atlantic seaboard of the United States.

Schools of menhaden make their appearance in the coastal waters upon the approach of warm weather and they remain until the cooling of the water drives them away, the temperature most favorable for them being from 60° to 70° Fahrenheit. Along the coasts of the Southern States they appear earlier and remain longer than farther north. In Chesapeake Bay they usually appear in March and April, on the New Jersey coast in April and early in May, and along the shores of Southern New England in the latter part of April and May; at Cape Ann about May 15, and along the coast of Maine in the latter part of May and the 1st of June. Since 1879 these fish have not appeared north of Cape Cod, except in very limited quantities, though they were formerly very abundant along the Massachusetts coast. In the autumn they usually begin to leave the Maine coast in September, and, gradually working to the southward, or perhaps seaward, disappear from Long Island Sound in November and December, from Chesapeake Bay in Decem-

ber, and from Cape Hatteras in January. They are found farther south in greater or less abundance throughout the entire year. Not enough is known of the movements or habits of these fish to determine the winter home of the great schools that summer along the New England and more southern shores, but one of the most plausible theories at present advanced is that they remain in temperate stratas of ocean waters known to exist under the Gulf Stream and between it and the American coast.

As the menhaden appear in early spring in Chesapeake Bay and farther north they increase rapidly in abundance until in some places the water is almost alive with them. They prefer the shallow places along shore, and in some years crowd in great numbers into the brackish sounds and inlets and ascend some of the larger rivers for a long distance, until the water becomes too fresh for them. They are accustomed to swim in immense schools with their heads close to the surface, packed side by side, and often tier above tier, almost as closely as sardines in a box.

The commercial importance of the menhaden has but lately come into appreciation. Thirty years ago, and before, it was thought to be of very little value. A few millions were taken every year in Massachusetts Bay, Long Island Sound, and the inlets of New Jersey. A small portion of these were used for bait, and a few barrels were salted for home use or for export to the West Indies. Large quantities were plowed into the soil of the farms along the shores and stimulated the crops for a time, but in the end filled the soil with oil, parching it and making it unfit for tilling. Since that time manifold uses have been found for this fish and its products. As a bait-fish it excels all others. For many years much the greater share of our mackerel were caught by its aid, while the cod and halibut fleets use it rather than any other fish when it can be procured. The total consumption of menhaden for bait in 1877 was not less than 80,000 barrels. Ten years before, when the purse-seine was not in general use in the mackerel fishery, the consumption of menhaden bait was very much greater.

As a food resource the menhaden is thought to have great possibilities, large quantities having been canned under the name of "American sardines" and "Shadines," but the superiority of small herring for canning purposes has led to an abandonment for the present of efforts to introduce menhaden "sardines." An extract of fish, said to possess all the properties of Liebig's "Extract of Beef," was some years ago discovered by Mr. S. L. Goodale, and may open up a vast field for future development. As a food for the domestic animals in the form of "fish meal" there may be a broad opening.

The great value of the menhaden, however, at present is the oil and scrap produced by cooking and pressing these fish. As a source of oil the menhaden is of more importance than any other marine animal. The annual yield of this oil usually exceeds the production of the American whale fisheries by about 200,000 gallons, and in 1874 did not fall far short of the aggregate of all the whale, seal, and cod oil made in America.

The number of menhaden taken has, in some years, been considerably more than 1,000,000,000 fish. In 1880 the weight of the catch was 576,000,000 pounds, equivalent to about 700,000,000 menhaden in number. The quantity of oil produced in 1880 was 2,066,396 gallons, and of guano 68,904 tons, having a total value of $2,034,641. The capital invested in steamers and their outfit and in factories was $2,362,841. As compared with previous years, the yield of oil in 1880 was small. In 1874 the number of gallons was 3,373,000; in 1875, 2,681,000; in 1876, 2,992,000; in 1877, 2,427,000. In 1874 the value of the oil and guano was $1,809,000; in 1875, $1,582,000; in 1876, $1,671,000; in 1877, $1,608,000; in 1878, $1,050,000.

2. FISHING GROUNDS.

The menhaden fishery is carried on chiefly by fishermen of New England, New York, and New Jersey, along the coast, and by the fishermen of Virginia and a few from Maryland, in the waters of Chesapeake Bay. Prior to the year 1879, when menhaden suddenly disappeared from the region north of Cape Cod, the Gulf of Maine was one of the principal fishing grounds, and was resorted to by a very large fleet of sail and steam vessels. Since 1879 the cruising grounds have been south of Cape Cod, one of the best places being along the Long Island shore from Montauk Point westward. Other important fishing grounds are in the waters of Long Island Sound, along the New Jersey coast, and in Chesapeake Bay.

As soon as the fish make their appearance in spring, vessels start in pursuit of them and continue their capture until their disappearance in the autumn. From the menhaden oil and guano factories along the Southern New England, New York, and New Jersey shores the fleets of steam and sail vessels begin their cruises early in May, pursuing the fish along the shores and in the sounds wherever they can be found.

The regular fishing grounds at present extend from Chesapeake Bay to and including Long Island Sound, and in some seasons extending into Vineyard Sound, on the southern coast of New England. The vessels seldom cruise more than 10 or 15 miles from land. The total area of the grounds is estimated at 5,350 square geographical miles, divided as follows: Long Island Sound and the vicinity of Block Island, 1,200 square miles; off the south side of Long Island, from Montauk Point to Sandy Hook, with an average width of 15 miles, 1,575 square miles; off New Jersey, from Sandy Hook to Cape May, 1,575 square miles; Delaware Bay, 150 square miles; Cape Henelopen to Cape Charles, with an average width of 2 miles, 250 miles; Chesapeake Bay, from the Capes to Tangier Sound, 600 square miles.

The absence of menhaden north of Cape Cod during the last few years has caused a great loss to the capitalists interested in the numerous oil factories on the Maine coast and much distress among the men who depended on this fishery. Mr. R. E. Earll thus describes the effects of this scarcity in 1879:

"The total absence of pogies along the coast of Maine is causing no little loss to all interested. The shore fishermen have lost fully half of their time and over half of their usual catch from not being able to get any pogies to fish with, while the 'George's-men,' from Cape Ann, have been driven far out of their way, going even to Rhode Island and Connecticut to obtain their usual supply of pogy bait. Some have ventured to seek bait here, in the 'hedges' and traps of the river fishermen, and have frequently taken river pilots and gone far up the Kennebec, often waiting fully a week before getting their supply. The oil and guano factories had gone to considerable expense in getting ready for the season's work, and their property is entirely idle. The factory hands and steamers' crews have been thrown entirely out of employment, and are perhaps less able than any of the other classes interested to bear such a loss. The general prosperity of the pogy fisheries, for some years past, has drawn to them a large class of workmen from other occupations. Some, in moving into this region, have built for themselves small houses and have been depending on the summer's work for the means to pay for them or to complete them; others have spent their entire means in getting their families located, and almost none have money laid up to carry them through the winter, and but little employment can be had from this time forward. They were all on hand to begin work the first of June, and kept waiting, in hopes that the fish would 'strike,' until late in August. When they at last gave up the idea, it was too late to engage in any other occupation. A few of them have gone out in small boats to 'hook' for

mackerel, but have met with indifferent success. After waiting for a long time for the fish to appear, a few firms allowed the crews to take their steamers south and sell the fish to factories there."

Along the north coasts of North and South Carolina menhaden are abundant, but efforts to establish fisheries in that region have not been successful. Mr. R. E. Earll, in another place, discusses the possibilities of the menhaden fisheries of North Carolina. He says that an attempt was made to establish an oil and guano factory at Charleston, S. C., a few years since, but the plan was abandoned after the first day's fishing, on account of the abundance of sharks. *Several efforts have been made to locate factories on the North Carolina coast, and some parties* have prosecuted the business with varying success for several years. Thus far, however, no one has succeeded in making it profitable. It is, therefore, an open question whether this fishery can be prosecuted in the State. The currents are so strong at the inlets that sail vessels are often unable to enter them when the tide is unfavorable, and they are thus frequently delayed so long that the fish spoil before they reach the factory. *Menhaden are quite abundant in the inner sounds,* but the water is usually so shoal as to interfere seriously with the use of purse-seines, and the fish are so scattered that only a few barrels can be taken at a haul.

3. THE FISHERMEN.

The men engaged in this fishery are, as a rule, employed in agricultural or other pursuits after the fishing season is over. Along the Rhode Island and Connecticut shores many of them pursue the cod or other fisheries throughout the winter and the menhaden fishery in the summer, while the crews of menhaden vessels in Chesapeake Bay are farmers when the fishing is not in season. The number of men required to man a menhaden vessel varies from two or three on a carry-away boat or tender, to crews of twenty-seven or thirty on the double-gang steamers. The fishermen were formerly allowed a certain share in the results of a cruise, but most of them are now hired at fixed wages. On the steamers the crew receive from $30 to $40 per month and their board; the mate has wages and a share in the profits, and the captain receives no regular wages, but a share in the profits of the cruise. The owners of the vessel furnish provisions and all the requisites for fishing. In 1879 most of the owners of vessels engaged their crews on halves, the factory issuing printed regulations as to the price to be allowed for the catch. The prices paid in that year were 30 cents per barrel of 200 pounds, from the beginning of the season until August 1; from that date till the middle of September, 60 cents per barrel; and then 80 cents per barrel till the end of the season in Maine. The increase in price was because of a corresponding increase in the fatness of the fish.

One of the ordinary size menhaden steamers carries fourteen men, consisting of a captain, mate, cook, engineer, fireman, and a crew of nine men. The captain must, of course, be an experienced fisherman, and, as an incentive to hard work, he is frequently allowed a large share in the profits. He must be a good navigator, and have a pilot's license to permit his pursuing the fish into bays and sounds, and to allow his entering a harbor convenient for shelter. The mate also must be an experienced fishermen and "have a good eye for fish"; for, as he is generally stationed at the masthead to watch for schools, much of the success of the trip depends on him. A good fisherman can sometimes see the fish swimming even 1 or 2 fathoms below the surface and determine whether they are herring, mackerel, or menhaden. As soon as they show themselves at the top of the water he can judge the size and quality of the school. The duties of the mate are also to care for the gear and to superintend the landing of the cargo. The cook is in many cases hired

and paid by the crew at about $40 per month. When the men are all out in the boats after fish the cook acts as pilot, guiding the vessel alongside the seine full of fish.

The engineer must be always at his post in the engine room, except when taking in the catch, when he tends the donkey engine, the vessel at that time not being under way. The engineer and fireman are paid regular wages, the former generally a larger sum than the fishing crew.

THE RELATION OF THE MENHADEN FISHERY TO THE FISHERMEN.

In discussing the relations between the fishermen and the fisheries, when the business was carried on along the coast of Maine, Mr. Maddocks says:

"The steamers return every night, if they have any fare, and are hardly absent more than two or three days. Operations are suspended in bad weather. The oil is manufactured at once, and meets ready market. The men can thus be promptly paid; whereas in the mackerel and cod fisheries the hands are sometimes obliged to wait until the end of the season for settlement; the service is dangerous and comparatively full of hardships. The Menhaden Association has never lost a man in its service, and not one of the steamers has ever burst a boiler. This is the more important, since the cod and mackerel fisheries have been and are greviously oppressed, and greatly reduced by the tariff regulation that admits English fish free to our markets. The Englishman can build his craft at less cost than the American, can fit and equip her cheaper, and can therefore afford to sell his fish at a lower figure than the home fishermen, and at the same time he pays none of our taxes while enjoying the benefit of our market. The menhaden fishery has afforded no little relief in this condition of things to the unemployed fishing population on our coast and elsewhere."

Mr. R. E. Earll thus describes the relations of the fishermen of Maine in 1879: "The factories have printed regulations as to the price to be paid for the fish, paying more toward the close of the season as the fish get fatter. In 1879 the prices adopted by the Maine Oil and Guano Association were 30 cents per barrel till August 1, 60 cents till September 15, and 80 cents till the end of the season in Maine. Mr. L. Maddocks says that the average amount of oil for the season to a barrel of fish is about 1 gallon from fish taken south of Cape Cod, and 2½ gallons from those taken later on the coast of Maine.

"The men are almost wholly Americans, will average about thirty years of age, and are, as a rule, the strongest and most energetic men of the section. The business being more remunerative than other kinds of fishing, men are anxious to engage in it, and thus the captains have a large list to select from; and as there is much hard work that at the same time requires quickness of movement, skill, and good judgment, the crews are selected on account of their fitness for the place.

"The captain not only has an average share with the crew, but is paid an additional 5 to 10 cents for each barrel of fish landed, as an incentive to extra exertions. He must be a practical fisherman, have an accurate knowledge of the coast, and a pilot's license to enable him to follow the fish into the rivers and bays of the coast and to take the steamer into any convenient harbor for shelter. In addition to this, he must, to use the language of the secretary of the Maine Oil and Guano Association, 'have a good eye for fish,' which means that he must have a sharpness of vision that will enable him to see the fish schooling at a distance or to detect their presence under water from a slight change of its color. Even when swimming at a depth of 2 or 3 fathoms an experienced eye will distinguish between pogies, mackerel, and even herring. The average captain will make $1,000 while the fish are on the coast of Maine, which is an average of $250 per month. The practice of hiring the captain outright is coming into favor, and in 1878 probably 10 per cent. of those from Maine were working upon salary, getting an average of $1,500 for the season,

which begins in the vicinity of Long Island the 1st of May. The fish gradually work north to the coast of Maine in June, where they remain until October, when they go south as far as Long Island again, the season closing about the 1st of November.

"The mate must also 'have a good eye for fish,' as he generally goes to the masthead with the captain to look for them. His duties are to look after all the gear, superintend the salting, and mending of the seine, and tend to discharging the fish at the factory, keeping an accurate account of the number of barrels landed. He gets from 1 to 3 cents per barrel on all the fish landed in addition to his average share with the crew.

"The cook is hired outright at $40 to $50 per month, and is paid wholly by the crew. Formerly he had an average share, but of late this practice has been given up. He takes charge of the steamer when the men are out in the boats, and frequently brings it alongside the seine after it has been pursed up.

"The engineer must have a license, and is expected to remain at his post all the time, except *when at meals and when running the donkey engine for hoisting the fish into the steamer.* When the business first started he received $100 per month, but the wages have kept falling, until the present season (1879) some of them get only $50. The fireman generally receives from $25 to $30. Both are paid and boarded by the owners.

"The crew 'go at the halves' and board themselves. They live probably the most extravagantly of any class of fishermen, and in some cases go into foolish expenditures for the table.

"Mr. Maddocks cites instances of its costing them $10 per week for provisions alone, and he estimates their average cost of living to be $6 or $7 per week, though, from what I learn from other sources, I should say $4 would be nearer the figure. They also pay their cook's wages, thus bringing the expense of living perhaps a little above the figures stated. They are expected to get the steamer ready in spring, do the fishing, mend and care for the seine, and put steamer, boats and gear in order, to be left for the winter. They make on an average about $50 per month, leaving a balance, after paying their expenses, of but little, if any, more than the ordinary fisherman."

4. THE VESSELS.

Schooners and sloops were the only vessels in this fishery until a few years ago, when steamers were introduced, and as they have been found preferable to sailing craft they are now very generally employed on the northern grounds, though a large fleet of sailing vessels continues in the business. In the year 1880 the menhaden fleet comprised eighty-two steamers and three hundred and seventy-four sailing vessels, aggregating 12,905.71 tons, and equipped with six hundred and forty-eight seine-boats. The value of the fleet, including seines and other outfit, was $1,357,304. The average steamer is about 70 tons measurement, and costs $16,000. They are about 90 feet long, 17 feet beam, 7½ feet depth of hold, and 7 feet draught aft. The largest steamers in the fleet are more than 150 feet long; these carry from 27 to 30 men, and cost $30,000 and upwards. The cost of running the average steamer is about $1,000 per month for wages, fuel and provisions. They are screw steamers, and are rigged with one mast forward, which is fitted with a crane used in taking in the catch. The quarters for the men are in the forecastle, under and forward of the pilot-house. A little forward of amidships is the main hatch opening into the hold, where the fish are stowed in bulk. The engine-house is astern the main hatch, with coal-bunkers opening on the deck on either side. Fitted to the bulwarks on either side, near the stern, are cranes for the boats, and towing-chocks are set in the deck on either quarter aft. The steamers are built of hard pine, with white-oak frames. The hold or tank for stowing the fish is water-tight, and is said to make the vessels exceedingly safe. The menhaden steamer Jemima Boomer, while at sea in rough

weather, had 50 feet of her keel knocked out, together with eleven of the bottom planks, yet she was run safely into port and taken upon a marine dock for repairs.

The steamers are so constructed that they are not fit for sea in rough weather, and they seldom venture from harbor at such times. This frequently delays them from going to and coming from the factory when fishing at a distance, though it does not interefere with the fishing in other respects, as a seine cannot be managed in rough water, and the fish are then not apt to come to the surface.

The sailing vessels are either schooner or sloop rigged, many of them being open boats of from 5 to 10 tons measurement, while the larger vessels are in some cases 80 or 90 tons.

Prior to 1879 fleets of vessels from Massachusetts ports were engaged in the capture of menhaden to be used for bait. From Gloucester, forty schooners of from 20 to 70 tons, employing four hundred men, were thus kept busy throughout the menhaden season in supplying the cod and mackerel vessels with bait. In the same employment there were also hundreds of boats fitted with gill-nets. It is probable that this branch of the menhaden business will be renewed when menhaden reappear on those shores.

With the advent of steam vessels the factories have increased their facilities for handling large catches. The first factory could work up only a few hundred barrels daily, while the large factories can now take from 3,000 to 5,000 barrels per day. The average catch of a steamer a few years ago was not more than 5,000 barrels, while now 20,000 barrels are not infrequently taken in a season.

The menhaden carry-away boat is a wide-beam, sloop-rigged open boat capable of heavy burden, and is used, when fishing with sailing vessels, to carry their catch to the factory. Steamers have no need of these boats, but take their fish direct to the factory.

5. APPARATUS AND METHODS OF CAPTURE.

Prior to 1860, when menhaden were of very small importance, the business of manufacturing oil and guano being still in its infancy, almost the only use for the fish was as a fertilizer in its raw state. This demand was then easily supplied by the use of haul-seines and gill-nets along the shore. The fish then swarmed the bays and inlets all along the New England coast, and there is good authority for a story that 1,300,000 were once taken with a single haul of a seine in New Haven Harbor. Constant fishing on the northern coast has driven the fish out to sea, though in the south their habits are much the same as of old. In New England the menhaden fishing has become, to a very considerable extent, sea-fishing and is carried on by the fleet of steamers and sailing craft.

The purse-seine is the most effective apparatus ever devised for the capture of either mackerel or menhaden. It has almost entirely superseded all other forms of apparatus in these fisheries. By its use, even in the open sea, immense schools of fish are easily secured in a small fraction of the time required when the hook and line and gill-net were chiefly employed. The purse-seine is, however, not adapted for fishing in very shallow water, unless on smooth bottom, so that gill-nets and haul-seines are still used in rivers and in hauling fish ashore. When set in the water the purse-seine is a flexible wall of twine hanging from a corked line on its upper edge and extending from 75 to 150 feet beneath the surface and from 750 to 1,800 feet long. This wall is made to encircle the school of fish, and then the lower edge is gathered up by a rope passing through rings, thus forming an immense bag. The largest seines are for use in water 45 to 60 feet deep, and the smallest in water about 20 feet deep. The usual size of mesh in the seines is 2½ inches, that is, 1¼ inches square; some are only 2¼ inches, and in Chesapeake Bay, where the fish are small, they are

only 1¼-inch mesh. The seines of 145 feet depth are about 700 meshes deep. A seine with 2½-inch mesh is the standard size for the average menhaden, which is estimated at 22 cubic inches.

The corks at the upper edge of the seine are strung on the cork-line at from 12 to 15 inches apart, two corks, known in the trade as Nos. 2 and 3, being put together, and are 4 inches in diameter. About 60 pounds of lead weights, each 2 ounces, are fastened along the bottom of the seine at intervals of 4 inches apart at the sides and farther apart at the middle. The lower edge of the seine is hung on six-thread manila line, and to this are attached the bridles, which are about 18 feet long and placed 18 feet apart. Upon each of these bridles slides one of the purse-rings, made of iron or brass, weighing 1½ to 2¼ pounds and about 3½ inches in diameter. Many of the seines have less weight than that given above. In operating the seine a large, heavy weight, called purse-weight or "Long-Tom," is used, which is placed upon the vertical ropes at the end of the seine, by the use of snatch-blocks, and allowed to run down to the bottom of these ropes, thus holding together the ends of the lead-line before the pursing begins.

The purse-lines are arranged to pass obliquely from the last purse-rings which are about 6 feet from the lead-line. This has the effect of leaving large triangular flaps of netting at the end and closing the opening of the seine when it is pursed. The twine is of cotton, No. 20 to No. 12 thread, except the middle or "bunt" of the seine, which is of stronger twine, No. 14 to No. 9 thread, to prevent the escape of the fish when they are crowded into a small compass. The twine is prevented from rotting by being tarred after the seine is knit and is preserved during the fishing season by sprinkling salt over it after each haul. The number of menhaden purse-seines in use in 1880 was 366, valued at $138,400.

THE SEINE-BOATS.—The seine-boats were formerly square-sterned, lap-streak boats, about 28 feet in length, and resembling in shape an ordinary ship's yawl; but the boats now in use resemble the whale-boat in shape, differing from it, however, in some important particulars. According to Mr. Gifford, a practical seine-boat builder of Gloucester, the seine-boat must have three qualities: (1) It should tow well; consequently it is made sharpest forward; a whale-boat, on the other hand, is sharpest aft, to facilitate backing after the whale has been struck. (2) It should row well, and this quality also is obtained by the sharp bow; the whale-boat also should row well, but in this case it has been found desirable to sacrifice speed in part to the additional safety obtained by having the stern sharper than the bow. (3) It should be stiff or steady in the water, since the operation of shooting the seine necessitates much moving about in the boat.

The average length of the seine-boat is about 34 feet, its width 7 feet 5 inches, and its depth amidships 33 inches. At the stern is a platform measuring about 4 feet, fore and aft, on which the captain stands to steer. This is 6 to 8 inches below the gunwale. Another platform extends the whole length of the boat's bottom, from the after part of which the seine is set. In the bow is still another platform, on which stands the man who hauls the cork-line. There are four thwarts or seats, a large space being left clear behind the middle of the boat for the stowage of the seines. Upon the starboard side of the boat, near the middle, is arranged an upright iron support, about 18 inches in height, to which are attached two iron snatch-blocks, used in the working of the purse-ropes. On the opposite side of the boat, generally near the bow and stern, but with position varied according to the fancies of the fishermen, are fixed in the gunwale two staples, to which are attached other snatch-blocks used to secure additional purchase upon the purse-ropes. In the center of the platform at the stern of the boat is placed a large wooden pump, used to draw out the water which accumulates in large quantities during the hauling of the seine.

Most of the steamers carry four seine-boats, two being used in setting the seine, one called the purse-boat and the other the mate-boat.

Mr. Earll thus describes the methods of seining for menhaden:

"The steamer is put in readiness for starting by the engineer and fireman as early as 2 to 4 o'clock in the morning, depending wholly on the distance to be run before reaching the fishing grounds. When all is ready the captain is called and takes the steamer to the fishing ground. In the mean time the cook is preparing breakfast, and when ready the crew are called, giving them just time to finish their meal before reaching the grounds, which is generally about as soon as it is light enough to see the fish. After breakfast the captain and mate generally repair to the mast-head and keep a sharp lookout, while the steamer jogs slowly along in almost any direction. In the mean time the crew are busily engaged in transferring the seine to the two boats, one-half in each, and all is in readiness in a few moments.

"When a school is seen the crews take their places in the seine-boats, while two of the party known as 'drivers' go out in advance in little 13-foot boats to learn the direction in which the school is moving and to mark out its size. The captain generally takes his place at the inside bow oar in one of the seine-boats, the mate a corresponding position in the other, and by the time they reach the school the drivers give them information of the movements of the fish. They now begin throwing out the seine, each boat going in an opposite direction around the school, the drivers in the mean time doing what they can by splashing to check the fish in case they attempt to run out of the seine. Soon the boats meet and the captain and mate take their places in the middle of the boat, and with others begin hauling in the purse-line while the rest are hauling on the net and cork-line. The men from the drive-boats help in this, and after it is pursed up the captain frequently goes aboard and brings the steamer alongside, while the other boats go to the opposite side of the seine from the pursers and fasten their boats to the cork-line to prevent the fish from escaping over it. In the mean time the men are hard at work drawing the net in and bringing the fish nearer together. Four will pull corks, two bag or net, and the others lead. After the fish are driven well together the net is fastened to the steamer's side, and they are bailed into the hold by means of a large dip-net run by a donkey-engine.

"Mr. Maddocks says that 1,300 barrels were taken at one haul by the schooner Wave, Capt. C. A. Esterbrook, of Round Pond, while fishing off Muscongus Bay, in August of 1870 or 1871.

"After the fish are all taken from the seine, it is taken aboard the steamer to straighten (or 'clear,' as it is called), and again taken into the boats, when everything is ready for another set.

"Each steamer carries two seines—one 300 fathoms long, 20 fathoms deep, with a 3-inch mesh; the other, 200 fathoms long, 15 fathoms deep, with 2½-inch mesh. The larger seine has about 5,000 corks, and the smaller 4,000. Leads are not used, but in their place they have metal composition rings weighing about 2 pounds, through which the purse-line passes. The larger seine requires about 60 and the smaller 40 rings. A seine will last with proper care about two seasons.

"As soon as the steamer has been filled with fish, the captain generally takes the wheel and heads her for the factory, or, if fishing at a long distance off, he goes for a harbor, whence he ships his fish by a sailing vessel chartered for the purpose. In case few fish have been taken, the vessel continues to jog about till nearly dark, and then either returns to the factory or makes harbor in the vicinity for the night, but in very pleasant weather they will occasionally remain on the ground instead of running in. As soon as the vessel is headed for home the mate sets the men to salting and stowing the seine and putting things to rights. On reaching the factory, the steamer is made fast and the captain goes below to turn in, and the engineer and fireman, after banking their fires, do the same. The mate now takes charge of the unloading, and sets the crew to work taking out the fish at the rate of 250 barrels per hour, by means of a large hoisting-tub worked by steam from the factory.

"It is generally quite late when the last fish are out, and, after washing down the deck and hold, the crew lose no time in going to their bunks for the night."

MENHADEN FISHING ON A LONG ISLAND STEAMER.*

"Loitering in comfortable indecision, I was fortunate enough to get an invitation from Capt. 'Jed' Hawkins to take a fishing cruise in his 'bunker' steamer. The start was to be made at earliest dawn—an ungracious hour—and I was glad to leave the hotel in the evening and avail myself of a sofa in the captain's snug stateroom behind the pilot-house, so as to avoid the annoyance of getting up in the middle of the night. It was Sunday, and the little wharf was utterly deserted as I picked my way among the rubbish and piles of merchandise down to the steamer. Standing on the high deck, a picture of serene beauty spread before me. The air was perfectly still, the moon just fairly risen, and no sound was to be heard save the ticking of that mighty time-piece, the tide, as its wavelets swung gently back and forth under the weedy piers or divided against the sharp prows of the smacks. It was light enough to show the spars and ropes of every craft, and all lay as motionless as though fixed in rock rather than floating in liquid, save the tremulous blue pennons on the topmasts. Then I turned in; and when I emerged, after an hour's pounding on my door (as it seemed) by the chuggety-chugging engines, we were far down Gardiner's Bay.

"Last night the unruffled water was like bronze. Now, under the soft silvery haze of the morning, the dancing surface became frosted silver, opaque and white, save where the early sunbeams, striking through the mist, were reflected from the crests of the ripples in glancing ribbons of light. Shelter Island was an indistinguishable mass far astern; Long Beach light had ceased to twinkle; Orient Point was hidden in haze; Plum Island, where eagles used to make their metropolis, and many fish-hawks now live, nesting on the ground with the gulls, was only a low bank of blue; Gull Islands could not be seen at all; and I only knew that Little Gull, with its copper-bolted wall, was there from the dot in the horizon made by its lonely light-house, and an occasional gleam, imagined to be the surf, breaking on the reefs at the Race. All this was northward. Southward the wooded bluffs of Gardiner's Island, with its natural breakwater and light-house, like a long arm reaching out between the outer and the inner waters, limiting the view. But this was soon left behind, and as the deep indentation of Napeague came into view the steamer's head was turned southeastward, toward Montauk, which, in the growing light, now stood out plain in every bleak feature of sandy dune and treeless moor. Now a very sharp lookout must be kept for fish; and after the substantial breakfast in the forecastle, I took my pipe and a place in the shrouds. Even then I could not look across Montauk, but could easily see two great ponds of fresh water, which nearly served to make an island of the point. One of them, Fort Pond, was once a scene of sanguinary warfare between the Montauks and Narragansetts, the latter being beaten only by help from the Shelter Island Indians, who drove the invaders to their canoes.

"Off Culloden Point the lookout excitedly announced, 'Fish off the port bow.' The captain seized his glass and scanned the water. So did I. 'There's a big bunch,' he shouts. 'Watch 'em flirt their tails. Good color. See how red the water is.'

"'Oh, yes; to be sure,' I cry. 'By Jove, that's a good color.'

"My vacant face must have belied my words, but he didn't notice it. He was shouting, 'Lower away the boats; stand by to ship the nets;' furiously ringing signals to the engineer; giving hasty orders to the wheelsman; ensconcing himself in a pair of oil-skin trousers, so capacious I half expected he would disappear altogether; and so, amid the roar of escaping steam, the creaking of

* From an article entitled "Around the Peconics," by Ernest Ingersoll, in Harper's New Monthly Magazine for October 1, 1878, pp. 719–723.

davit tackle, the laughing excitement of the crews, and the rattle of rowlocks, I tumble head-foremost into a boat, and the steamer was left behind. Now the flirting of tiny tails was plainly visible, but I must confess that I did not learn to distinguish the reddish hue which indicates a school of these fish until much later in the day. The two large boats side by side were sculled rapidly toward the shore where the fish were seen, the forward part of each boat piled full of the brown seine, which extended in a great festoon from one to the other. There were four men in each boat, all standing up, and in our red shirts and shiny yellow oil-skin overalls we must have made a pretty picture on that sunny morning. Close by was a pound-net, where a porpoise was rolling gaily, notwithstanding his captivity; but by maneuvering we got the 'bunch' turned away from it and well inshore, where the water was not too deep. At last we were close to them, and now came a scene of excitement.

"'Heave it!' yelled the captain, and in each boat a sailor whose place it was worked like a steam-engine throwing the net overboard, while the crews pulled with all their muscles in opposite directions around a circle perhaps 100 yards in diameter, and defined by the line of cork buoys left behind, which should inclose the fish. In three minutes the boats were together again; the net was all paid out; an enormous weight of lead had been thrown overboard, drawing after it a line rove through the rings along the bottom of the seine. The effect, of course, was instantly to pucker the bottom of the net into a purse, and thus, before the poor bunkers had fairly apprehended their danger, they were caught in a bag whose invisible folds held a cubic acre or two of water.

"This was sport. I had not bargained for the hard work to come, to the unsportive character of which my blistered palms soon testified.

"None of the fish were to be seen. Every fin of them had sunk to the bottom. Whether we had caught 10 or 10,000 remained to be proved. Now, lifting the net is no easy job. The weight of nearly 10,000 square yards of seine is alone immense, but when it is wet with cold sea-water, and held back by the pushing of thousands of energetic little noses, to pull it into a rocking boat implies hard work. However, little by little it came over the gunwales, the first thing being to bring up the great sinker and ascertain that the closing of the purse at the bottom had been properly executed. Yard by yard the cork-line was contracted, and one after another the frightened captives began to appear, some folded into a wrinkle or caught by the gills in a torn mesh (and such were thrown back), until at last the bag was reduced to only a few feet in diameter, and the menhaden were seen, a sheeny, gray, struggling mass, which bellied out the net under the cork-lines and under the boats, in vain anxiety to pass the curious barrier which on every side hemmed them in, and in leaping efforts to escape the crowding of their thronging fellows. How they gleamed, like fish of jewels and gold. The sunshine, finding its way down through the clear green water, seemed not to reflect from their iridescent scales, but to penetrate them all, and illumine their bodies from within with a wonderful changing flame. Gleaming, shifting, lambent waves of color flashed and paled before my entranced eyes; gray as the fishes turned their backs, sweeping brightly back with a thousand brilliant tints as they showed their sides; soft, undefined, and mutable, down there under the green glass of the sea; while, to show them the better, myriads of minute medusæ hurried hither and thither, glittering like phosphorescent lanterns in gossamer frames and transparent globes.

"All possible slack having now been taken in, the steamer approaches, and towing us away to deeper water, for we are drifting toward a lee shore, comes to a stand-still, and the work of loading begins. The cork-line is lifted up and made fast to the steamer's bulwarks, to which the boats have already attached themselves at one end, holding together at the other. This crowds all the

bunkers together in a mass between the two boats and the steamer's side, where the water boils with the churning of thousands of active fins. A 20-foot oar is plunged into the mass, but will not suffice to sound its living depths. Then a great dipper of strong netting on an iron hoop is let down by tackle from the yard-arm, dipped into the mass under the guidance of a man on deck who holds the handle, the pony-engine puffs and shakes, and away aloft for an instant swings a mass of bunkers, only to be upset and fall like so much sparkling water into the resounding hold.

"'How many does that dipper hold?'

"'About a thousand.'

"'Very well, I will count how many times it goes after a load.'

"But I didn't. I forgot it in looking down the hatchway. The floor of the shallow hold was paved with animated silver, and every new addition, falling in a lovely cataract from far overhead, seemed to shatter a million rainbows as it struck the yielding mass below, and slid away on every side to glitter in a new iridescence till another myriad of diamonds rained down. If you take it in your hand, the mossbunker is an ordinary looking fish, like a small shad, and you do not admire it; but every gleaming fiery tint that ever burned in a sunset, or tinged a crystal, or painted the petals of a flower, was cast in lovely confusion into that rough hold. There lay the raw material of beauty, the gorgeous elements out of which dyes are resolved—abstract bits of lustrous azure and purple, crimson and gold, and those indefinable greenish and pearly tints that make the luminous background of all celestial sun-painting. As the steamer rolled on the billows, and the sun struck the wet and tremulous mass at this and that angle, or the whole was in the half-shadow of the deck, now a cerulean tint, now a hot brazen glow, would spread over all for an instant, until the wriggling mixture of olive backs and pearly bellies and nacreous sides, with scarlet blood-spots where the cruel twine had wounded, was buried beneath a new stratum.

"'How many?' I asked, when all were in.

"'Hundred and ten thousand,' replied Captain Hawkins. 'Pretty fair, but I took three times as many at one haul last week.'

"'What are they worth?'

"'Oh, something over $100. Hard a-starboard! go ahead slow.'

"And the labor of the engines drowned the spat, spat, spat of the myriads of restless little tails struggling to swim out of their strange prison, while I climbed to the masthead to talk with the grizzly old lookout, who had been round Cape Horn thirteen times, yet did not think himself much of a traveler.

"The cry of 'Color off the port bow!' brought us quickly down the ratlines and again into the boats.

"That day we caught 250,000 fish, and made a round trip of 100 miles, going away outside of Montauk Point, where it was frightfully rough after a two days' easterly gale. Great mountains of water, green as liquid malachite, rolled in hot haste to magnificent destruction on the beach, where the snowy clouds of spray were floating dense and high, and the roar of the surf came grandly to our ears wherever we went. Yet the difficulties were none too great for these hardy fishermen, who balanced themselves in their cockle-shells, and rose and sank with the huge billows, without losing their hold upon the seines or permitting a single wretched bunker to escape."

CERTAIN REQUIREMENTS OF PURSE-SEINE FISHING.

METHODS OF HANDLING THE NET.—Much care and expedition are necessary in handling a purse-seine full of fish. In the event of a very large draught, if the fish are left in the net too long they are killed by the confinement and close pressure and sink. In such a case the only alterna-

tive offered the fishermen is to cut open their seine. Sometimes the dead fish carry the net with them to the bottom. When there are more than enough fish in the seine to fill the vessel to which it belongs, and there is danger that they may be lost, other vessels which are near often take the surplus fish. In such a case, writes Mr. Babson, one-half the value of the fish is paid to the captors.

In calm or moderate weather, fishing is carried on from dawn till dark, though morning and evening seem most favorable. In rough weather the nets are not easily set, while the fish usually swim farther from the surface and cannot be seen. Cold northerly and easterly winds seem to affect the fish, causing them to sink toward the bottom. Southerly winds seem the most propitious.

Mr. Dudley states that in the fall, during the southward migration, the fish play at the surface with a northwest wind.

THE BEST TIME FOR SEINING.—The early morning is apt to be the stillest part of the day, and a large part of the fish are taken at that time.

So far as we can learn, the motions of the fish are not particularly affected by the tides, except that, like the *Clupeidæ*, they prefer to swim *against* strong tides and winds. An impression seems to hold among the fishermen that rather better success attends fishing on the flood-tide. This is no doubt the case where gill-nets are in use, for in localities where the fish have not been frightened off shore by constant fishing they like to play up into coves and bays with the rising tide, and are then easily taken by the gill-nets and the pounds or weirs.

Where the purse-seines are worked in deep water off the shore, as on the coast of Maine, little attention need be paid to the tides; but where they are used in bays or channels where the tide has much head, there is a practical difficulty in using them except at or near the time of slack water. In a swift current the seine is liable to accidents from being caught on rocks or other obstructions, or may be capsized or pulled out of position. In Narragansett Bay, the difficulties of this kind appear to be particularly great. According to Mr. Church, it is not uncommon for a gang to work all day without success, their net being capsized every time it is set.

GILL-NET FISHING.

Besides the purse-seine, which is the chief apparatus of capture, gill-nets, set-nets, and haul-seines are also employed along some parts of the coast. On the New Jersey coast gill-nets are shot ahead of the fish as they are swimming along and they are thus easily captured. This method is called gilling. Sometimes an ordinary haul-seine is used, the fish being dragged ashore.

Before the introduction of the purse-seine, gill-nets were the chief means of capture. Until within a few years most of the menhaden fishing east of the Penobscot River, in Maine, was carried on with gill-nets. These nets were usually of No. 12 to 14 4-thread twine, of 3¼ to 4 inch mesh, and from 30 to 180 feet in length by 10 to 24 feet in depth. Two men in an open sail-boat could tend a dozen of these nets, which were set in the night by being anchored in favorite haunts of the fish.

MENHADEN WEIRS.

In former years there were a few menhaden weirs along the Maine coast. In the pound-nets of Martha's Vineyard and other parts of the coast large quantities of menhaden are sometimes taken, but these nets are set specially for other species. The menhaden thus taken are generally sold for bait. Col. Theodore Lyman has given a very graphic account of the capture of bait menhaden in Vineyard Sound:

"The weir is hauled once a day, and always at slack water, because with a strong tide running east or west it is impossible to handle the bottom lines. The men pull out in two parties, of which one in a large scow passes around the outside of the bowl, casting off the bottom lines, while the other in a yawl-boat pushes inside the bowl, pulls up the sliding poles, and closes the entrances. The slackening of the bottom line allows the bowl-net to hang free, and the crew inside begin to haul up the bottom of this net in such a way as to work the fish toward one corner, letting the net as it comes to the surface pass under their boat, which is thus slowly drawn across the bowl toward the corner where the capture is to take place, and where the scow is already waiting outside.

"The scene now becomes an exciting one. The menhaden in thousands begin to show the upper lobes of their tails above the water; here and there darts a feverish mackerel like a blue and silver flash; great leathery skates, looking like pigs rolled out flat, raise their snouts in slow astonishment; here a shark suddenly works his way through the crowding mob; hundreds of goggle-eyed squid, smothered in the press, feebly ply their force pumps; and there the murderous bluefish, undismayed by imminent death, glares fiercely and snaps his savage jaws to the last. All these, with flat-fish, sea robins, butterfish, and many more, are taken and rolled in a fluttering mass, iridescent with changing colors, and shower their silver scales high in air. It moves even the weirmen, in their oilskin clothes, with a slight excitement as they cull out from the menhaden the choice and the offal fishes. There is Uncle Abishai smiting sharks with a spear, like so many Sauls, and he smiteth them not twice; and Captain Ed'ard endeavoring, with a swift scoop-net, to capture a dodging shad, because Mrs. Asa has boarders and needs a fish dinner; and Captain Charles, with the air of one who gets a toy for a good child, diligently striving after some of them ere striped robins that the professor wanted. All this is strange and entertaining, even to a commissioner, who, by the motion of a long swell and the evil piscatory odor, is somewhat afflicted with what the local satire terms 'white-ears.'

"And now the menhaden, bushels on bushels, are scooped all quivering into the great scow, for a little outside lies a mackereler who has just let go her anchor with a rattle, and a boat is pulling in with the skipper to buy bait. 'What you got?' cries he, in an indifferent tone. 'Menhaden,' retorts Captain Warren, as if speaking of a new and scarce fish. (A pause.) 'I don't know but I might take a few barrels if they are low,' says the skipper. (No reply.) 'What do you want for 'em?' 'Eighty-five cents,' shouts Captain Warren, and then (sotto voce), 'I don't believe he's got a scale.' At this answer the man of mackerel pushes over the tiller and steers off indignantly; but presently pauses, 'Give you sixty-five for seventy barrels.' 'Seventy-five cents is the lowest,' replies Captain Warren. 'Call it seventy cents for seventy-five barrels." 'Waal, Waal.' And by this time the scow is full, and the weirmen pull for the vessel, whose numerous crew is ready to hoist the bait on board and salt it down. They stand with knives, barrels, and chopping-blocks, and rapidly cut off the heads and tails of the fish, and the thin parts of the sides, then give a gash in the shoulder, and throw them into the barrel for salting. A mackereler will take as many as 120 barrels of such bait, which is minced fine in a hand-mill and thrown over to toll the fish."

The change in the method of taking mackerel has well-nigh done away with the use of toll-bait so extensively employed in the days of mackerel hooking.

6. OIL AND GUANO FACTORIES.

As stated in a previous paragraph, the chief products of the menhaden are the oil and guano, to be obtained by a process of cooking and pressing. A limited quantity is used for food along

the New Jersey coast, and formerly they were salted down in New England for export to the West Indies. They are also used as bait in various fisheries.

The factories are located at various points along the coast, convenient to the fishing grounds. At the eastern end of Long Island there are a large number of factories, fitted to handle great quantities of fish. One of the largest and best-equipped factories is that of Joseph Church & Co., at Tiverton, R. I. Along the Connecticut and New Jersey shores there are several factories, and in Chesapeake Bay upwards of sixty, many of them, however, very small. The processes of manufacture are fully described in another part of this report.

METHODS OF OIL MANUFACTURE.

THE PRINCIPLES INVOLVED.—The manufacture of menhaden oil is simple in the extreme, consisting of three processes—boiling the fish, pressing, and clarifying the expressed oil. The apparatus absolutely needful is correspondingly free from complication, consisting, for the first process, of a cooking vessel; for the second, a press; and for the third, a shallow vat or tank. These were used twenty-five years ago by Mrs. Bartlett, the manufacturer of the first menhaden oil, who produced an article little inferior to the best now in the market. Very few patents for improved methods of manufacture have been granted. Mr. W. D. Hall's patent for steam-rendering is the most important. The principal changes have been in the introduction of labor-saving appliances, which enable manufacturers to carry on their business with the smallest possible force of workmen. Steam is of course an important auxiliary in handling the fish and in working the presses, and is also used to great advantage in heating the cooking-tanks, as well as for pumping the water and oil. The hydraulic press has replaced the old-fashioned screw-press in most of the larger establishments, and the size, shape, and arrangement of the bleaching vats, as well as the methods of drawing and pumping the oil from one to the other, have been perfected.

PROCESSES EMPLOYED IN MANUFACTURE.—The process of oil-making at the larger works is essentially as follows: The fish are conveyed to the upper story of the factory on wooden tramways in cars containing about 20 barrels each, and are dumped into large reservoirs, from which the cooking-tanks are replenished from time to time, or are emptied directly into the cooking-tanks, which are filled to the depth of 6 inches with sea-water. From 50 to 75 barrels are placed in each cooking-tank, and then steam is turned on and they are boiled for half an hour or more. In this way about two-thirds of the oil is separated; the remainder is expressed by means of the hydraulic presses, under a pressure of 50 to 150 tons or less, the fish having been placed in circular curbs of half inch iron, perforated with holes an eighth of an inch in diameter, each curb having a capacity of 3 to 10 barrels. The oil, mixed with water, is now run into the "drawing-off tanks" while it is still hot, and is passed through several of them, the water separating and sinking to the bottom. The oil is now drawn off into a "settling-tank" of 4,000 or 5,000 gallons capacity, where it remains a few hours to allow impurities to sink to the bottom. Finally, it is pumped into "bleaching tanks," containing several thousand gallons, where it becomes clearer and whiter in the rays of the sun, and after one or two weeks of exposure is ready for shipment.

PROCESSES EMPLOYED IN REFINING.—Boardman & Atkins make the following statements about processes of refining:

"The oil and water running together into the receivers separate by the oil rising to the top, whence it can be drawn or skimmed off. Great pains must be taken to separate the oil from the water before the impurities contained in the latter begin to ferment, for if this happens the quality of the oil suffers much. Moreover, in what appears at first to be pure oil there is a variable amount of finely divided fleshy substance that must be allowed to settle, as it will after a while, and the

clarified oil drawn off before putrefaction sets in. In order to effect the separation the oil is commonly passed through a number of settling-vats, and a portion of the impurities deposited in each, and finally, before barreling, the oil is, if practicable, exposed some hours to the sunlight in a broad, shallow tank. If all these processes are successfully carried through, the oil is light-colored, sweet, and of prime quality; but if it is exposed at any time to the influence of putrefying animal matter, it becomes dark and 'strong.' The very strongest of oil is made from the 'gurry' or settlings of the oil, after fermentation, by steaming or boiling it over.

"It naturally happens that every manufacturer makes several grades of oil, of very different quality, of which the best is very sweet, fine oil, bringing 10 cents a gallon more than a strong article. Notwithstanding this fact, it is said to be the common practice of dealers to pour all grades into the same vat, and this has led manufacturers to take less pains to keep them separate.

"It is a curious fact that oil made from early fish is not so good as that made later. It is called 'weak,' and brings in market five cents per gallon less."*

Gurry oil is sold for one-third less than the other grades.

Perhaps the most satisfactory way of indicating the processes now in use will be to describe three or four of the principal factories in detail.

THE FACTORY OF THE GEORGE W. MILES COMPANY.—The factory of The George W. Miles Company at Milford, Conn., is said to have been the first one built after the model now universally followed, with the cooking-tanks and oil-presses upon the second floor of the building.

When the fishing fleet comes in, the fish are hoisted from the holds of the vessels into cars, in which they are carried over an inclined tram-way to the upper story of the factory building. Here they are turned into tanks, 20,000 fish in each, and cooked by steam-power. Then the water is drawn off and the cooked fish are placed in perforated iron curbs, which are so arranged upon railways that they can be pushed under a hydraulic press. Each curb-load of fish is subjected to a pressure of sixty or seventy tons, by which the greater part of the oil is extracted. The scrap is then dropped into the cellar below.

THE COST OF AN OIL-FACTORY.—The larger part of the cost of an oil-factory consists in the machinery, as the buildings are always of wood, substantial but cheap. The amount invested in factories by different manufacturers appears to range from $2,000 to $65,000. The average amount invested in the fourteen factories of the Maine Association is $22,600, but the general average will not probably exceed $12,000 or $15,000.

Mr. Church, of Tiverton, R. I., speaking of the establishments on Narragansett Bay, remarks that a factory ready for business, including buildings, tanks, boilers, hydraulic presses, oil-room, &c., of a capacity to cook and press 800 barrels (200,000 fish) in a day, costs not far from $14,000. A hydraulic press costs about $1,200; in 1877, $700.

Mr. Miles, of Milford, Conn., states that boilers cost from $2,000 to $4,000, hydraulic presses with curbs and fixtures $2,000; engines, pumps, shafting, and pulleys, together with the necessary buildings, bring the cost of the factory to from $10,000 to $50,000.

Capt. B. H. Sisson, of Greenport, N. Y., estimates the cost of boilers, engine, piping, hydraulic press worked by steam, steam drying machines, and steam hoisting apparatus, to be from $10,000 to $25,000 for each factory.

Mr. Dudley states that a factory running three or four gangs of fishermen costs from $20,000 to $30,000.

The capital invested in the factory is one-half of the whole amount. The fourteen establishments of the Maine Association had in 1874 $316,000 in buildings and machinery and $390,000 in

* *Op. cit.*, p. 27.

"gear"; that is, in steamers, sailing vessels, small boats, and nets; an average of $27,800 to each for gear against $22,600 for factory. In Connecticut, according to Mr. Dudley, about the same proportion holds.

ORGANIZATION OF THE FISHING GANGS.—"In the early days of the business," says Mr. Dudley, "the manufacturers did not own the fishing vessels, nor were they interested pecuniarily in the fishery; they bought the fish from independent fishermen. This method was found unsatisfactory; the fishermen sold to the highest bidder, and the supply was uncertain. Of late years the company owns the vessels which supply it with fish. The crew work upon shares, as in other fisheries. In the settlement, at the end of the season, a sailing vessel, with seine and gear, draws one-third of the net proceeds; a steamer, one-half; the remainder is divided by the crew, the captain receiving an ordinary share, in addition to which he is paid a salary by the company, either fixed or proportionate to the success of the season's work. It is not uncommon for a successful captain to receive a bonus of $500, or sometimes $1,000. In settling the season's account, the total catch is paid for at a rate proportionate to the yield of oil. In 1876, the Quinnipiac Fertilizer Company paid $1.25 per thousand. The company usually advances pay to the men to the extent of $1 a thousand, and at the end of the season a final settlement is made. The crew of a sailing vessel will average from $35 to $75 a month; the crew of a steamer somewhat more."

ADVANTAGES CLAIMED FOR FLOATING FACTORIES.—Floating factories were in use until recently chiefly on Long Island Sound; in whose protected waters they operate to great advantage. They have now gone out of use on account of the introduction of steamers. They were usually built upon the hull of some old vessel, and towed from point to point, gathering the fish from the smacks and working them up into oil and guano as they moved. Some of them were fitted up with machinery for very extensive manufacture. Two important objects were attained by the owners of floating factories: The objection to their business arising from the offensive odor was to a considerable extent removed; by following the movements of the fish time and expense were saved, for by bringing the factory to the fish they obviated the necessity of having a fleet of lighters to carry the fish to the factory, which might often require two or three days. There were five of these factories in 1878; one owned at Milford, Conn., and four at Greenport, N. Y.

7. THE MENHADEN AS A BAIT FISH.

THE USE OF MENHADEN FOR BAIT.—Menhaden bait, when obtainable, is extensively used in the cod fisheries of New England. Its popularity is no doubt chiefly due to the ease with which it may be obtained in large quantity, though its oily nature and strong odor render it particularly well adapted for use as a toll bait for mackerel. "Slivered porgies" are carried by the vessels fishing for cod on the Grand, Western, and George's Banks. According to Capt. N. E. Atwood, salted menhaden are good bait for haddock, but inferior for cod.

In the days of hooking mackerel thousands of barrels of menhaden were used for toll-bait, but the purse-seine has done away with the need of such bait, except in special cases.

The menhaden were said to be superior to all other mackerel bait. They were ground up fine in a bait-mill and then thrown over with a bait-dipper. A great deal of testimony concerning the use of menhaden as mackerel bait was given before the Halifax Commission.

THE TESTIMONY OF CANADIAN OFFICERS.—Mr. H. W. Johnson, of the Department of Marine and Fisheries, wrote, in 1868, a "Special Report on the Distress among the Nova Scotia Fishermen." One of the reasons assigned by him for the failure of the fisheries is that "the pogies, the only real mackerel bait, is not caught east of Portland, and must all be imported for our fleet, the increased cost of which, added to the American duty, the fisherman has to pay on his share of

fish, besides charges of transportation place him in the position that if he catches during the season, to his own share, forty barrels of mackerel in one vessel, he has not made as good a season by about $100, gold, as if he had been in an American bottom."*

Capt. P. A. Scott, R. N., commanding the marine police of the Dominion, reported, in 1870, to the Commissioner of Marine and Fisheries: "For mackerel fishing the Americans use pogies and clams, chopped fine, as bait. The pogies are found only on the coast of the United States, and when imported into the Dominion cost about $6 per barrel."†

Capt. Charles G. F. Knowles, R. N., commanding H. M. S. Lapwing, cruising on fishing station No. 4, which includes the west coast of Cape Breton and the east coast of Prince Edward Island, reported to Vice-Admiral Fanshawe, November 7, 1870, in these words: "The bait with which the Americans are supplied is far superior to any which can be procured in this country, to which may be attributed, in a great measure, the success of the Americans previously to the recent restrictions, although even now the local fishermen complain that they have no chance while an American schooner is fishing near them."‡

Professor Hind, in his treatise on "The Effect of the Fishery Clauses of the Treaty of Washington on the Fisheries and Fishermen of British North America" (part 1, p. 75), remarks that its value as a bait for cod is, in a considerable degree, superseded by the herring; but as a bait for "tolling mackerel" it is still in repute, although other fish, similarly treated and finely ground, appear to be equally useful in this respect. The first part of this statement is undoubtedly true, at least as far as the fishermen of the British colonies are concerned. In regard to the comparative value of herring and menhaden for toll-bait, there is still room for difference of opinion.

An average of perhaps 250,000 barrels of mackerel were annually caught by the United States vessels, using menhaden bait solely, against 110,000 caught by the Provincial fleet, which used menhaden bait when it could be obtained, buying it at the rate of $6 a barrel in preference to herring bait, which costs only the labor of catching and the salt for preserving.

SLIVERING MENHADEN.—The method of preparing menhaden for salting, to be used as bait, is very simple. The head of the fish is taken in the left hand of the workman, and with a knife held in the right hand he cuts a slice, longitudinally, from each side of the body, leaving the head and vertebræ to be thrown away, or, occasionally, to be pressed for oil. The slivers (pronounced *slyvers*) are salted and packed in barrels. The knife used is of a peculiar shape and is called a "slivering knife."

THE PREPARATION OF MACKEREL BAIT.—The use of menhaden bait for mackerel fishing was inaugurated in 1835 or 1840; the bait is ground up into a mush and salted, to be used as a "toll-bait," and to be thrown over the side of the smack to attract the school to the surface and keep it alongside; this is called "chumming up the fish," and the bait is called "chum" or "stosh." To prepare it for use the "slivers" are passed through a "bait-mill," which is a machine like a farmer's feed-cutter; the fish are thrown into the hopper, from which the fish pass between a roller armed with small knives in rows, and a series of similar knives arranged along a board which slopes toward the bottom. The bait is usually ground at night, by the watch on deck; when the vessel has no "bait-mill," the fish are cut up with a hatchet or scalded with boiling water in a tub. Bait-mills were first introduced about the year 1824. In fishing for mackerel, one man throws over the bait while the rest ply their lines. "Toll-bait" is also used by the smacks, which use purse-seines and drift-nets, to attract the fish to the surface.

* Proceedings Halifax Commission, 1877, Appendix F, p. 67.
† Third Report Commissioner Marine and Fisheries, 1871, p. 312.
‡ *Ibid.*, p. 342.

THE USE OF MENHADEN BAIT IN THE COAST FISHERIES.—Menhaden bait is also used in the coast fisheries for sea bass, on the "bull-tows" or "trot-lines," and in the eel and lobster pots. They are not much in favor for the latter use, however, for the oil of the fish is thought to permeate the flesh of the lobster, imparting to it an unpleasant flavor.

Menhaden have also been used as bait for bluefish in the same manner as in the mackerel hook-fishery, the menhaden being chopped up fine and thrown in the water to attract the schools of bluefish. This method of catching bluefish is called "chumming."

EXTENT OF BAIT-FISHERY IN NEW ENGLAND.—Captain Babson, of Gloucester, whose account of the bait-fishery of Cape Ann is quoted elsewhere, and who has given much other valuable information, states that there were over 60,000 barrels of "round-fish" taken in his district in 1873. Vessels belonging to the companies of the Maine Oil and Guano Association sold in 1873 for bait 2,977 barrels; in 1874, 10,400; in 1877, 10,795. From the bait fisheries about Marblehead, in the vicinity of Provincetown, 1,000 to 2,000 barrels were taken for bait in 1873, according to Mr. Loring. At Chatham, for the past five years, the average catch has been about 5,000 barrels, a large portion of which are sold to the George's Bank codfish vessels. There are some bait-fisheries about Nantucket, which are, however, quite unimportant.

Most of the fish taken at Martha's Vineward are used for bait; in 1873, according to Jason Luce & Co., there were 5,000 barrels.

At Gloucester, according to Capt. F. J. Babson, the 60,000 barrels of round fish make 20,000 barrels of "slivers," worth $4 per barrel to the producer. At Marblehead it averages $1 per barrel for fresh and $6 for salt; at Chatham, $1.50 fresh; at Nantucket, 50 cents to 75 cents, and at Martha's Vineyard 50 cents, as I am told. In Narragansett Bay, according to Mr. J. M. K. Southwick, bait sold in 1871 for $1 and $1.50.

BAIT-FISHERY IN MERRIMAC RIVER AND SALEM HARBOR.—Fisheries of some importance were formerly carried on at the mouth of the Merrimac River. The menhaden thus obtained were used chiefly to supply the Cape Ann fishing fleet with bait, although they were salted for food to a considerable extent. Ten seines and about seventy men were engaged in this fishery during its continuance, which usually lasted about one month—from the middle of June to the middle of July. The seines were 100 to 200 yards long and 5 to 8 fathoms deep, requiring six to eight men to manage them. The boats from which they were worked were light scows, about 25 feet in length and 8 feet in breadth of beam. The seine was set from the stern of the scow, and was worked from the shore by means of long warps.

Capt. Moses Pettingell, of Newburyport, to whom we are indebted for the above facts, states that the seine-gangs have occasionally taken 2,000 barrels of fish in a single day.

Boston and Gloucester vessels were accustomed to anchor at the mouth of the river and wait for their supplies of bait. At one time in 1877 there were 25 fishing schooners waiting. Captain Pettingell estimates that 500 supplies of bait from 10 to 60 barrels were sold annually by the Merrimac seine-gangs.

The regular price of fresh bait for ten years prior to 1878 was $1 per barrel. Probably 1,000 barrels of slivered fish were prepared in 1876; these sold for $5 per barrel. Captain Pettingell estimates the catch for 1876 at 2,000 barrels to a boat, making an aggregate catch of 20,000 barrels, or perhaps 6,600,000 fish. The returns were probably not far from $20,000 in a good season.

The following table is from the Report of the Commissioners of Inland Fisheries for 1877 (p. 65). It is possibly not complete.

TABLE.—*Seine-fishery at mouth of the Merrimac.*

Name.	Menhaden.
E. Thurlow R. Pierce S. M. Perkins W. H. H. Perkins N. Lattime B. Stevens	2,013,675

A similar fishery, though of much less extent, was carried on by Gloucester vessels in Salem Harbor. There being no considerable body of fresh water, the schools were small and easily dispersed. July 15, 1877, I observed six or seven gangs busily plying their seines opposite The Willows. After a day or two the menhaden were driven away, and the fishing ceased until the following week, when they returned and were soon followed by the same boats.

AN ESTIMATE OF THE TOTAL CONSUMPTION OF MENHADEN BAIT.—It is not practicable to make, from the data to which we have access, any very accurate estimate of the total quantity of menhaden bait used in one year. We give below a number of estimates for individual ports or fisheries; 60,000 round barrels are thus accounted for. It is no doubt correct to estimate the total consumption for 1877 at 80,000 barrels, or 26,000,000 of fish.

CONSUMPTION BY THE GEORGE'S BANK FLEET.—The George's Bank cod fleet is owned entirely in Gloucester. There are about 130 vessels, making usually one trip every twenty days. When they can get slivered menhaden they carry no other bait. Early in the summer they go to Vineyard Sound for their bait, where they buy it from the pounds; later they have usually been able to buy nearer home. Each vessel carries about forty round barrels of menhaden, iced. Mr. Joseph O. Proctor estimates the annual number of trips made with this bait at 600. This gives a total amount of 24,000 round barrels, or about 8,000,000 of fish; 24,000 round barrels are equivalent to 8,000 barrels of slivered fish.

Ten years ago, according to the estimate of the same gentleman, the George's-men did not carry menhaden bait on so many trips, nor did they carry so much. He estimates 300 trips, at 30 barrels, giving an aggregate of 9,000 round barrels, or about 3,000,000 fish.

CONSUMPTION BY THE GRAND BANK FLEET.—Mr. Proctor estimates that the Grand Bank cod vessels of Gloucester use in all about 600 barrels of slivered menhaden bait.

Major Low's statement of the outfit of the schooner Madam Roland,"* copied from the trip-book, shows that she was supplied with 5 barrels of pogy slivers, at $8 per barrel, making $40; and 5 barrels of slack-salted clams, at $11, making $55. His model table, to show the cost of a a new schooner fitted at Gloucester, 1875, for a four months' trip to the Grand Bank for codfish and halibut, with 14 hands, estimates for 12,000 pogies or herring, at $100.

CONSUMPTION BY THE MACKEREL LINE-FISHERMEN.—Each mackerel vessel engaged in line-fishing consumes during the course of the season about 20 barrels of salted menhaden slivers. In 1867, when the entire fleet fished with hooks, the amount consumed by Gloucester alone amounted, by Mr. Proctor's estimate, to 6,500 barrels, and the total consumption in the United States of mackerel bait must have exceeded 25,000 barrels. In 1877 the purse-seiners are in a large majority. The whole amount consumed by a seining vessel does not exceed 5 or 6 barrels in a season. Glouces-

*Sailed for the Grand Banks August 26, 1873; arrived at Gloucester October 10, 1873; time absent, one month fourteen days; gross stock, $2,758.27. Doc. and Proc. Halifax Commission, vol. iii, p. 2,600.

ter had in 1877 about 60 "mackerel-hookers," using about 2,400 barrels of slivers, while its seining fleet used about 2,000 barrels more.

Capt. Sylvanus Smith, of Gloucester, stated to the Halifax Commission that a vessel fitting out for a four months' trip to the Gulf of Saint Lawrence would need to be supplied with 40 barrels of pogy bait, worth $6 a barrel, making $240, and 10 barrels of salt clams, worth $8 a barrel, making $80.*

Major Low's statement, copied from the trip-book of the schooner Oliver Eldridge,† shows that she fitted out with 55 barrels of slivered pogies, at $6.50 a barrel, making $357.50, and 7 barrels of clams, at $6, making $42.‡

The amount of these outfits is much greater than that upon which the above estimate was made.

The entire amount used in the mackerel fishery in 1877 probably did not exceed 8,000 or 9,000 barrels of slivers, or 24,000 to 27,000 barrels of "round fish."

CONSUMPTION BY THE CONNECTICUT SMACKS.—In 1878 there were seven Connecticut smacks fishing for the flounder (*Chænopsetta ocellaris*) in Long Island and Block Island Sounds. Five of these hailed from Noank, one from Mystic, and one from New London. Captain Ashby states that these smacks average one trip every four or five days for five months (May to September inclusive). They use only menhaden bait; about one barrel each trip, or perhaps 150 barrels in the season.

About sixteen Noank and four New London smacks fish for sea-bass. Each carries two or three barrels of menhaden bait each trip, making an aggregate annual amount of about 1,000 barrels.

CONSUMPTION BY THE NEW YORK HALIBUT FLEET.—The New York halibut fleet of eleven vessels, owned at Noank, New London, and Greenport, uses only menhaden bait, which is iced fresh in the vessels' holds. A vessel carries from 6,000 to 10,000 fish on each trip, and makes five or six trips. The aggregate number of menhaden thus used is perhaps 480,000, or 1,400 barrels. The usual price is $4 a thousand.

ANNUAL SALE OF BAIT BY THE MAINE MANUFACTURERS.—The Menhaden Oil and Guano Manufacturing Association of Maine sold for bait:

	Barrels of fish.
In 1873	2,977
In 1874	10,400
In 1875	10,752
In 1876	8,432
In 1877	10,795

THE CONNECTICUT METHOD OF ICING BAIT.—A peculiar method of preserving the unsalted menhaden is made use of on board the Connecticut halibut-catchers. The fish, after being very carefully cleaned and eviscerated, are packed with pounded ice in bins holding about 125 cubic feet (about 5 feet in each dimension). A ground-layer of ice-blocks 12 inches thick is first laid, then a tier of fish consisting of two layers and about 4 inches thick, then a layer of 4 inches of pounded ice, and so on until the bin is filled, after which its sides are packed with pounded ice and covered with canvas. Seven to ten thousand fish are thus stowed in one bin. The stowing having been completed, the fish and ice freeze together in a solid mass, which is left untouched until the fishing-banks are reached.

Their supply of bait being thus secured, the vessels are never obliged to make harbor in search

* Documents and Proceedings of the Halifax Commission, 1877, Vol. III, p. 2547.

† Which sailed for the Bay of Saint Lawrence August 5, 1875 (absent two months and twenty-eight days), arrived at Gloucester November 2, 1875, stocking $1,771.83, or 224 barrels of mess mackerel.

‡ Documents and Proceedings of the Halifax Commission, 1877, Vol. III, p. 2602.

of a new supply. They often catch their fare upon La Have or Brown's Bank, and return home without having anchored. The bait is good for three weeks. Captain Ashby states that he has used it on the thirty-third day.

THE CAPE ANN METHOD OF ICING BAIT.—On board the Gloucester vessels the menhaden are not eviscerated, nor are they packed with so much care; consequently they never last more than three weeks. Since twenty-four hours or more are usually occupied on both outward and home voyages, there is only a short time left for which the supply of bait can be counted upon. If by any means this time could be doubled an important advantage would be acquired. Vessels would often be able to complete their fares on the eastern banks without going to Newfoundland for bait. Does the Connecticut method fulfill this requirement? Captain Hurlbert, one of the most experienced fishermen of Gloucester, says no. He claims that neither cod nor halibut will bite well at a fish which has had its blood removed. He says that a half-decayed fish, with the blood still in it, is better bait than a perfectly sweet one kept by cleaning it. He says, still further, that Gloucester fishermen formerly followed this method, but that it was abandoned many years ago, as early as 1866.

THE COMPARATIVE VALUE OF VARIOUS METHODS OF ICING.—The comparative value of the different methods of preserving bait was discussed by Professor Baird in his testimony before the Halifax Commission, which is quoted:

"Question. Now will you state what observation you have made respecting the method of preserving fresh bait from the start all the voyage through?—Answer. As a general rule it is now preserved either by salting or freezing. Of course they keep it as long as it will remain without spoiling, and when you have to carry it beyond that time either ice it or salt it. Salting, of course, is a very simple process, but it alters materially the texture and taste to such a degree that fish or other bait that under certain circumstances is highly prized by the fish is looked upon with a great deal of indifference when salted. Now, there are special methods of preserving the fish or bait by some chemical preparation, which preserves the fish without giving the saline taste. There are preparations by means of which oysters or clams or fish can be kept in solutions for six months without getting any appreciable taste, and without involving the slightest degree of deterioration or destruction. One process submitted to the group of judges, of whom I was chairman, was exhibited by an experimenter, who placed a jar of oysters in our room prepared in that way. I think about the 1st of August those were placed in our room, and they were kept there until the middle of September, for six weeks during the hottest part of the Centennial summer, and that was hot enough. At the end of that time we mustered up courage to pass judgment upon this preparation, and we tasted these oysters and could not find them affected. We would have preferred absolutely fresh oysters, but there was nothing repugnant to the sensibilities, and I believe we consumed the entire jar. And we gave the exhibitor, without any question, an award for an admirable new method. That man is now using that process on a very large scale in New York for the preservation of fish of all kinds, and he claims he can keep them any length of time and allow them to be used as fresh fish quite easily. I don't suppose any fisherman ever thought of using any preservative except salt.

"Q. That is entirely experimental?—A. It is experimental, but it promises very well. Now, borax is one of the substances that will preserve animal matter a great deal better than salt, and without changing the texture. Acetic acid is another preparation, or citric acid will keep fish a long time without any change of the quality, and by soaking it in fresh water for a little while the slightly acidulated taste will be removed. I don't believe a cod will know the difference between a clam preserved in that way and a fresh clam.

"Q. Now, about ice. We know a great deal has been done in the way of preserving bait in ice. How far has that got?—A. It is a very crude and clumsy contrivance. They generally break up the ice into pieces about the size of pebble stones, or larger; then simply stratify the bait or fish with this ice, layer and layer about, until you fill up a certain depth or distance. The result is that if the bait can be kept two weeks in that method it is doing very well. They generally get a period of preservability of two weeks. The ice is continually melting and continually saturating the bait or fish with water, and a very slow process of decomposition or disorganization goes on until the fish becomes musty, flabby, and tasteless, unfit for the food of man or beast.

"Q. Well, there is a newer method of preservation, is there not?—A. There is a better method than using ice. The method described by the Nonnk witness, by using what is equivalent to snow, allows the water to run off or to be sucked up as by a sponge. The mass being porous prevents the fish from becoming musty. But the coming methods of preserving bait are what is called the dry-air process and the hard-freezing process. In the dry-air process you have your ice in large solid cakes in the upper part of the refrigerator and your substance to be preserved in the bottom. By a particular mode of adjusting the connection between the upper chamber and the lower there is a constant circulation of air, by means of which all the moisture of the air is continually being condensed on the ice, leaving that which envelopes the bait or fish perfectly dry. Fish or any other animal substance will keep almost indefinitely in perfectly dry air about 40° or 45°, which can be attained very readily by means of this dry-air apparatus. I had an instance of that in the case of a refrigerator filled with peaches, grapes, salmon, a leg of mutton, and some beefsteaks, with a great variety of other substances. At the end of four months in midsummer, in the Agricultural Building, these were in a perfectly sound and prepossessing condition. No one would have hesitated one moment to eat the beefsteaks, and one might be very glad of the chance at times to have it cooked. This refrigerator has been used between San Francisco and New York, and between Chicago and New York, where the trip has occupied a week or ten days, and they are now used on a very large scale, tons upon tons of grapes and pears being sent from San Francisco by this means. I had a cargo of fish-eggs brought from California to Chicago in a perfect condition. Another method is the hard-frozen process. You use a freezing mixture of salt and ice powdered fine, this mixture producing a temperature of twenty degrees above zero, which can be kept up just as long as occasion requires by keeping up the supply of ice and salt.

"Q. How big is the refrigerator?—A. There is no limit to the size that may be used. They are made of enormous size for the purpose of preserving salmon, and in New York they keep all kinds of fish. I have been in and seen a cord of codfish, a cord of salmon, a cord of Spanish mackerel, and other fish piled up just like cord-wood, dry, hard, and firm, and retaining its qualities for an indefinite time.

"Q. Well, can fish or animals be kept for an unlimited period if frozen in that way?—A. You may keep fish or animals hard-dried frozen for a thousand years or ten thousand years perfectly well, and be assured there will be no change.

"Q. Have geologists or paleontologists satisfied themselves of that by actual cases of the preservation of animal substances for a long period?—A. Yes; we have perfectly satisfactory evidence of that. About fifty years ago the carcass of a mammoth, frozen, was washed out from the gravel of the river Lena, I think, one of the rivers of Siberia, and was in such perfect preservation that the flesh was served as food for the dogs of the natives for over six months. Mr. Adams, a St. Petersburg merchant, came along on a trading expedition, and found it nearly consumed, and bought what was left of it for the St. Petersburg Academy of Science—the skeleton and some portion of the flesh—which were preserved first in salt and afterwards in alcohol. Well, we know the

period of time that must have elapsed since the mammoth lived in the arctic circle must be very long. We know we can talk with perfect safety of ten thousand years. The geological estimate of it is anywhere from fifty to a hundred thousand years; we cannot tell. There is no unit of measure; we know it must have been some hundreds of thousands, and probably it would have remained in the same condition as much longer.

"Q. Now, to come to a practical question, is this a mere matter of theory or of possible use? For instance, could this method be adapted to the preservation of bait for three or four months if necessary?—A. The only question of course is as to the extent. There is no question at all that bait of any kind can be kept indefinitely by that process. I do not think there would be the slightest difficulty in building a refrigerator on any ordinary fishing vessel, cod or halibut or other fishing vessel, that should keep with perfect ease all the bait necessary for a long voyage. I have made some inquiries as to the amount of ice, and I am informed by Mr. Blackford, of New York, who is one of the largest operators of this mode, that to keep a room ten feet each way, or a thousand cubic feet, at a temperature of 20° above zero would require about 2,000 pounds of ice and two bushels of salt per week. With that he thinks it could be done without any difficulty. Well, an ordinary vessel would require about seventy-five barrels of bait—an ordinary trawling vessel. That would occupy a bulk something less than 600 feet, so that probably four and a half tons of ice a month would keep that fish. And it must be remembered that his estimate was for keeping fish in midsummer in New York. The fishing vessels would require a smaller expenditure of ice, as these vessels would be surrounded by a colder temperature. A stock of ten to twenty tons would, in all probability, be amply sufficient both to replace the waste by melting and to preserve the bait."*

CONFLICTS BETWEEN BAIT-FISHERMEN AND OTHERS.

EARLY FEUDS.—Some jealousy has naturally arisen at times between the bait-fishermen and the manufacturers, as is shown by the following extract from Professor Johnston's "History of the Towns of Bristol and Bremen, in the State of Maine:"

"A special branch of the fishing business has of late been undertaken quite largely here (in Bristol), as at other places on the New England coast, called the 'porgey fishery.' The fish are taken in seines, usually several miles from the coast, and are used for the oil they produce and for manure.

"These fish, the common menhaden of the coast, have been caught for use as bait in the cod fishery from the earliest times; and at first the new branch of industry, in which such immense quantities are consumed, was viewed by the old fishermen with no little suspicion, as likely to interfere with the important and older branch of the fishing business by depriving them of bait. Some riots were at least threatened, and one oil factory was actually destroyed, as was believed, by the old fishermen or at their instigation; but the opposition has ceased, and the general opinion seems to be that it is best to foster such an extensive branch of business, giving profitable employment for a part of the season, as this does, to so many men, even though it may be attended by some disadvantages, which in the end may prove more imaginary than real."

THE PRESENT ASPECTS OF THE CONFLICT.—In 1877 and 1878 a determined effort was made by the Maine line-fishermen to secure the passage of a legislative act forbidding the use of seines near the shores. Their claim was that the present methods employed in the fishery interfered with their legitimate privilege of catching menhaden for bait, and that their tendency was to drive away all other fishes as well and to destroy the fisheries.

To this movement the manufacturers made strenuous opposition, claiming that the menhaden

* Proceedings Halifax Commission, Appendix L, p. 467.

fishery is practically inexhaustible; that the habits of the species have not been changed by the fishery, and that so far from making it difficult to obtain bait, the large fishery made it easier, capturing it in great masses and selling it to the fishermen in any desired quantity cheaper than they could obtain it for themselves.

The absence of the menhaden from the Maine coast has rendered protective legislation useless there, though in New Jersey and other States there is still considerable opposition to the wholesale capture of these fish by the use of steamers. A Congressional committee has recently investigated the subject, and in their report recommend: "First, that the use of purse-seines and pound-nets, fyke or weir, in the waters of the Atlantic outside of low-water mark, be absolutely prohibited within 3 miles of the shore prior to the 1st day of June in each year south of a line drawn east from the south cape of Chesapeake Bay, and prior to the 1st day of July north of that line, with suitable penalties for any violation of the law in this respect; second, that the use of meshes in such nets of less than 1½ inches in size, bar measure, should in like manner be prohibited at all seasons, so as to prevent the taking of young and immature fish."

MENHADEN BAIT AS AN ARTICLE OF COMMERCE AND THE CONSIDERATION OF ITS VALUE, BY THE HALIFAX COMMISSION OF 1877.

THE EXPORT OF BAIT TO THE DOMINION.—Allusion has been made to the extensive exportation of menhaden for use in the fisheries of the Dominion of Canada.

The evidence of several witnesses at the Halifax Commission shows that menhaden bait was preferred to any other kind by the Provincial fishermen. It is said that a considerable number of the vessels of the New England fleet fishing in the Gulf of Saint Lawrence were accustomed to carry partial cargoes of salted menhaden to sell in the Straits of Canso. There are, however, no satisfactory statistics of this exporting trade. This is doubtless due to the fact that every mackerel vessel carries twenty barrels or more of salt slivered fish, and there being no law requiring their entry in the custom-house or for reporting sales after the return of the vessel, no one has the data upon which to found an estimate. More than 5,000 barrels of slivered menhaden, worth more than $30,000, were carried to Dominion waters during the season of 1878. Many vessels doubtless expended all the bait which they carried; many others sold their surplusage to the Provincial mackerelmen. It is probable that these sales amounted to not more than $8,000 or $10,000, and very possibly they are even less extensive.

THE CLAIM OF THE ENGLISH GOVERNMENT.—The subject of the alleged trade in menhaden bait was referred to frequently in the course of the proceedings of the Halifax Commission of 1877. The subject was first introduced by the English counsel in the "Case of Her Majesty's Government,"* as follows:

"The question of bait must now be considered, as some importance may, perhaps, be attached by the United States to the supposed advantages derived in this respect by British subjects. It might appear at first sight that the privilege of resorting to the inshores of the Eastern States to procure bait for mackerel fishing was of practical use. Menhaden are said to be found only in the United States waters, and are used extensively in the mackerel fishing, which is often successfully pursued with this description of bait, especially by its use for feeding and attracting the shoals. It is, however, by no means indispensable; other fish-baits, plentiful in British waters, are quite as successfully used in this particular kind of fishing business, and very generally in other branches, both of deep-sea and inshore fishing, as, for example, fresh herrings, alewives, capelin, sandlance, smelts, squids, clams, and other small fishes caught chiefly with seines close in shore. British fish-

*Proceedings of the Halifax Commission, Appendix A, p. 28.

ermen can thus find sufficient bait at home, and can purchase from American dealers any quantities they require much cheaper than by making voyages to United States waters in order to catch it for themselves. It is a remarkable fact that for six years past American fishermen have bought from Canadians more herring bait alone than all the menhaden bait imported into Canada during the same period. The menhaden bait itself can also be bred and restored to places in the Bay of Fundy, on the western coast of Nova Scotia, where it existed up to the time of its local extermination."

And again: "It is notorious that the supply both of food and bait fishes has become alarmingly scarce along the United States coast. At Gloucester alone some thirty vessels are engaged during about six months in each year catching menhaden for bait. They sell about $100,000 worth annually, and, by catching them immoderately in nets and weirs for supplying bait and to furnish the oil mills, they are rapidly exterminating them. The Massachusetts Fish Commissioners, in their report for 1872, state that 'it takes many hands working in many ways to catch bait enough for our fishing fleet, which may easily be understood when it is remembered that each George's man takes 15 or 20 barrels for a trip, and that each mackereler lays in from 75 to 120 barrels, or even more than that.' One of the principal modes for the capture of bait and other fishes on the New England coast is by fixed traps or pounds on the shore. By means of these, herrings, alewives, and menhaden are caught as bait for the sea-fishery, besides merchantable fish for the markets, and the coarser kinds for the supply of the oil factories. There are upward of sixty of these factories now in operation on the New England coast. The capital invested in them approaches $3,000,000. They employ 1,197 men, 383 sailing vessels, and 29 steamers, besides numerous other boats. The fish material which they consume yearly is enormous, computed at about 1,191,100 barrels, requiring whole fishes to the number of about 300,000,000. These modes of fishing for menhaden and other bait are, furthermore, such as to preclude strangers from participating in them without exceeding the terms of the treaty; and even without this difficulty it must be apparent that such extensive native enterprises would bar the competition and suffice to insure the virtual exclusion of foreigners."

THE REPLY OF THE AGENT OF THE UNITED STATES.—In the "Answer on behalf of the United States of America to the case of Her Britannic Majesty's Government,"* Judge Foster states: "Off the American coast are found exclusively the menhaden or porgies, by far the best bait for mackerel."

This is well stated by Sir John MacDonald (in a debate in the Dominion Parliament, May 3, 1872), who says:

"It is also true that in American waters the favorite bait to catch the mackerel is found, and it is so much the favorite bait that one fishing vessel having this bait on board would draw a whole school of mackerel in the very face of vessels having an inferior bait. Now, the value of the privilege of entering American waters for catching that bait is very great. If Canadian fishermen were excluded from American waters by any combination among American fishermen or by any act of Congress, they would be deprived of getting a single ounce of the bait. American fishermen might combine for that object, or a law might be passed by Congress forbidding the exportation of menhaden; but, by the provision made in the treaty, Canadian fishermen are allowed to enter into American waters to procure the bait, and the consequence of that is that no such combination can exist, and Canadians can purchase the bait, and be able to fish on equal terms with the Americans."

These statements were based upon the Canadian official reports previously published, which say:

* Proceedings of the Halifax Commission, Appendix B, pp. 18, 19.

"For mackerel the Americans use 'pogies' and clams, chopped fine, as bait. The 'pogies' are found only on the coast of the United States, and, when imported into the Dominion, cost about $6 per barrel.

"The bait with which the Americans are supplied is far superior to any which can be secured in this country, to which may be attributed in a great measure the success of the Americans previously to the recent restrictions, although even now the local fishermen complain that they have no chance while an American schooner is fishing near them."*

"The menhaden fishery has within ten years grown into an immense business. Formerly they were taken only for bait, and were either ground in hand-mills, for mackerel, or used in what is called 'slivers,' for codfish bait. There is now a large fleet of steamers and sailing vessels engaged in this fishery. Large factories have been erected on shore for extracting the oil. As these fish are not valuable until they are fat, which is in August and September, they are not much taken in their spawning time, and they will not therefore be exterminated. They are caught solely with seines, near the shore, their food being a kind of marine seed which floats upon the waters; consequently they will not take the hook. This fishery is one of the most profitable of all the fisheries, the oil being used for tanning and currying, extensively at home, and being exported in large quantities. The refuse of the fish, after being pressed, is used for manufacturing guano or fish phosphate, and is very valuable as a fertilizer. This fishery is purely an American fishery, no menhaden ever being found north of the coast of Maine. It is entirely an inshore fishery, the fish being taken within two miles from the shore."

THE REPLY OF HER BRITANNIC MAJESTY'S GOVERNMENT.—The "Reply on behalf of Her Britannic Majesty's Government to the Answer of the United States of America" responds:

"The answer (pp. 18 and 19) lays much stress on the importance to Canadian fishermen of the menhaden bait fishery on the coast of the New England States. The menhaden is here represented to be the best bait for mackerel, and is said to inhabit exclusively the American coast. An entirely fictitious value has been attached to this fishery. British fishermen do not frequent United States waters for the purpose of catching bait of any kind or for any other purposes connected with fishing; consequently the privilege of entering those waters to catch menhaden is of no practical value. Any bait of that description which they may require may be purchased as an article of commerce.

"There are not now, nor have there ever been, treaty stipulations to prevent British fishermen from entering American waters to buy bait, if they prefer to do so. As a matter of fact, whatever mendaden bait British fishermen use is either purchased from American dealers or from Canadian traders, who import and keep it for sale like any other merchandise. Reference is made in the Answer to the possible contingency of legislation prohibiting the export or sale of menhaden-bait, the implied consequence being a serious disadvantage to Canadian fishermen in prosecuting the mackerel fishery. It would, in such contingency, be necessary to use other baits equally good, or resort to some other method of fishing, such as that described at page 10, enabling the fishermen to dispense with bait. Moreover, it is well known that menhaden are now caught in the open sea, many miles distant from the American coast. The Answer asserts, at page 19, that 'it is entirely an inshore fishery.' It can be proved that menhaden are chiefly caught off shore, frequently 'out of sight of land.'

"Mr. S. L. Boardman, of Augusta, Me., in an interesting report to the State Board of Agriculture, of which he is secretary, published in 1875, at page 60, says:

"Parties engaged in taking menhaden now go off ten or twenty miles from shore, whereas they

* Annual Report of the Department of Marine and Fisheries for the year ending June, 1870, pp. 312, 342.

formerly fished near the coast, and they now find the best and 'most profitable fishing at that distance.' This fish is included among the shore fishes described by Prof. S. F. Baird as having suffered 'an alarming decrease' along the inshores of the United States, owing partly to excessive *fishing throughout their spawning time in order to supply the oil-factories.*

"Chapter 5 of the Answer deals with 'the specific benefits which the treaty directs the Commission to regard in its comparison and adjustment of equivalents.' The admission of British subjects to United States fishing grounds has been dealt with at length in the third chapter of the Case. There is nothing in the Answer on this subject calling for any reply excepting the statement, at *page 20, that Dominion fishermen 'have in the United States waters to-day over thirty vessels* equipped for seining, which, with the American fleet, are sweeping the shores of New England.' Leaving out of question the 'American fleet,' which has nothing whatever to do with the matter, the correctness of the statement is directly challenged in so far as it implies that these thirty vessels, or any of them, are British bottoms, owned by Dominion fishermen; and the United States *is hereby called upon to produce evidence in its support.*"

8. VALUE OF MENHADEN FOR MANUFACTURING PURPOSES.

PRICES OF FISH AT DIFFERENT SEASONS.—The price of fresh menhaden cannot be definitely stated, since it varies from week to week with the abundance and fatness of the fish and the needs of individual manufacturers.

Many factories rely entirely upon their own "gangs" for their supplies; some others buy the fish of the vessels engaged in the trade, though this practice is less common than it formerly was. Still every factory buys fish in greater or less quantity, and the answers to question 47 of the circular are important in exhibiting the variations in abundance at different points on the coast. Perhaps it may not be amiss to quote fully from the letters, it being quite impossible to tabulate the facts.

In the report of the committee on statistics from the United States Association for the meeting of 1875 the estimate was put at 3 barrels to the thousand fish, or 333 fish to the barrel.*

Captain Tuthill estimates 22 cubic inches to each fish, Captain Sisson 21, making 3½ barrels to the thousand. In Long Island Sound the fish are sold by the thousand; farther east, always by the barrel.

Mr. Condon, of Belfast, estimates the price for 1873 at 60 cents; Mr. G. B. Kenniston, of Booth Bay, at 75 cents, stating that in previous years the price has ranged from 50 cents to $1.25. Mr. B. F. Brightman says that in 1872 and 1873 the average has been 65 cents, but that when oil was high they have brought $1. Mr. J. Washburn, of Portland, estimates the price at $1 for 1873; during the war, much higher. Mr. Eben B. Phillips estimates the price at from 60 to 70 cents in 1873, 56 in 1874, and about 60 in previous years. Fall fish, for trying, bring 40 to 50 cents in Wellfleet, Mass., according to Mr. Dill. At Nantucket, according to Mr. Reuben C. Kenny, the fish are worth from 50 to 75 cents as taken from the nets; only about half are used in the manufacture of oil.

Mr. Church gives the average price on Narragansett Bay at 40 cents, and to this correspond very nearly the estimates of the southern shore of Cape Cod and the Vineyard Sound, which find market for their menhaden at the Narragansett factories.

*A "round barrel" is a barrel of undressed fish, and weighs about 200 pounds. The number of fish in a barrel necessarily varies with their size. Estimates range from 180 to 280; but that made by Mr. Fairchild, at the meeting of the "*United States Menhaden Oil and Guano Association,*" in 1874, is perhaps fair, putting 4 barrels to a thousand fish, or 250 fish to a barrel.

Captain Crandall, of Watch Hill, R. I., thinks $2 to the thousand a fair estimate for 1873 and 1874. Captain Beebe, of Niantic, Conn., agrees with this, giving $2.50 for previous years. Mr. R. E. Ingham, of Saybrook, says $1.25 to $2. Mr. Miles says that in 1873 the prices ranged from $1 to $2.50, according to the yield of oil. Mr. F. Lillington, of Shatford, puts it for 1875 at from $1.50 to $2. Captain Sisson, of Greenport, says that in 1873 the price was $2.25; in previous years, $1.75; in 1874 the price was lower. Collector Havens, of Sag Harbor, N. Y., estimates it at 30 cents per barrel. In the vicinity of Atlantic City, N. J., M. A. G. Wolf gives the price at *$1.25 to the thousand; and Mr. Albert Morris, of Somers Point, at 39 cents per barrel (about $1.50* to the thousand). Mr. Hance Lawson, of Crisfield, Md., states that the Chesapeake factories pay 15 cents per bushel.* Mr. Dudley says that in 1877 the average price in the Chesapeake was 50 cents a thousand.

PRICES PROPORTIONATE TO AMOUNT OF OIL CONTAINED IN FISH.—These prices are simply those paid for fish used in the manufacture of oil and guano, the prices of those sold for bait or food being given under other heads. No satisfactory conclusions can be drawn from these statements except the very general one that the fish are more valuable on the eastern than on the southern coast of New England; in Maine bringing from $2.40 to $3.20 to the thousand; on Long Island Sound, $1 to $2.25. As the expense of capture is necessarily as great in Southern as in Northern waters, we must seek the reason of the difference in price either in the methods of manufacture, the abundance of the fish, or in the intrinsic value of the fish for the purposes of the manufacturer.

OIL YIELD OF NORTHERN FISH PRIOR TO 1879.—On the first arrival of the schools in Northern waters the fish are thin and do not yield a large quantity of oil; but they rapidly gain until the time of their departure in the fall, so that the late fishing is by far the most profitable. It is the general opinion of fishermen that Northern fish yield a larger proportionate amount of oil than Southern.

Mr. Sargent, of Castine, Me., says that 3 quarts of oil to the barrel is the smallest yield he has ever known from the first school, and 6 gallons the most from the last school. When the fish are very poor, about the 1st of June, it takes 250 to make 1 gallon of oil; when poor, in July, 200; when fat, in August, 150; when very fat, in October, 100. About 1 ton of scrap is obtained in making 3 barrels of oil. Mr. Condon states that when the fish arrive in the spring they will produce but 1 gallon to the barrel, while in October the yield is 4 or 5 gallons; the average for the season being 3 gallons. Mr. Friend states that the least yield, in June, is 2 quarts to the barrel; the greatest, in August, 4 gallons. Mr. Kenniston states that May fish yield 3 pints to the barrel; October fish, 6½ gallons. These are no doubt intended as the extreme figures. The average yield is 2½ gallons to the barrel, an estimate in which Mr. Brightman concurs, though placing the lowest at 3 quarts; the highest, in August and September, at 4 gallons. He estimates the yield of a ton of scrap at 30 to 40 gallons, according to the season. Judson Tarr & Co. put the early fish at less than a gallon, the September fish at 4 gallons to the barrel. Mr. Babson thinks that the early fish yield about a gallon, the last 4 gallons; an estimate in which he is confirmed by Mr. E. B. Phillips.

Mr. Erskine Pierce, of Dartmouth, Mass., states that in 1877 the average yield at his factory was 1¼ gallons to the barrel.

According to Mr. Church, the fish are fattest generally in the fall, though after a warm winter he has known them, after the first arrival, to yield 2½ gallons. After a cold winter the opposite is true; and he has seen them so poor in the summer that out of 100 barrels of fish not a pint of oil could be extracted. The first 18,000 barrels taken by Church & Co., on the coast of Maine, in 1873, did not make over 14,000 gallons of oil (about 3 quarts to the barrel). On Narragansett Bay, in 1873, the yield was 1½ gallons less than on the coast of Maine; on Long Island Sound, half a gallon.

*About 50 cents per barrel, or $2 to the thousand.

Mr. Reuben Chapman informed us that at his factory, on Mason's Island, opposite Noank, Conn., the yield of early fish was sometimes as low as a gallon to the thousand, later in the season reaching 14 or even 18 gallons; which would be equivalent to 5 or 6 gallons to the barrel.

Mr. Maddocks, writing of the Maine fish, states: "The yield of oil sometimes doubles, per head, in thirty days after their coming. The fish taken on the coast of Maine yield a considerably larger supply of oil than those taken at points farther south, around Long Island, off the Jersey shore, &c. The amount of oil per barrel of fish is there about 1 gallon, against 2½ here, for the whole season in each case."

And again: "The amount of oil realized varies from 1 gallon per barrel of fish early in the season to 4 or 5 gallons in September. The scrap contains, on the average, as it comes from the press, 55 to 60 per cent. of its weight in water, and sometimes more. This is, of course, worthless for fertilizing purposes. It also contains from 12 to 20 per cent. of fat or oil, which is equally worthless for manure."

Mr. Dudley considers that the first taken in Long Island Sound yield, on an average, about 4 gallons to the thousand. At Pine Island it is somewhat greater; one season averaged 3½, another 6½. In 1877 the average to June 12 was 5 gallons; to November 1, 3 gallons. On November 1 the fat fish made their appearance, and the average has since doubtless greatly increased. There is usually an increase in the yield of oil after July 1, but since 1874 this has not been the case in Southern New England. Mr. Dudley has cooked fish which would not yield a quart of oil to the thousand. Again, in November, the yield has been 18 gallons. It is the opinion of Mr. Dudley that dark oil only is yielded by fish taken in brackish water; light oil by those taken outside.

The George W. Miles Company, of Milford, states that the largest amount made by them in one factory in any one year was in 1871, when they produced 100,000 in about fifty working days; the largest quantity in the shortest time was 21,000 gallons in seventy-two hours, or 7,000 gallons to each day of twenty-four hours. In 1872 they produced 60,000 gallons, and in 1873 105,000 gallons in their two factories, one factory not operating all the time on account of a pending lawsuit.

According to Capt. J. L. Stokes, of the Salt Island Oil Company, the average yield of oil is 4 gallons to the thousand, 9,000 fish making a ton of scrap. Captain Beebe and Mr. Ingham put the highest for the region about the mouth of the Connecticut River at 8 gallons, or perhaps 3 gallons or less to the barrel.

Mr. Miles writes: "All depends upon the quality of the fish, whether fat or poor. In July, August, and September we only get fish that come into the Sound to feed, and they fatten after they get here. If they are poor, we have the largest catch in June and July. If they are increasing in fat or yield of oil, we cannot capture them successfully until August and September. The fat fish in the Sound are usually wild and hard to take until late, perhaps owing to the fact that their food is plenty and low in the water. When the season is unusually dry, the fish are sure to be fat; but in a wet season they are found to be below the average in yield of oil. After the fish get here, if their food is plenty, they grow fat very fast. In the past season (1873), in May and June, 1,000,000 of fish would make only 800 gallons. In August the yield was from 8 to 10 gallons per thousand; and in September, 10 to 12."

At Greenport, in 1873, the average yield, on Captain Sisson's estimate, was 8½ gallons to the thousand; the smallest yield, half a gallon, in spring and late fall; the greatest, 22, in September and October; 8,000 fish make 1 ton of green scrap. Hr. Havens puts the lowest yield at 1 quart to the barrel; the highest at 4 gallons, an estimate much below Captain Sisson's, which would make over 6 gallons to the barrel.

Hawkins Bros. estimate the lowest yield at 1 gallon to the barrel in midsummer, and 4½ in

October and November, putting the average quantity of fish to the gallon at one-third of a barrel on Gardiner's Bay, one-half at Barren Island, and 80 gallons to a ton of scrap on Gardiner's Bay, 50 at the island.

At Atlantic City, N. J., according to Mr. A. G. Wolf, the average yield is 4 gallons to the thousand, the greatest in November, 11; a ton of scrap corresponding to 40 gallons of oil.

On Great Egg Harbor, states Mr. Morris, July fish yield 1 quart of oil to the barrel; those of October and November yielding 4 gallons. A gallon of oil is the average to each barrel of fish, and 45 gallons to a ton of scrap.

The yield to each barrel of fish was thus estimated by Rhode Island manufacturers in 1877: Joseph Church & Co. and W. H. H. Howland, 1 gallon; Charles Cook, Job T. Wilson, Isaac G. White, and James Manchester, 1¼ gallons; Isaac Brown & Co., 1½; and William J. Brightman, 1½.

Connecticut manufacturers estimated as follows: The George W. Miles Company, 2½ gallons to the thousand; Leander Wilcox & Co., 3 gallons; G. S. Allyn & Co., 3½ gallons; Wadey & Co. and Lace Brothers, 3½ gallons; the Quinnipiac Fertilizer Company, 3½ gallons; J. H. Bishop, 3½ gallons; and Fowler & Colburn, 3¾ gallons.

New York manufacturers estimated the yield in 1877 as follows: The Barren Island Manufacturing Company, G. H. Clark, W. Y. Fithian & Co., 2½ gallons to the thousand; Smith & Yarington, 2¾ gallons; S. Jones & Co., 4½ gallons; eleven factories in Gardiner's Bay, 3 gallons.

New Jersey manufacturers estimated as follows: Morris & Fifield, 2 gallons to the thousand; James E. Otis, Griffen & Vail, Cyrus H. Smith, 2½ gallons.

Maine manufacturers in 1877 were reported as follows: Albert Gray & Co., 1½ gallons to the barrel; Gilluly, Morgan & Co., 2⅝ gallons; Fowler, Frost & Co., 2½ gallons; Suffolk Oil Company, 2½ gallons; R. A. Friend, 2½ gallons; Gilluly & Holmes, 2½ gallons; Loud's Island Company, 2¾ gallons.

Mr. Maddocks declares that on the coast of Maine "195 pounds of fish make a barrel. One barrel yields about two and a half gallons of oil, or eighteen and three-quarter pounds. One barrel yields about eighty pounds of chum or scrap."

OIL YIELD OF SOUTHERN FISH PRIOR TO 1879.—Mr. Kennaston makes the following statement: "Corresponding with the successive appearance of the menhaden from South to North there is a progressive improvement in size and fatness. When they arrive in Chesapeake Bay, in the spring, they are thin and lean, and appear to be sluggish and stupid, so that they are easily caught—can almost be taken out by the hand along the shore, which many of them follow closely. Between Virginia and Maine the increase in weight is thought to be one-third. In the fall the increase still continues, but the order of it is reversed, the fish appearing to grow larger the farther South they go, and on reaching Virginia again are twice as heavy as in the spring, and have so gained in strength, swiftness, and wariness that they are very hard to catch."*

Mr. Dudley says that from his experience of two years he knows that the first runs of fish in the Chesapeake are fat. This is in March and April.

Mr. A. C. Davis states that the June fish at Beaufort yield from ¾ to 1 gallon, those in October and November 4 to 5 gallons.

Mr. W. F. Hatsel, of Body's Island, states that the average yield is 1½ gallons to the barrel, 75 gallons to the ton of scrap.

COMPARISON OF YIELD IN DIFFERENT LOCALITIES.—These statements indicate in a general way that the yield of Northern is greater than that of Southern fish, though the disparity is not so great in the latter part of the season. Mr. Davis's estimate for Beaufort is, however, not much

* Boardman and Atkins, op. cit., p. 6.

below the average of the coast south of Maine, and it is quite possible that the apparent disparity of the yield on the Southern coast (of which we are not really entitled to judge with the meagre returns before us) would be in part explained by differences in the modes of manufacture. Florida menhaden are many of them very fat in the winter season, and there is no apparent reason why the manufacture of oil and guano may not be successfully carried on on our Southern coast.

The official returns of manufacturers may add some additional facts in reference to the yield of fish in oil and guano and the comparative advantages of location.

The following table and statement, quoted from Mr. Maddocks, give a comparative view of the manufacture as carried on by the Maine Association and by all the rest of the United States for the year 1876:

Locality.	No. of men.	No. of vessels.	No. of steamers.	Total capital.	Barrels fish used.	Gallons oil manufactured.	Tons crude guano manufactured.
Other States	1,629	291	3	$1,767,000	826,885	848,727	29,831
Maine	*1,129*	*29*	*42*	*983,000*	*709,000*	*2,143,279*	*21,414*

The most striking fact brought out in the comparison is that Maine realized, from 46 per cent. of the fish, 71 per cent. of the oil. To this it may be added that from the use of $983,000 capital Maine turned out a total product of $1,071,449 value, whereas the rest of the country realized $637,600 from $1,767,000.

9. STATISTICS OF THE FISHERY AND OF THE MANUFACTURE OF OIL AND GUANO.

Tables showing statistics of the manufacture of menhaden oil and guano in the United States in the years 1873 to 1882.

[Compiled from the Annual Reports of the United States Menhaden Oil and Guano Association.]

	1873.	1874.	1875.	1876.	1877.
Number of factories in operation	62	64	60	64	56
Number of sail-vessels employed	363	283	304	320	270
Number of steamers employed	30	25	39	46	62
Number of men employed in fisheries	1,109	871			
Number of men employed in factories	1,197	1,567			
Total number of men employed	2,306	2,438	2,633	2,758	2,631
Amount of capital invested	$2,388,000	$3,500,000	$2,650,000	$2,750,000	$2,047,612
Number of fish taken	397,700,000	492,878,000	563,327,000	512,450,000	587,624,025
Number of gallons of oil made	2,214,840	3,272,837	2,881,487	2,992,000	2,426,589
Number of tons of guano made	36,290	50,976	53,625	51,245	55,444
Number of gallons of oil held by manufacturers at the end of the year	484,520	648,000	125,000	264,000	94,000
Number of tons of guano held by manufacturers at the end of the year	2,700	5,200	1,850	7,275	2,840
Value of oil, at 37 cents	$819,476	$1,247,950	$992,140	$1,107,040	$897,838
Value of guano, at $11	$399,190	$560,736	$589,875	$563,695	$609,884
Total value of manufactured products	$1,218,675	$1,808,686	$1,582,015	$1,670,735	$1,007,722

	1878.	1879.	1880.	1881.	1882.
Number of factories in operation	58	60	79	97	97
Number of sailing vessels employed	279	204	366	286	213
Number of steamers employed	64	81	82	73	83
Number of men employed	3,337	2,296	3,261	2,805	2,313
Number of fish taken	*767,779,250	637,953,750	776,000,000	454,192,000	346,632,555
Number of gallons of oil made	3,809,233	2,258,993	2,035,000	1,266,549	2,021,312
Number of tons of crude guano made	83,718	67,059	45,000	7,302	10,020
Number of tons of dried guano made	19,377	29,563	25,000	25,027	17,552
Amount of capital invested	$2,350,000				

CENSUS STATISTICS OF THE MENHADEN INDUSTRY FOR 1880.

In 1880 the total number of persons employed in the menhaden fishery and in the manufacture of the oil and guano was 3,635; the capital invested was $2,362,841; and the value of the products was $2,116,787. The detailed statistics for each State were as follows:

Number of persons employed.

State.	Fishermen.	Factory hands.	Total.
Massachusetts	251	20	271
Rhode Island	416	192	608
Connecticut	504	127	631
New York	756	325	1,081
New Jersey	174	130	304
Maryland	15	6	21
Delaware	8	3	11
Virginia	419	289	708
Total	2,543	1,092	3,635

Capital invested and apparatus employed.

State.	Vessels.				Boats.		Purse-seines.		Value of factories and fixtures.	Total capital invested.
	No.	Tons.	Value.	Outfit exclusive of nets and boats.	No.	Value.	No.	Value.		
Maine	5	320.89	$20,000						$279,187	$299,187
Massachusetts	35	1,269.70	106,400	$17,105	57	$7,000	34	$13,600	35,000	179,105
Rhode Island	61	2,168.58	171,050	24,600	111	10,750	50	20,000	77,900	304,300
Connecticut	72	2,304.76	191,950	27,600	114	11,850	55	22,000	139,000	392,370
New York	147	4,053.87	391,750	42,600	225	20,240	126	50,400	315,000	819,990
New Jersey	31	560.68	35,400	12,000	52	6,350	20	8,000	67,500	129,250
Maryland	3	71.20	2,900	1,200	4	275	1	400	8,000	12,775
Delaware					5	200			1,500	1,700
Virginia	102	2,130.03	90,200	18,714	80	4,800	80	24,000	84,450	222,164
North Carolina									2,000	2,000
Total	456	12,905.71	1,009,650	143,819	648	65,465	366	138,400	1,009,537	2,362,841

Quantities and values of products.

State.	Pounds of menhaden taken.	Gallons of oil made.	Value of oil.	Tons of guano made.	Value of guano.	Value of compost.	Total value of products.
Massachusetts	26,066,077	50,400	$17,640	1,971	$23,652	...	*$61,769
Rhode Island	68,693,809	270,482	94,668	10,590	127,080	...	221,748
Connecticut	65,092,000	256,500	89,705	9,000	108,000	...	250,205
New York	288,891,200	1,186,662	415,332	32,210	658,520	$40,300	1,114,158
New Jersey	29,064,600	87,747	30,711	4,545	113,625	1,950	146,286
Maryland	3,903,000	10,575	3,701	300	6,200	1,950	11,851
Delaware	499,900	450	157	15	180	604	941
Virginia	88,233,800	203,760	81,504	10,273	265,460	16,865	353,829
Total	570,424,377	2,066,396	733,424	68,904	1,301,217	61,669	2,116,787

*Includes $20,477, the value of menhaden sold to factories outside the State or used for bait.

A COMPARISON OF THE YIELD OF THE WHALE AND OTHER FISHERIES.—In 1875, the total amount of sperm oil from the American whale fisheries was 1,090,951 gallons; of other whale oil, 1,414,186 gallons; in all, 2,505,137 gallons. The amount of menhaden oil for the same year was 2,618,487 gallons, an excess of 176,350 gallons. In 1874, the amount of menhaden oil was 3,372,837 gallons, exceeding that of whale oil by 1,115,597 gallons.

In 1876, 2,992,000 gallons of menhaden oil were made, and in 1877, 2,426,589. For the year ending June 30, 1877, the production of whale oil was 2,140,047 gallons, and for the year 1877, 2,151,765 gallons.

In the Oil, Paint, and Drug Reporter for January 14, 1874, the following statement is made:

"It is asserted that while the amount of oil produced is equal to that derived from the whale fisheries in this country, the menhaden interest is ahead of the whale; for though the menhaden oil sells at a less price per gallon, for every barrel of oil made there is three-quarters of a ton of scrap, which readily commands $15 per ton at the factory."

This is not true. In 1874, for instance, the value of the sperm oil alone was $1,250,987; that of other oils from the whale fishery, $775,919. Total value of oils from the whales, $2,026,906; the value of the total products of the whale fishery, $2,291,896.

By way of further comparison, the cod and seal-oil fishery of Newfoundland and Labrador may be instanced. The latest figures at hand show the product of the seal-oil fishery to be 1,500,000 gallons, and of the cod-oil fishery 900,000.

COMPARISON OF YIELD OF NITROGEN FROM GUANO ISLANDS.—The refuse products of the oil-factories, together with the fish used in a crude state for manure, are estimated to have yielded in 1875 over 10,000,000 pounds of ammonia in the best possible organic forms. This quantity of ammonia is equivalent to at least 60,000,000 pounds of Chincha Island guano, formerly imported from Peru, the gold value of which would be not far from $1,920,000.

In addition to ammonia, the phosphate of lime derived from this source and convertible into agricultural products amounted to nearly 1,430,000 pounds, which is the equivalent of nearly 60,000,000 pounds of Peruvian guano.

ASSOCIATIONS OF OIL AND GUANO MANUFACTURERS.—The Association of the Menhaden Oil and Guano Manufacturers of Maine was formed in the year 1870. The objects were such as are usually sought by organizations of the sort—harmony of action on points affecting the common welfare of the business, social acquaintance, and the communication of information as to improved processes, &c. The annual meeting is held the second Tuesday in January of each year. The United States Menhaden Oil and Guano Association was organized in 1873.

Extent of the menhaden fisheries of Maine for the years 1873 to 1878.

[Compiled from annual reports of Maine Association.]

	1873.	1874.	1875.	1876.	1877.	1878.
Capital in factories	$278,500	$316,000	$307,000	$431,000	$459,812	$467,812
Capital in vessels and gear	$335,000	$390,500	$482,000	$552,000	$623,800	$584,000
Number of fishermen	523	561	771	758	727	682
Number of factory hands	249	304	373	371	309	324
Number of sail vessels	38	37	36	29	13	.....
Number of steamers	17	22	31	43	48	48
Barrels of fish taken at the factories	429,413	621,861	635,771	709,000	557,145	616,851
Barrels of fish sold for bait	2,977	10,400	19,752	8,432	10,795	14,100
Gallons of oil made	1,204,955	1,931,037	1,514,887	2,143,273	1,168,213	1,714,384
Tons of crude guano made	12,965	19,295	19,395	21,414	16,666	18,328

10. THE USES OF MENHADEN OIL; THE OIL MARKET.*

THE USES OF MENHADEN OIL.—The uses of menhaden oil are manifold. It is chiefly employed as a substitute for the more costly and popular oils and to adulterate them. It is sold largely to tanneries for currying leather. After the hide has been "dressed," *i. e.*, after its coarser fleshy parts have been pared off, the oil, mixed with tallow, is applied. This is technically called "stuffing," and results in qualifying any residue of alkali left from the "liming" process and in filling

the pores and softening the leather. Mr. L. C. d'Homergue states that this oil is largely used in the tanneries of Russia.

A considerable quantity is used as a burning oil in coal-mines to fill the small lamps, one of which is fastened to the cap of each miner. It is then mixed with paraffine or some of the heavier oils. Some is also sold to be used in the manufacture of rope. A small quantity is used annually for lubricating purposes, but on account of its gummy nature it is not much in favor among machinists.* It is used in adulterating linseed oil, and is also sold as a substitute, its cheapness and durability rendering it especially valuable for rough outside work and for painting ships. Mixed with other oils, it is found to be very serviceable for the painting of interiors, and its use is attended with decided economy, its price being about one-half that of the best linseed oil. Some of the most pure is said to be put into the market as olive oil.

Most of that which is exported is used in the manufacture of soap and for smearing sheep, after they have been sheared, to keep off ticks. Mr. L. C. d'Homergue states in the Manufacturer and Builder that a bright fish oil, cut with some alcohol and mixed with paint, forms a far more lasting covering than linseed oil.

The Oil, Paint, and Drug Reporter for October 21, 1874, implies that much of the whale oil now sold is really menhaden oil. "It is well known that the chief use for menhaden oil is for currying leather, but with the low prices ruling of late and the scarcity of whale oil it has found new channels, and very much of the whale oil sold probably consists of two-thirds or more of menhaden, for it comes when crude nearly as handsome as any whale, and in appearance when bleached is quite equal. It is reported as a fact about the street that one concern alone sells more 'winter-bleached whale oil' than is caught of crude, and they do not by any means get all the crude."

The refuse from the cooking tanks and the settling tanks is dried and ground for sale to the guano factories, where it is mixed with phosphates and other substances. The quantity of this refuse, called scrap, amounted, in 1880, to 68,904 tons, valued at $1,301,217. A discussion of the uses of this scrap and the methods of preparing it will be found in another part of this report. The subject is also discussed by Prof. W. O. Atwater in the Annual Report of the United States Fish Commission for 1877. He says: "As a result of the profitable utilization of fish for the manufacture of oil, the use of the whole fish as a fertilizer has gradually and (in Maine) almost entirely ceased, and given place to the refuse from which the oil has been expressed or otherwise extracted. This is known in its crude state as 'fish scrap,' 'fish pomace,' or 'chum,' and, when more carefully prepared, as 'dry fish,' 'dry ground fish,' and 'fish guano.' Still, farmers have been slow to avail themselves of this more concentrated material. * * * It is worthy of note that in the European fish guano factories the liquid coming from the steamed or boiled fish, and containing considerable nitrogenous matter in solution, is utilized for the manufacture of a low quality of glue, while in this country the practice is to throw it away. The Norwegian guanos have generally smaller percentages of fat than occur in the menhaden guanos in this country."

THE MARKETS.—The principal market for menhaden oil is in Boston and New York; some is also sold in New Bedford, and considerable quantities are shipped to London, Liverpool, Glasgow, and Havre direct.

GRADES OF OIL.—Several grades are recognized. The Oil, Paint, and Drug Reporter usually quotes under the heads of "select light strained," "select light," "choice brown," and "inferior to dark," and "gurry."

THE PRICES OF OIL.—The highest price ever obtained for menhaden oil was $1.40 a gallon—

* Mr. Isaac Bow, of Springfield, Mass., devoted several years to experimenting, with a view to the preparation of a good lubricating oil from menhaden oil, but the results were not satisfactory.

this was a war price. The following table shows the average prices of the different grades of oil in the New York market for a period of seven years.

Table showing highest and lowest prices of menhaden oil for the years 1871 to 1877.

[Compiled from Oil, Paint, and Drug Reporter.]

Years.	Select light.	Choice brown.	Inferior to dark.	Gurry.	Strained.	Pressed.	Select light, strained.	Bleached.
1871	53 to 55	50 to 52½	47½ to 50	35 to 40	60 to 62½	.....	.....	.....
	40½ to 41	39½ to 40	35 to 38	20 to 25	58 to 60	.....	.....	.....
1872	62½ to 65	60 to 62½	55 to 57½	45 to 50	60 to 65	64 to 66	.....	.....
	40 to 42½	40 to 41	36 to 38	25 to 30	58 to 65	45 to 50	.....	.....
1873	*60 to 62*	*59 to 60*	*52 to 58*	*48 to 50*	.....	*55 to 57½*	.....	.....
	32½ to 35	30 to 32	29 to —	.....	.....	.....	.....	.....
1874	45 to 47½	45 to 46	42½ to 45	.....	.....	.....	52½ to 55	.....
	32½ to 35	35 to 35½	32 to 34	.....	.....	.....	40 to 42	.....
1875	45 to 47½	43 to 44	38 to 40	.....	.....	.....	49 to 50	65 to 66
	32 to 33	31 to 32	20 to 30	.....	.....	.....	38 to —	44 to 45
1876	48 to 50	46 to 48	36 to —	.....	.....	.....	50 to 52½	55 to 60
	32½ to 33	32½ to 33	34 to 35	.....	.....	.....	40 to 41	45 to 47
1877	46 to 47	45 to 46	40 to 42	.....	.....	.....	48 to 50	53 to 54
	33 to 34	33 to 34	30 to 32	.....	.....	.....	38 to 40	42½ to 45

REVIEWS OF THE MARKETS.—In January, 1874, the manufacturers composing the "United States Menhaden Oil and Guano Association" had on hand 484,520 gallons of oil, or about 21 per cent. of the amount manufactured in 1873; in January, 1875, 648,000 gallons, or about 19 per cent.; in January, 1876, 125,000, or over 4 per cent.; in January, 1877, 264,000, or over 8 per cent.; and in January, 1878, 94,000, or over 4 per cent. These figures seem to indicate that the demand for oil quite keeps pace with the supply.

The following editorial on the value of menhaden oil appeared in the Oil, Paint, and Drug Reporter, October 21, 1874:

"Prices for menhaden oil have ruled very low this year, and it has probably been relatively the cheapest grease in market. This fact, together with a poor run of fish part of the season, caused several of the weakest of the manufacturers to close their works, and the natural result has been less than an average season's production, except in Maine. The Maine season ended some time since, and the fall catch of the other States, which is usually the best, has thus far been comparatively nothing, and, as it will soon close, cannot be improved much. To-day we should estimate the stock in the hands of fishermen as fully one-quarter less than last year, and with one exception the dealers in this city are almost without stock.

"The entire failure of the Arctic whaling fleet, the high price of all other grease, and the advance in the price of Newfoundland cod oil point to advanced prices for menhaden. We said early in the season that menhaden oil was cheap at 40 cents, and it ought not to have gone below that price. *At the present time some parties talk of 50 cents as the point the market will reach,* but we hope that manufacturers will not hold for such high prices. This would be as much too high as 35 cents was too low, and as soon as you get an article above its real value something takes its *place and you cannot get it into the same channels until it becomes so low that it is forced back.*"

11. HISTORY OF THE MENHADEN OIL INDUSTRY.

THE CLAIMS OF MAINE TO THE DISCOVERY OF MENHADEN OIL.—The manufacture of menhaden oil has been prosecuted for a few years only. Several individuals claim the honor of having been first to discover its value. About the year 1850 Mrs. John Bartlett, of Blue Hill, near Mount

Desert, Me., while boiling some fish for her chickens, noticed a thin scum of oil upon the surface of the water. Some of this she bottled, and when on a visit to Boston soon after carried samples to Mr. E. B. Phillips, one of the leading oil merchants of that city, who encouraged her to bring more. The following year the Bartlett family industriously plied their gill nets and sent to market 13 barrels of oil, for which they were paid at the rate of $11 per barrel, in all $143.*

Mr. Phillips gave them further encouragement, furnishing nets and large kettles, which they set up out of doors, in brick frames, for trying out the fish. It was thought that much oil was thrown away with the refuse fish or scrap, and the idea of pressing this scrap was suggested. This was at first accomplished by pressing it in a common iron kettle with a heavy cover and a long beam for a lever; afterward by placing it under the weight of heavy rocks, in barrels and tubs perforated with auger holes. Mr. Phillips subsequently fitted out some fifty parties on the coast of Maine with presses of the model known as the "screw and lever press."

ERECTION OF FACTORIES IN MAINE.—The first factory in Maine was built by a company from Rhode Island, in 1864, at Blue Hill, and the next by another company from Rhode Island, at Bristol, on John's Bay, the same season. Operations being successful, home parties in Booth Bay, Bristol, Bremen, and Southport went into the business. In the spring of 1866 eleven factories were built, all using steam. This may be regarded as the beginning of the industry in Maine on a scale at all in ratio with its capabilities.

The following table, taken from Mr. Maddock's pamphlet, gives the dates at which the factories of the several firms named were built, and the cost of the same. The titles of some have since been changed by incorporation with others, change of ownership, &c. Of the eleven factories specified before as built in 1866, one has been burned, and two absorbed by now exisiting corporations; they have all been idle since 1879.

Date of building of factories in Maine.

Names.	When built.	Where.	Cost of buildings and equipment.
Gallup & Holmes	1866	Booth Bay	$15,000
Gallup, Morgan & Co	1866	do	15,000
Suffolk Oil Works	1866	do	30,000
Kenniston, Cobb & Co	1867	do	15,000
White Wine Brook Company	1867	do	12,000
Maddocks' Factory	1866	Southport (now Booth Bay)	25,000
Bristol Oil Works	1866	Bremen	10,000
Albert Gray & Co	1870	do	12,000
Round Pond Company	1866	Bristol	15,000
L. Brightman & Sons	1866	do	15,000
Pemaquid Works	1869	do	15,000
Jos. Church & Co. Works	1871	do	40,000
Loud's Island Works	1873	do	6,000
Brown's Cove Works	1874	do	10,000
Tuthill, French & Co	1868	do	10,000
Wells & Co	1864	do	12,000
Fowler, Foote & Co	1874	do	2,000
South Saint George Factory	1870	South Saint George	1,500
Total			260,500

*As this account is somewhat different from those hitherto published, we give the story in the words of Mr. E. B Phillips himself: "In about 1850 I was in the fish-oil business in Boston. An elderly lady by the name of Bartlett, from Blue Hill, Me., came into my store with a sample of oil, which she had skimmed from the kettle in boiling menhaden for her hens. She told me that the fish were abundant all summer near the shore, and I promised $11 per barrel for all she could produce. Her husband and sons made 13 barrels the first year, and the following year 100 barrels."

THE CLAIMS OF RHODE ISLAND. — Mr. R. E. Earll obtained from Mr. B. F. Brightman the following account of the beginning of the menhaden industry in Rhode Island:

"During the war of 1812 paint oils became very scarce and high, and people in the vicinity of Southern New England and Long Island conceived the idea of using fish-oil for this purpose. Among the first to go into this business was a family of Gardiners living at Mount Hope Bay, Rhode Island.

"The first method was to drag the pogies ashore with seines and put them into large casks or hogsheads brought down to the water for the purpose. After filling the casks with fish, salt water was added to cover them, and boards, weighted with stones, put on top of the fish to press them down. The fish were then left to rot for a few days, after which they were thoroughly stirred with a long stick daily to break up the fish and liberate the oil, so that it might come to the surface of the putrid mass. This process was kept up for from two to three weeks, the oil being dipped off daily, after which the barrels were emptied into the water.

"About 1820 they commenced boiling the fish in large kettles, stirring them frequently, and skimming the oil off by hand. Among the first to do this was John Tollman, at Black Point, East River.

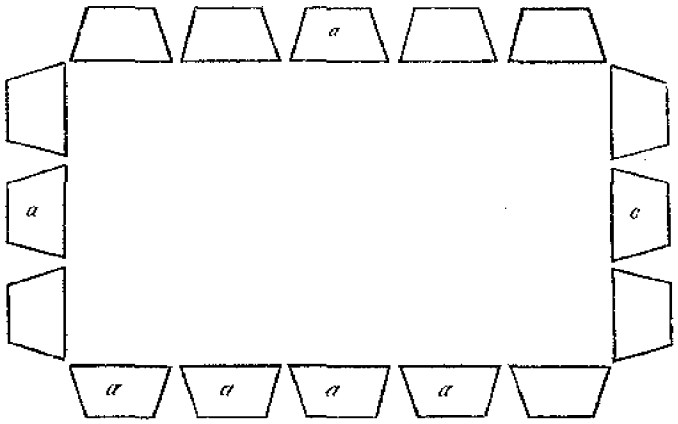
"Soon the business reached such dimensions that the kettles were too small, and they were obliged to build large cooking tanks, and with these steam was introduced for cooking, the pipes being laid at the bottom, as now, but wholly unprotected. The fish were thoroughly cooked and stirred, and, after standing for a time, the oil was skimmed off, and a plug pulled from the bottom of the tank and the whole mass allowed to run off on the ground near by. Quantities of scrap or chum accumulated in this way and found a ready sale for manure to the farmers. The cooking by steam was introduced about 1830, when John Tollman had works at Black Point, East River, John Herreshoff at Prudence Island, and a number of parties on Long Island Sound.

"About 1835–'40 the chum was coming to be of such value that a false bottom made of wood was introduced above the steam pipes to keep it in better condition, and after skimming it was pitched out on an inclined platform and allowed to press itself by its own weight. Thus an additional amount of oil was obtained from the drainings, and the chum was in better condition for market. At this time the water was drawn off into a separate tank in drying the chum for pitching on the platform. Probably Mr. Herreshoff was among the first to introduce the incline-plane platform, though other parties at Greenport and Shelter Island used it about the same time.

"This gave a great start to the pogy business, as it utilized a far larger per cent. of the oil and also saved the chum in a marketable condition.

"The next great improvement was the introduction of the press for taking the oil and water from the chum. This came about in the following way: Between 1855 and 1860, Mr. Charles Tuthill went from New York to Greenport for his health, and while there he visited the factory of Mr. Wells and saw the scrap-draining on the inclined platform, and it occurred to him to press the chum. Accordingly he proposed the subject to Mr. Wells and built a small press or curb in the following manner:

"The blocks were 5 inches wide on the inner face of the press, 4 inches on the outer, and 4 inches thick. The spaces between the pieces were one-half inch on the inside of the press. The plan shows a top view. There was a large follower made to fit snugly into the press, and the power



was applied by means of a 20-foot lever. The press was found to work admirably, and Mr. Tuthill at once built a larger one and arranged with one of the largest Long Island factories to press their scrap for one-half of the oil obtained by pressing, he to furnish himself and press, and they to furnish chum and the balance of the labor.

"It is reported that he made $1,800 in five weeks in this way.

"Soon all the factories began pressing their scrap, and in 1858 the first steam-works with hydraulic presses were built at Greenport, known as the Atlantic Oil Works. In 1860 the Narragansett Works were built on Narragansett Bay. At first they used very coarse manila cloths or blankets for pressing, putting a shovel of chum in a folding so as to make a sort of bag, and three of these were placed side by side and pressed at once. They put about 80 to 100 tons pressure, and got about the same amount of oil to the barrel of fish as now.

"One of the first steam-factories on the coast of Maine was owned by Wells, De Blois & Co., and located at South Bristol, about 1863.

"At first pogies were taken by the farmers along the coast by means of drag-seines, and used almost wholly for manure. They had a whale-boat to shoot the seine, and would row along looking for schools of fish, or more frequently would wait for them on the shore, and, making one end of the haul-rope fast as the school came opposite the beach, would surround them with the seine and haul them in by hand. When rowing along shore with seine in the boat, they would, on seeing a school, land a man, who would make one end of the 60-fathom haul-line fast on shore; two would row the boat, and one man throw seine. Men living near the shore would often have three of the "gang" working on the farm, while one would stay on the shore and would call them when a school put in an appearance.

"As early as 1820-'30 a small schooner was used for carrying and shooting the seine, and the fish were taken aboard instead of being hauled clear up on shore, and sold to the farmers at 15 cents per barrel. These schooners were generally from 5 to 10 tons burden, and would carry from 50 to 150 barrels. They used seines from 60 to 100 fathoms long and 30 to 50 feet deep.

"The practice of using schooners to carry fish to any point where the vessel could go for a

market soon threw this trade into the hands of the fishermen largely, and farmers all along the coast began buying and using fish on their land.

"The introduction of the purse-seine by Mr. Benjamin Tollman, of Portsmouth, R. I., about 1845, (?) entirely revolutionized the pogy fishery, and from that time fish could be taken at any distance from shore. The first method, as with the drag-seine, was to row out from shore when fish were seen, but it was not long before they began using a fleet of four small boats for catching them. One was called the seine-boat, another the "mate," and the remaining two the "tenders," or "carry-away boats." The four boats would start out together, and sail about near each other looking for fish.

"*As soon as a school was seen the seine-boat and mate would start for the windward side and* the tenders to leeward. The masts were unstepped, as soon as the seine-boat and tender reached their position, and elevated above the boats. The boats were then fastened together, and one-half of the seine transferred to the mate-boat, after which they rowed for the school, the captain standing in the bow and keeping close watch of them. As soon as they reached the school the word was given, the boats separated, and the captain and mate took the steering oar of their respective boats and brought them around the fish as the net was shot, the tenders generally marking the leeward boundaries of the school. As soon as they met, all hands got into one boat, and allowed the other to drop astern out of the way. The fish were dipped into the tenders and carried to market.

"The next change was to introduce a schooner to carry the seine and afford accommodations for the men. This method was first employed in Long Island Sound.

"The first pogy steamer built was the Seven Brothers, belonging to James Church, of Newport, R. I., in 1870. Tug-boats had been engaged the previous year during calm weather to tow the boats to and from the fishing grounds. L. Brightman & Sons employed the steam-tug Fairy for this purpose in 1869."

THE CLAIMS OF CONNECTICUT AND NEW YORK.—*Others claim to have manufactured oil* at an early date.* It is said that as early as 1850 or 1852 there was an establishment for the manufacture of whitefish oil near old Fort Hale, New Haven Harbor. Elisha Morgan, of Poquannock Bridge, Conn., is said to have made oil from bony fish previous to the year 1850. He owned seines with which he caught fish to be spread upon land fresh. When he could not sell all his fish to the farmers he extracted their oil by boiling them.

Whether the value of the article and the methods of manufacture were first brought to notice in Maine or not, the people of that State were slow to improve their opportunities and the trade first assumed its importance on the shores of Long Island Sound. Whether the fisherman's wife *of Blue Hill is the sole discoverer of the properties of menhaden oil is not evident; perhaps the* facts were also known to others. At any rate the tradition of the Bartlett family is not current on Long Island. In the year 1850, according to Captain Sisson, D. D. Wells and his son Henry E. Wells started the first factory in the vicinity of Greenport, using steam for making oil and scrap. "At that time there were some few pots (whalemen's try-pots) used by other parties in boiling the fish in water and making a very imperfect oil and scrap, but were not very successful. The first oil made by D. D. Wells & Son was very black, impure, full of fleshy matter, and had a very offensive smell. It did not come much into use, and for a long time the profits of the business were small; but by persistent effort in perfecting machinery the quality of the oil was so much improved as to

* The manufacture of oil and of artificial guano from fishes has long been practiced in France, where the fish called merlan (*Gadus merlangus*) is employed for the purpose, yielding 1½ to 2 per cent. of oil. In France the fish cake remaining after the extraction of oil is dried at a steam heat and is then ground fine and packed in air-tight casks for sale as manure.

come into general use for certain purposes, such as painting, tanning, manufacture of rope, and adulterating other oils. The scrap was also very much improved by grinding and drying, pulverizing, &c., so that during the war the business was quite remunerative. At that time quite a number of factories were established and for a time the business was somewhat overdone, which caused some to abandon it altogether, and others to consolidate; and at the present time there are ten factories in operation, doing a fair business, giving employment to a large number of people and bringing up a hardy race of boatmen and sailors."

Professor Baird, visiting this region in 1857, wrote: "Quite recently several establishments have been erected on Long Island for the manufacture of oil from the moss-bunker. The fish, as brought in, are chopped up and boiled, and the oil skimmed off; a heavy pressure on the residuum expresses the remaining oil, and what is left is still useful as a manure. The oil finds a ready market. It has been estimated that a single fish will furnish enough oil to saturate a surface of paper 18 inches square."†

Notwithstanding the fact that the coast of Maine was adapted for much more profitable prosecution of the oil manufacture, nothing of importance was done there until 1865. The trade *grew rapidly for about four years, but has not augmented considerably since 1870.* Twenty factories were built in a short period, fourteen of which are still in operation, though several have failed from the too sudden expansion of their business. As has been seen, the only points at which the trade has had any statistical importance are within a limited area on the coast of Maine, on Narragansett Bay, on Long Island, on the New Jersey coast, and in Chesapeake Bay. Some of the factories are but half worked, and many of them have been abandoned. Efforts have been made to establish factories on Cape Cod and on the coast of South Carolina.

Great improvement has been made in the processes of refining and clarifying the oil, and the clear, yellow, nearly odorless substance now produced is vastly different from the article manufactured in early days.

The process of extracting oil by steam was patented in *1852* or *1853* by William *D. Hall*, of Wallingford, Conn., the originator of the Quinnipiac Fertilizer Company. Mr. Hall was engaged in bone-boiling and tallow-rendering at Wallingford; he had a load of whitefish carted to his factory from Branford, 16 miles distant. At night, after his men had left the factory, he cleaned out his tallow tanks, steamed his fish, and extracted the oil; his experiment was satisfactory and the process was immediately patented. The priority of his discovery is challenged by Mr. D. D. Wells, of Greenport, who claims to have used the process for some years previous to this time After *securing his patents, Mr. Hall visited numerous "pot works," which had by this time* been established, for the purpose of introducing his new methods. At this time he also secured a patent for the process of drying fish scraps upon platforms by solar heat.

THE INDUSTRY IN CHESAPEAKE BAY.—The menhaden fishery in Chesapeake Bay is said to have been inaugurated in 1865, by Mr. David G. Floyd, of Greenport, L. I. He bought a sail vessel and put oil works on board it, and went down to Chesapeake Bay. The business was new, and having no experience he did not do much.

The first persons to successfully engage in the Chesapeake menhaden fishery were Mr. E. W. Reed, of Maine, and Mr. G. Terry, of Long Island, together with Mr. G. T. Owens, of Fairport, Va. These men, in the spring of 1869, put up a six-kettle factory, using one seine to take the fish. The first season they took 2,750,000 menhaden, averaging 3 gallons of oil to the 1,000 fish. The next year Mr. Owens withdrew, and with a man from Long Island put up a second factory. The industry

† Fishes of the New Jersey Coast, 1855, p. 33.

gradually grew in importance until in 1880 there were upwards of sixty large and small factories in that region, that employed seven hundred and eight fishermen and factory hands, and that produced oil and guano valued at $303,829.

11. PROTECTIVE LEGISLATION.

The States of Maine and Massachusetts have enacted several laws for the protection of the menhaden fishery. The most important law in Maine, passed in 1865–'66, prohibited the setting of any seine within three miles of the shore for the purpose of taking menhaden, but "a net of no more than one hundred and forty meshes shall not be deemed a seine."

In Massachusetts "fishing with seines in the Merrimac, when the menhaden stand in, is forbidden by law. The *mouth* of the river has, however, never been defined by the governor as permitted by statute; and it was represented to the commissioners that valuable menhaden fisheries existed in this neutral ground of brackish water. Therefore, under the personal promise of the fishermen to capture no shad or salmon, and with the guarantee of responsible persons in Newburyport, the commissioners agreed to defer the definition of the river mouth, and to assume that these menhaden were not positively included in the river proper."*

Since the general adoption of the purse-seine there has been considerable opposition to this apparatus on the ground that it is destructive to the fishery. Congress and State legislatures have been petitioned to prohibit the use of menhaden seines within certain specified tracts of water, such as the Chesapeake Bay and the coast of New Jersey. During the winter of 1882 the legislature of the latter State passed restrictive laws, but the governor of the State vetoed the laws as unconstitutional, since, by the law, the State claimed jurisdiction within three miles of the coast, whereas the attorney-general of that State decided that no jurisdiction could be claimed beyond low-water mark.

Congress having been petitioned to pass laws prohibiting the capture of menhaden during the spawning season, a sub-committee of the Committee on Foreign Relations was appointed by Senate resolution of July 26, 1882, to examine, in conjunction with the Commissioner of Fish and Fisheries, into the subject of the protection to be given by law to the fish and fisheries on the Atlantic coast. This committee, during the season of 1882 and 1883, visited various parts of the coast and took considerable testimony from fishermen and menhaden oil manufacturers. The report of the committee,† submitted June 17, 1884, recommends (1) "That the use of purse and pound-nets, fyke or weir, in the waters of the Atlantic outside low-water mark should be absolutely prohibited within 3 miles of the shore prior to the first day of June in each year south of a line drawn east from the south cape of the Chesapeake Bay and prior to the 1st of July north of that line, with suitable penalties for any violation of the law in this respect; (2) That the use of meshes in such nets of less than 1½ inches bar measure should in like manner be prohibited at all seasons so as to prevent the taking of young and immature fish."

12. THE MENHADEN FISHERY AT THE EAST END OF LONG ISLAND; 1793 TO 1880.

The capture of menhaden for fertilizing purposes at Long Island, N. Y., began about a hundred years ago. Mr. B. F. Conklin, of Jamesport, N. Y., a veteran fisherman of more than fifty years' experience, gives the following account of the early history of the fishery at the eastern end of Long Island. He says:

"According to the best information I have been able to gather from old inhabitants, the use

* Report of the Commissioners of Inland Fisheries for 1877, p. 65.
† Senate Report No. 706, 48th Congress, 1st session, pp. xxiv, 377.

of menhaden for fertilizing purposes upon Long Island commenced about a century ago. At that time they were taken near the head of Peconic Bay, in short draw-seines, made from twine manufactured by the farmers' wives from flax grown upon the farms."

Mr. Conklin quotes the following extracts from the journal of Mr. David Warner, one of the old fishermen:

"1793. *May* 29.—Left my bed early; went down to the nets and caught 14 fish. After school went out with Mr. Payne gunning. Went to the ship-yard; saw Jason, who had made a draught of bass." "Mr. Warner was at this time," says Mr. Conklin, "engaged in teaching school, and used a set-net evidently on Saturday. When he went to the Point he used a haul-seine."

"1826. *May* 15.—Went down to the fishing ground before daylight. Went over to Red Creek Point and made a haul of upwards of 100,000 [menhaden]. In evening came home with one boat.

"*May* 16.—Attended to the fishing. Boated over the above haul. Got to the fish-house and reeled our seine and shifted our clothes, when we discovered fish on the east side of the Point. In a great hurry got the seine onto the boats and made a draught of 150,000 fish by estimation.

"*May* 17.—Attended to fishing. Spent the day in getting out the last-mentioned haul. I acted as clerk, and had a very busy day. The weather extremely warm. The ground is becoming very hard.

"1827. *May* 4.—Up very early. Went down to the fish house on foot. All the seines out but ours. Got the seine on the boat and rowed to Miamogue. When there discovered fish to the eastward. Rowed on, and soon put off the seine a great distance from the shore and were about six hours a-drawing. I labored hard at whipping the rope [to keep the fish from passing over the seine]. We began to scoop out, and before sun-setting quit the seine and rowed up to Simeon's Point. Retired about 9 o'clock and slept about four hours.

"*May* 5.—Left our beds before day, rowed down to our fish, and carried out until almost high water. Labored all day. The haul will amount to about 500,000, we judge. We shored the fish at Old Mill. Came home about sunset greatly fatigued.

"1830. *May* 17, *Monday*.—Rain this morning and wind easterly, and like for a stormy day. Shot one blackbird in defense of my corn, for the birds pull it up. Much water fell in the course of the day. Carted three loads of fish from Old Mill landing. The draught of fishes made partly on Saturday evening will amount to several hundred thousands, perhaps 500,000. The fishermen have had a day of hard labor, and the weather has been uncomfortable.

"1833. *May* 17.—Cloudy in the morning and a little misty. Rode down to Miamogue. Our gang put their seine around a number of porpoises and saved or got ashore 24 of them. A number made their way through the seine and escaped. Rode home between one and two o'clock and took dinner. Then rode down to Miamogue again and attended to the porpoises. Divided some of them and sold some. It was in the evening when I got home. Clear all the afternoon. The northern lights showed bright in the evening. [The fish-house, at the time 'Squire Warner was fishing, was located at Simeon's Point, which is at the head of the bay. Miamogue is where the village of Jamesport now stands, and Old Mill Landing is in the bend just east of Jamesport.—CONKLIN.]"

"These fish," continues Mr. Conklin, "proved so valuable as a fertilizer that the business was gradually enlarged, until, in my boyhood, nearly every farmer owned a right in a seine, and it was a part of the yearly business to go or send a hand fishing from the first of April until haying time, or about the middle of June. These seines at this time were made of cotton twine, and were nearly a mile in length, with about the same length of rope on either end. They were used to sweep large semicircles of surface, and the fish inclosed were drawn to the shore by means of

capstans. The capstans were formerly manned by men, but as they increased the size of the seines they commenced using horses to draw them. Each fishing company comprised sixteen men, and used four boats about 24 feet in length and 8 or 9 feet wide. These boats were propelled by oars, and were used for carrying the seine ropes and capstans, and also for carrying fish from one side of the bay to the other when occasion required.

"Very large draughts of fish were sometimes taken in these seines. My earliest experience as a fisherman was in assisting in making a haul of 1,200,000 fish. It was a pleasant morning, and we were lying off Old Mill, just east of Jamesport. I was anxious to row and the steersman said we might row as much as we liked; he would steer. So we went off-shore about half a mile from where our boats lay, and we discovered a large shoal of fish and hoisted a signal to our captain, who immediately came to us, and I recollect asking one of the old fishermen how many he thought were in the bunch. He said about 300,000. Our captain concluded they were so far off-shore we could not reach them with our seine and line and signaled another gang, when we joined staffs or ends of seines together and laid the seine outside of them and went for shore with seines and lines. I staid at the staffs with the steersman of the boat I was in and kept the fish away from the seine, as the seines were narrow at the ends. The fish kept in a solid body all day. As near as I can remember it was sundown before we had the staffs on shore. They divided the fish before we shored them; one seine had 600,000, and the other a few thousand over that amount.

"I fished on the haul-seines two or three seasons and helped catch a number of good hauls, but no other as large as the above. The continued use of these shore-seines, as they were called, had the effect to make the fish keep off-shore in the wider and deeper parts of the bay until it became difficult to reach them, and in the year 1848 or 1849 the first purse-seines were used in Peconic Bay by S. M. Petty and Joshua Cleves. This mode of fishing had been adopted in Rhode Island a few years previous. In 1850 my father built part of a purse-seine. We knit it by hand during the winter, and this first seine was about 30 rods long and 275 meshes deep. We used cedar wood for corks, but used them only a few years when we exchanged them for cork. Our seine was carried on two small skiffs, and we used a little sloop of about seven tons burden to tow the seine and carry fish. The first few years of our fishing we cleared up the seine on the sloop. Our crew consisted of four men. We commenced fishing the first of June, 1850, and I remember well my first experience. We pursed the seine and got the sloop alongside to clear the seine, when the wind rose suddenly and blew a gale from the southeast, and we were obliged to hoist the seine on board the sloop the best we could and run for a harbor under a jib. We used this fishing rig for several years."

Mr. Conklin's daily journal covers the period from 1852 to 1880, giving the record of the days when he went fishing and when prevented from fishing by unfavorable weather, and omitting the days when he remained ashore to hoe corn or to attend to other work. In 1852 he took charge of the fishing himself. As the entire journal covers more than three hundred pages of manuscript it is inexpedient to print it entire, but the following synopsis of the record of most of the years, together with a tabulated statement of the results of each day's fishing during the entire period, will indicate the seasons and growth of the fishery and some of the changes in methods during those twenty-eight years:

1852.

May 27th, Thursday: Commenced fishing for the season; caught nothing. *Saturday, 29th*: Went fishing p. m.; caught none.

June 1st, Monday: Went fishing; saw none. *Tuesday, 2d*: Saw fish just at night, but caught none. *Wednesday, 3d*: Went fishing; caught none; shower just at night. *Thursday, 4th*: Raining a. m.; p. m. caught 11,000 fish;

the first of the season. *Monday, 7th:* Wind blowing hard from southwest. *Tuesday, 8th:* Blowing and raining. *Wednesday, 9th:* Windy weather. *Thursday, 10th:* Windy. *Friday, 11th:* Caught 7,000 fish. (Our fishing was nearly all done at this time in Great Peconic Bay, above Robins Island, and when we go in the bay below it will be mentioned.) *Saturday, 12th:* Caught 1,500 fish p. m.; tore the seine on a snag. *Monday, 14th:* Caught 10,000 fish p. m. *Thursday, 17th:* Caught 6,000 fish; very warm weather. *Monday, 21st:* Went out and about 1 o'clock p. m. saw a shoal of drum-fish in about the middle of Peconic Bay and put the seine around them. After pursing the seine we found it impossible to raise the bunt of the seine to the surface, on account of the weight of fish enclosed; we hoisted it up as well as we could with the throat halyards and commenced at one end of the seine and tried to take it on, but could make no headway on account of the quantity of fish; then we loaded the sloop with the fish that were in one end of the seine, and with great difficulty we succeeded in emptying the seine of fish and getting it on the boats. I presume we let from 40 to 50 tons go; we saved one striped bass and saw another in the seine, but were unable to secure it. It is said to be almost invariably the case that one or more bass are found in a shoal of drum-fish. Our seine was so badly torn, or chafed, that it took several days to mend it, and our next fishing was on June 28. *Monday, 28th:* Went out in p. m.; caught 8,000.

July 1st, Thursday: Went fishing in p. m.; caught 3,000; we had to attend to haying and harvesting; did not fish any more until the 9th. *Friday, 9th:* We caught 9,000 and spread them in the corn. *Wednesday, 14th:* We went out fishing; caught none; getting in wheat, &c. *Wednesday, 21st:* Went fishing; caught 1[illegible],000. *Thursday, 22d:* Caught 7,000 and carted them out. *Friday, 23d:* Went out; caught 12,000 fish; sold a part of them and carted part. We were busy with our farm work and did not fish any more until—

August 9th, Monday: Went out; caught 3,500 fish. *Tuesday, 10th:* Went out; caught 21,000 fish. *Wednesday, 11th:* Wind east; carted fish and plowed them under. *Thursday, 12th:* Went fishing; caught 11,000. *Friday, 13th:* Caught 12,000 fish. *Monday, 16th:* a. m. windy; p. m. went out; caught 8,000 fish. *Tuesday, 17th:* Went out; caught 17,000 fish; landed them on shore for some farmers at Franklinville. *Wednesday, 18th:* Went out; caught 8,000 fish. *Thursday, 19th:* Went fishing; caught 18,000; landed them for farmers in Franklinville. *Friday, 20th:* Wind east; came to Jamesport with sloop and seine. *Monday, 23d:* Went out fishing; caught 11,300; landed them just west of Jamesport for a farmer. *Tuesday, 24th:* Went out; caught 2,500 fish; they were very wild; we had great difficulty in surrounding them. *Thursday, 26th:* Rainy day; we went out fishing in p. m., but the wind blew hard and we caught nothing. *Friday, 27th:* Went out fishing; caught 11,000; we joined seines; thought we could get around them better, but made hard work of pursing. *Saturday, 28th:* We carted fish and mended seine; came on to rain in p. m. *Sunday, 29th:* An east storm. *Monday, 30th:* Wind continues to the east, so we did not fish. *Tuesday, 31st:* Went out fishing; caught 13,000.

September 1st, Wednesday: Went out fishing; caught nothing. *Thursday, 2d:* Went out; caught 7,000. *Friday, 3d:* Windy; did not fish. *Saturday, 4th:* Went out fishing; caught 10,000. I have a sore foot and the fall work coming on, potatoes to dig, &c., so we quit for the season.

1853.

In 1853 they started out in search of fish on April 28, but none were taken until June 6. The fishing was abandoned each year when farming was more important and when there was no longer use for manure.

1854.

In 1854 the season began on May 30 and ended September 27.

1855.

In the spring of 1855 the small sloop was sold and a larger one of about 12 tons was purchased.

We now take another man to sail the sloop while we go to catch the fish. Previously we had been obliged to anchor the sloop until we could purse the seine. And about this time we increased the width of the seine to 300 meshes. On the 22d of May got out and varnished the seine (up to this time we had used bright varnish on the seine), and on May 29 went out to look for fish, but caught none.

1856.

In 1856 the seine was again varnished and hung, and the fishing began June 2 and ended October 13.

The catch taken June 30, 1856, was sold at Jesse Terry's pot works. They were the first I ever carried to a factory. Mr. Terry had put up a small pot works on Red Creek Point to try out the fish that he caught with his drawseine. Formerly we had boated most of them over to Jamesport and sold to the farmers. Mr. Henry Wells says he commenced trying out fish in July, 1850, at Shelter Island, and some parties in Greenport commenced fishing with a purse-seine about the same time that Mr. Petty and Cleves commenced in Peconic Bay, which was in 1848 or 1849.

1857.

We used tar on the seine this year, instead of bright varnish, which we had formerly used, and have made the seine 350 meshes instead of 300 meshes deep.

1858.

In 1858 tarred the seine again. Fished until September 29, and as the work at the farm was urgent, we went no more until October 18, when we went out, but caught no fish. November 1 we started down bay with two sloops to fish for the factory at Southold. They have just built a factory there and wish to purchase fish. We heard there were plenty of fish in Gardiner's Bay, so we took two sloops, expecting the crew to live in one and have the other to carry the fish to the factory. And it was calm nearly all day. We arrived at Southold late in the evening; came to anchor, and before morning it was blowing a gale from the east; so we came back to Jamesport. The wind blew hard from the east for several days. And that ended our fishing for this season. This factory had been taking fish all the season, and a purse-seine gang from Connecticut had been fishing for them. I think it was the Luce Brothers. They did not fish in small boats towed behind a sloop, as we did, but used large double-end boats, and had to lower the sails to the purse and mate boats some ways to windward of the fish, and haul half of the seine from the purse to the mate boat while dropping down to the shoal of fish. They also used one or two boats, a trifle larger, to carry fish. They had six men on seine and a man in each car'away boat.

1859.

In 1859 tarred and hung the seine again, and went out for the first time on June 1. Sold the fish to the factory at Southold for most of the season. October 24, took 20,000 fish.

1860.

In 1860 we had a much larger purse-boat built, as I intended to clear up the seine in future on the seine-boats. It is sharp at both ends, and 20 feet long. [Some of the fishermen laughed at me and said it will not work, but in two years they all cleared up on the seine-boats and now (1878) would think a man crazy who tried to clear the seine as we used to the first years of my fishing; and when I commenced to purse fish they scooped them all on board the sloop with hand-nets, but we soon thought of a better way. I was the first that used a large net with a handle, the same that is used at the present time.] I have enlarged my seine this year (1860) and now have it four hundred meshes wide, and use six men instead of four, and have employed a small sloop, so that I can have a car'away. We had the boats and seine ready, so that we were ready to fish on May 23, when we caught 7,200 fish; on the 24th we took 21,000; on the 26th, 5,000; on the 29th, 12,700; on the 30th, 10,200, and the 31st, 18,000. In the latter part of July and first part of August fish were very scarce. August 9 took 28,000 fish off Bridgeport, Conn. Had previously fished nearly all the time in Peconic and Gardiner's Bays. August 13 tarred and hung the seine. September 11 the sloop I have had to use has started for home to-day, so I have only my little sloop now.

1861.

May 31, 1861, I fixed up bunks and table in a small house we have rented, as my little sloop is not large enough for us all to live on board and carry the fish, consequently I will be obliged to confine our operations in Peconic Bay fishing for the farmers.

July 25 and 26 fishing at Cold Spring and Northport. July 30 took 66,000 fish off Bridgeport, Conn., and August 2 took 70,000 at same place. August 24, off Milford, Conn., we saw fish in every direction as far as the eye could reach, and good shoals. We went to work with a will, and we soon had the sloop loaded and then headed her for Wading River. The farmers were looking for us, and we soon carted the fish out. We had 77,000 fish.

1862.

In 1862 we purchased a larger sloop called the William Hatfield, which will carry 20 tons; expect to have her to tow the boats and seine, and for the crew to live; also to carry fish. using the little sloop, the Accordeon, for a carry-away. We have fixed and painted the sloops and boats; tarred and hung the seine, and have everything ready to commence fishing the 4th of June, but the wind came on to blow and we had a violent east storm.

June 5th, Thursday: Wind continues east, so we did not fish, but fixed the deck boards and bunks on board the William Hatfield. *Friday, 6th:* Went down bay; wind continues east; went in Noyack Bay, but caught no fish; just at night went up and anchored in the cove near New Suffolk. *Saturday, 7th:* Went out; caught 3,000 fish; landed them at Jamesport. *Monday, 9th:* Wind blows strong from the east; we did not fish. *Tuesday, 10th:* Went out in Peconic Bay; caught 6,500 fish; sent them to J. Applie's factory; pleasant. *Wednesday, 11th:* Wind blew strong; did not fish. *Thursday, 12th:* Went out in Peconic Bay; caught 4,150 fish; sent them to Jamesport for the farmers; pleasant. *Friday, 13th:* Caught in Peconic Bay 18,900 fish; landed them at Jamesport; pleasant. *Saturday, 14th:* Caught in Peconic Bay 22,500 fish; landed them at Jamesport; pleasant. *Monday, 16th:* Went out in Peconic Bay; caught 18,000 fish; landed them at Jamesport; pleasant. *Tuesday, 17th:* Caught in Peconic Bay 23,050 fish; landed at Jamesport. *Wednesday, 18th:* Wind blew hard SW.; we did not go fishing; we fixed the reel. *Thursday, 19th:* Went out fishing; caught none. *Friday, 20th:* Went down through Peconic Bay, and were bound down into Gardiner's Bay, when, abreast of Greenport, we saw a good shoal of fish; went around it, but, the water being deep, they dove the seine and came up back side in good shape; we took the seine on as soon as we could and tried them again; they dove the second time, and while we were getting our seine on the boats they had moved into shoaler water; we tried them the third time, when we caught them; we saved 27,500; sent them to J. Applie's factory; pleasant day. *Satur*

day, 21st: Came to Jamesport. *Monday, 23d:* Started very early in the morning, intending to go into Gardiner's Bay, but it was calm; so we caught 11,000 fish in Peconic Bay; sent them to J. Applie's factory; pleasant day. *Tuesday, 24th:* An east storm; we made a harbor in Kirkle Harbor. *Wednesday, 25th:* Went out in Gardiner's Bay; caught 31,750 fish; sent them to J. Applie's factory; pleasant day. *Thursday, 26th:* Caught in Gardiner's Bay 22,500 fish; sent them to J. Applie's factory; pleasant day. *Friday, 27th:* Went fishing in Gardiner's Bay; caught none. *Saturday, 28th:* Went out in Gardiner's Bay; caught 44,000 fish; sent them to J. Applie's factory; pleasant weather. *Monday, 30th:* Went out in Peconic Bay; caught 26,500 fish; sent them to J. Applie's factory; pleasant day.

July 1st, Tuesday: Went in Peconic Bay; caught 13,500 fish; sent them to Applie's. *Wednesday, 2d:* Went out in Peconic Bay; caught 21,700 fish; landed them at Jamesport; pleasant day. *Thursday, 3d:* Wind east and stormy; did not fish. *Monday, 7th:* Went out in Peconic Bay; caught 39,000 fish; sent them to J. Applie's factory; pleasant. *Tuesday, 8th:* Went out in Peconic Bay; caught 35,000 fish; sent them to Jamesport in the Accordeon; caught 23,000 more and carried them to the factory in the William Hatfield; pleasant day. *Wednesday, 9th:* We caught 12,000 fish and brought them to Jamesport in the William Hatfield; the wind blew quite hard. *Thursday, 10th:* Went in Peconic Bay; caught 22,000 fish; brought them to Jamesport; pleasant weather. *Friday, 11th:* Caught in Peconic Bay 32,000 fish; sent them to J. Applie's factory; pleasant day. *Saturday, 12th:* Caught in Peconic Bay 10,000 fish; landed them at Jamesport; pleasant. *Monday, 14th:* Caught in Peconic Bay 20,000 fish; landed at Jamesport; pleasant. *Tuesday, 15th:* Went down in Little Peconic Bay; caught 40,000 fish; landed them at Clark's factory (small works in Noyack Bay); J. Applie could not take them; pleasant weather. *Wednesday, 16th:* We made one set in Noyack Bay and tried to sell them to the factories, but could not; so sent the Accordeon to Sag Harbor and sold them to the farmers: at night we went to Greenport. *Thursday, 17th:* Went down in Gardiner's Bay; caught 18,000 fish; landed them at J. Applie's factory; pleasant. *Friday, 18th:* Wind blew hard from the east, so we came to Jamesport. *Monday, 21st:* The wind east; so we did not fish; I took a horse and went down to the Southold factory to see Mr. Brundred, and he engaged to take our fish, for we do not like to catch fish without knowing where we can dispose of them; just at night we started down bay; left the Accordeon at Jamesport; we sailed all night, and in the morning anchored in Orient Harbor. *Tuesday, 22d:* The wind continues to blow from the east; we got under way and beat down under lee of Gardiner's Island; caught 32,000 fish; went to Brundred's factory at Southold with them. *Wednesday, 23d:* Went out in Gardiner's Bay; caught 22,000 fish; landed them at factory; pleasant day. *Thursday, 24th:* Caught in Gardiner's Bay 8,000 fish; factory; pleasant. *Friday, 25th:* Caught in Gardiner's Bay 26,500 fish; factory; pleasant. *Saturday, 26th:* Came to Jamesport. *Monday, 28th:* Went down in Gardiner's Bay; caught a large haul, and while clearing up the seine drifted so near Crow Island Shoal that the seine caught on the rocks: we saved only 21,000 fish; tore the seine bad; pleasant. *Tuesday, 29th:* Came to Jamesport with the seine and carted it up in the lot. *Wednesday, 30th:* Worked on the seine. *Thursday, 31st:* Worked on the sloops and seine.

August 1st, Friday: Worked on the seine. We did not start out until *Monday, 4th:* We carted the seine down to the boats, and started down bay; pleasant. *Tuesday, 5th:* Went out in Gardiner's Bay; caught 7,000 fish; sent them to factory at Southold; pleasant. *Wednesday, 6th:* Caught in Gardiner's Bay 24,000 fish; sent them to Southold; pleasant day. *Thursday, 7th:* Went below Gardiner's Island; caught no fish; at night came up to Greenport; pleasant. *Friday, 8th:* We hauled the William Hatfield out on the ways and cleaned her bottom, corked, &c. *Saturday, 9th:* Had the William Hatfield painted. *Monday, 11th:* Went down in Gardiner's Bay, caught about 2,000 fish, and anchored at night just east of Fire Place Point; pleasant. *Tuesday, 12th:* We went below Gardiner's Island and into Fort Pond Bay; caught none; wind blew quite hard from the southwest; went into Napeague Harbor and threw the 2,000 fish that we caught on Monday overboard, after which we went on shore and walked over to the surf. *Wednesday, 13th:* We went out of Napeague and went west of Gardiner's Island, in Gardiner's Bay; caught 88,000 fish; put them in both sloops and took them to the factory at Southold; pleasant day. *Thursday, 14th:* Went out in Gardiner's Bay, caught 18,000 fish and $5 worth of bluefish; wind blew quite hard. *Friday, 15th:* It rained in the morning; we went to Jamesport and carted the seine in the lot. *Saturday, 16th:* We worked on the seine, mending holes; the bluefish bit off a great many single bars, and it makes a great deal of mending. *Monday, 18th:* Started down bay early in the morning, but did not get into Gardiner's Bay until most night. Anchored in Orient Harbor; pleasant day. *Tuesday, 19th:* Went out in Gardiner's Bay; caught 29,200 fish; sent them to the Southold factory; pleasant day. *Wednesday, 20th:* Went below Gardiner's Island; caught 26,500 fish; sent them to the factory at Southold; pleasant. *Thursday, 21st:* Went out in Gardiner's Bay; caught 44,000 fish; factory; pleasant. *Friday, 22d:* Caught in Gardiner's Bay 30,000 fish; wind blew very hard. Went to Jamesport with the fish. *Saturday, 23d:* Attended to the fish; laid the William Hatfield on the shore to clean her bottom, and carted the seine out in the lot and mended it. *Monday, 25th:* We went down bay; went around a shoal of fish off Three-Mile Harbor, which is on the south side of Gardiner's Bay, and caught the seine on the rocks, lost the fish, and tore the seine; came to anchor, mended the holes, and lay there through the night; pleasant day; light wind southwest. *Tuesday, 26th:* Caught in Gardiner's Bay 17,000 fish; sent them to the Southold factory; pleasant day. *Wednesday, 27th:* Went below Gardiner's Island, then came up in Gardiner's Bay and caught 20,000 fish off Three-Mile Harbor; pleasant day. *Thursday, 28th:* A. M. it rained; p. m. we went out in Gardiner's Bay; caught a good haul of fish, but the sharks made holes in the seine and let them all out except 6,000. *Friday, 29th:* Wind blew hard from the northwest; we went out and lay under the lee of Ram Head, thinking the wind might die out, but as it continued to blow we came up to Greenport and hauled the William Hatfield on the ways to stop a leak.

September 1st, Monday: A windy day; it rained in the morning; we did not fish. *Tuesday, 2d:* Went out in the morning, but the wind came on to blow hard from the northwest; so we anchored under Long Beach, and lay there all day and night. *Wednesday, 3d:* Went out in the morning below Gardiner's Island; caught about 15,000 fish; staid in Napeague through the night; pleasant. *Thursday, 4th:* Got under way in the morning; looked below Gardiner's

Island; then went up in Gardiner's Bay; caught 30,000 fish; sent them to factory; pleasant day. *Friday, 5th:* Went down in Gardiner's Bay; caught 12,000 fish; sent them to the factory and we came to Greenport; pleasant. *Saturday, 6th:* Went down in Gardiner's Bay, off Plum Gut, but caught no fish; then came to Jamesport with the sloops; it took us all day, as the wind was southwest; we carted the seine up in the lot. *Monday, 8th:* We worked on the sloops and seine; in fact we spent the whole week tarring and hanging the seine, and working on the farm a part of the time; did not go out fishing until *Monday, 15th:* When we went down bay; caught 5,000 fish; landed them at the factory; pleasant day. *Tuesday, 16th:* Went out in Gardiner's Bay; caught 15,000 fish; sent them to the factory; pleasant. *Wednesday, 17th:* Caught in Gardiner's Bay 6,000 fish; factory; fine day. *Thursday, 18th:* Caught in Gardiner's Bay 15,000 fish; took them to the factory at Southold; pleasant. *Friday, 19th:* Went out in Gardiner's Bay; caught 10,500 fish; factory; fine. *Saturday, 20th:* Came to Jamesport with the sloops. *Monday, 22d:* We went down bay; caught none; pleasant day. *Tuesday, 23d:* We went out very early in the morning; went below Gardiner's Island; caught 30,000 fish; sent them to Southold to the factory; pleasant. *Wednesday, 24th:* Went out, but the wind came on to blow very hard; so we went into Napeague Harbor and went beach-plumming. *Thursday, 25th:* A. M. the wind blew very hard from the east; we went beach-plumming again; at noon the wind slacked down, so that we thought it would do to go out; went out east of Gardiner's Island and went around a shoal of fish; the seine caught on a rock, and we saved only 3,000 fish and tore the seine, so we went into Napeague and mended it. *Friday, 26th:* Went out below Gardiner's Island; caught 10,500 fish; we did not get to the factory until most daylight next morning; very calm day. *Saturday, 27th:* Went to Jamesport; pleasant. *Monday, 29th:* Went down bay; caught none; very fine day. *Tuesday, 30th:* We went out in Gardiner's Bay; caught 3,000 fish; sent them to factory; pleasant.

October 1st, Wednesday: Wind east and stormy; did not fish. *Thursday, 2d:* East storm continues. *Friday, 3d:* Went out in Gardiner's Bay; caught 17,500 fish; sent them to the factory at Southold; pleasant day. *Saturday, 4th:* Came to Jamesport; the wind blew quite strong from the southwest; did not go out again until *Wednesday, 8th:* We started down bay early in the morning; went down in Gardiner's Bay, but it was so late we caught none; pleasant. *Thursday, 9th:* Went down in Gardiner's Bay; caught 26,500 fish; sent them to Southold factory; pleasant day. *Friday, 10th:* An east storm; we lay in the basin at Greenport. *Saturday, 11th:* A. M. it rained; did not fish. *Monday, 13th:* A storm from the east. *Tuesday, 14th:* Wind continues; did not fish. *Wednesday, 15th:* Went out in Gardiner's Bay; caught 46,600 fish; sent them to Southold; pleasant, but blew quite hard from the southwest in p. m. *Thursday, 16th:* Went down in Gardiner's Bay; caught 24,000 fish; took them to the factory; pleasant day. *Friday, 17th:* Went out in Gardiner's Bay; caught 33,000 fish; sent them to the factory; we anchored under Gardiner's Island; fine. *Saturday, 18th:* In the morning we went around east of Gardiner's Island, but found no fish; then we went up to Southold with the William Hatfield, and reeled our seine on one of the haul-seine reels; got a team and went home. *Monday, 20th:* Went to Southold, then went to Greenport with the William Hatfield; the wind blew very hard from the northwest, so that we could not fish; mended seine, &c. *Tuesday, 21st:* Went out in Gardiner's Bay; caught 63,000 fish at one set; sent them to Southold factory; the wind came on to blow southwest. *Wednesday, 22d:* Started out of Greenport in the morning, but we had got no farther than Hay Beach when it commenced to blow so hard from the northwest that we came back to Greenport; it was as much as we could do to get back; some of the double-end fish-boats (Rhode Island gangs) could not get back, but got under the land and anchored. *Thursday, 23d:* Wind continued at the northwest; we laid in Greenport. *Friday, 24th:* Went out in Gardiner's Bay; caught 51,000 fish; sent them to Southold factory; pleasant day. *Saturday, 25th:* We went out in Gardiner's Bay; caught 60,000 fish at one set; the carry-away sloop did not get to us in time, so we took them on the William Hatfield; it was calm all the p. m., so we did not arrive at Southold with them until eight o'clock in the evening. *Monday, 27th:* Went to Greenport; it stormed, so we did not fish. *Tuesday, 28th:* A pleasant day, but some of my men have failed to come; therefore we cannot fish. *Wednesday, 29th:* Found two men in Greenport and went down below Gardiner's Island; made one set just at night, and as it was calm came to anchor east of the island and lay there until morning. *Thursday, 30th:* In the morning it blew quite hard from the northwest, but as soon as it slacked we got under way and soon found a nice red bunch; by the looks of it I should think it contained near 100,000; we set the seine around it and commenced pursing, but we soon found it had caught on rocks and we could not purse it; but as we were out of the tide, we took a boat and pulled the seine up, clearing it, and saved a part of the fish—saved, with the few we caught the day before, 46,500 fish; took them to the factory, and as I was bothered to get men to make out a crew, thought I would lay up. *Friday, 31st:* Went to the factories and had a settlement, and the next day went to Jamesport and stowed boats and seines away.

1864.

As the business has increased in importance, we have enlarged our capacity of catching and carrying the fish by getting another carry-away sloop. Now we have the William Hatfield for towing the boats and seine and for the fishing-crew to live in, and if necessary can carry a few fish on deck; the Accordeon, which will carry about 45,000 fish; and the Black Bird, which will carry about 40,000. We have fixed and painted the sloops and boats, and started out fishing in Peconic Bay May 31, when we took 40,000 fish, and sent them to J. Applie's factory in the Accordeon.

June 13th: Sold $7.50 worth of fish to a smack; most of our fish are now sold to the factories. *June 15th:* Sold $26.75 worth of fish to a smack.

October 18th: The wind has slacked up so that we started out in the morning, and as soon as the gangs were by Long Beach they began to drop off, and when we were just by Long Beach, looking off toward where the sun had just risen, we could see fish breaking as far as the eye could reach. I never saw such a show of fish. We dropped

off from the sloop with our boats and rowed down to where we saw them playing; and they were playing to the west, and to the east, and to the south, as far as we could see, just as fast as they were near us. So we rowed right in where they were playing and encircled as many as we could and caught about 75,000 the first set, after which we made two more sets not so large. We sent the Accordeon, with 41,000 fish, and the Black Bird, with 59,000, to J. Applie's factory, and we put 7,875 on the William Hatfield, which we took to the Atlantic Works, as they were nearer. These were large eastern fish, and had just struck in the bay. There were about ten gangs fishing there that morning, and I think they all loaded their boats before night. It was a pleasant day, but cool in the forenoon. *October 26th:* It blew quite hard in the morning from the northwest, but it soon died out and we made a set just north of Crow Island Shoal, in Gardiner's Bay. We pursed them up without any trouble, but when we came to take on the seine we found we had something. We found the fish had made three large "cods" and twisted the seine so we could not clear them. We worked a long time on them, and then we took the Black Bird alongside; took a boat-hook and hooked into the "cod," pulled it up on the side of the Black Bird, and cut a large hole in the seine, and nearly loaded her out of that "cod." We served another "cod" the same way, and while we were attending to this, "Mr. Shark" made a hole in another "cod" and so saved us the trouble of scooping them. Then we cleared the seine and scooped what was left in the bunt. We were at work on them nearly all day and saved 44,000 fish, which we sent in the Black Bird, and 12,000 in the Accordeon, to J. Applie's factory. All the fish we have caught since the 18th of October have been fat eastern fish.

The fish brought us $2.50 per thousand this year. In the fall they run $3 per thousand, and a few as high as $5 per thousand. It was a hard matter to get a good cotton seine. I bought some for $1.35 per pound, and it was so poor and the knitting so bad that we would not think of using it now (1878) if we could get it for nothing. [I don't recollect just what menhaden oil was bringing at this time, but I think it was $1 per gallon, perhaps a little more.]

1865.

Painted the sloops and got the seine ready and commenced fishing May 31. *June 27th:* Sold 10,500 fish to a smack for $31.50. *July 21st to 28th:* Fishing off Milford, Conn. *September 29th:* Went to Boston to see about getting a new seine; it was impossible to get a cotton seine without paying a very large price; so I bargained for a seine made of flax or hemp, and it was to be done so that I could have it soon, for our seine was getting very poor; got the seine October 30.

1866.

September 25th: We took off the sails and lined them. From that date to October 17 weather bad or fish scarce, so that there was no fishing.

1867.

As the Accordeon was getting old and we saw the need of having a larger sloop, I have sold her and built a new sloop that will carry about 60,000, which I have named the U. S. Grant. I had her built near my house and moved her to the bay on big wheels. So now we have the William Hatfield to tow the seine and the U. S. Grant and Black Bird for carry-away sloops. We have the sloops and boats ready, and on the 6th of May we put things on the William Hatfield and bent the sails on the U. S. Grant. *May 7th:* I sent to Riverhead for the U. S. Grant's anchors, and took the seine on board and had everything ready to go out fishing. We started out, thinking to go down to Greenport, but when we had sailed about half way to Robin's Island we discovered a number of bunches of fish. They were not playing much, but we saw the color of them. Then we prepared the seine as soon as we could and went to work at them. We made three sets, and caught about 20,000 each set. We sent 45,000 fish in the U. S. Grant and 16,000 in the Black Bird to Jamesport for the farmers. A pleasant day; wind light, southeast. *May 14th:* Went out in Peconic Bay; caught 22,400 fish, which we sent in the Black Bird to Hallett's Works. We came into Jamesport and came to anchor and hauled the seines out on deck, as we are in the habit of doing, to allow the air to come to, it to prevent its heating. We had one of the greatest hail-storms I ever witnessed; the hail-stones were four or five inches deep in some places next morning. Saw no fish again till the 22d, but we caught none till the 27th of May.

October 15th: We started out of Gardiner's Bay; it was a pleasant morning.

There was one gang a mile or two to the east of us; and about sunrise we saw them drop off and set the seine; when we came up to them the captain called out to me and said, "They are large eastern fish"; and about that time the man at mast-head cried out, "I can see them off to the east, playing as thick as rain-drops"; and we could soon see them from the deck (just after sunrise you can see fish a long way off to the eastward). In a little while we came up with them. It was a large, solid body of fish and showed a good color. We dropped off from the sloop and went around just one end of the body and commenced pursing. We pursed the seine without much trouble and took it on, running the fish all in the bunt; but when the carry-away came alongside, and we tried to get them up, so as to scoop, we found we could not raise them. As the wind was light we got both sloops alongside and had carry-away men to help us, but still we were not able to bring them up; then we lashed a pole on the scoop-net handle, but the fish were so far down we could make no headway in hoisting them out. At last the wind breezed up from the northwest, and the bunt, not being able to stand so heavy a strain, began to rip, when we were obliged to slack the seine down and let the fish out; there were four or five good shoals went out. One gang came along and caught one shoal and nearly loaded his boats. After all had run out that would, we raised up enough to make 49,100 fish, which

we sent to Hallett's Works. We were all of us about beat out; we had worked and pulled with all our might for four or five hours to try to save the fish, but we had too many for one gang to handle. I have no doubt but what we pursed up between 300,000 and 400,000. The fish at this time, as I well remember, were selling for $3 a thousand.

1868.

We have tarred and hung the seine and got the sloops out of the creek and had them painted, and have everything ready to commence work. *May 15th:* Went out in Peconic Bay, but caught none. *May 16th:* Caught in Peconic Bay 26,224 fish, which we sent in the U. S. Grant to Jamesport for the farmers. *June 19th:* I have purchased a part of the Smith's Island Works at Norwalk Islands, and we are preparing to go there to fish. Arrived at Norwalk Islands June 24. On the 29th we caught 33,180 fish in the mouth of the Saugatuck River.

1869.

April 26th, Monday: We started up to the Smith's Island Works, with the U. S. Grant and Black Bird, to make some improvement on the works, and also to set a pound that had formerly been used by the parties we purchased of. Taking what help we needed, we overhauled the works and put in the pound, but did not catch fish enough to amount to much.

May 29th: We started for home with the U. S. Grant; arrived at Mattituck next morning, and hired one of the farmers to take us home; we had the William Hatfield prepared, and, carting the seine on board, started from Jamesport.

June 2d, Wednesday: Arrived at Greenport evening; pleasant. *Thursday, 3d:* We laid in a store of wood, oars, and provisions, and had the sloop's papers renewed; then taking the reel on board, started for Norwalk Islands; in the evening we arrived at Mattituck Creek, where we came to anchor, to wait until morning and to get the U. S. Grant out of the creek; weather pleasant; light wind SW.

July 20th: We caught off Hog Island 7,700 fish, which we sent in the U. S. Grant to Luce's floating factory, which is anchored behind Hog Island Point, at the entrance of Oyster Bay.

1870.

May 3d: Started out, but saw no fish. *May 4th:* Saw no fish in shape to catch. *May 9th:* The wind continues to the east, but does not blow very hard, so we went out in Peconic Bay and off Canoe Place. Saw a nice round shoal of fish that we judged might contain 30,000. We encircled them with our seine and pursed them up without any trouble, and run them into the bunt ready to scoop, when we found we could not raise them. So another gang came to our assistance. When we got them up enough to scoop we loaded the Black Bird. As the U. S. Grant did not come out, we got the other gang's carry-away boat alongside. Many of the fish being dead, we could not hold them up. They tore the bunt nearly in two, and run out until we thought they were nearly gone; then we succeeded in getting up the rent in the bunt so that we got 60,000 fish in the other gang's carry-away. We sent to Jamesport in the Black Bird 42,390 fish; so we saved over 100,000, and I presume we lost more than we saved.

October 28th: Was too windy to fish. We staid at Greenport waiting for weather suitable to fish until the 4th of November, but the wind blew hard every day, from the northwest most of the time, and on the 4th of November we concluded we had better lay up.

1871.

I have made some changes; I am to fish for the floating factory, Algonquin, owned by C. H. Tuthill & Co. I am to have a sloop called the Starlight, which is a larger and faster sailer than the William Hatfield, to live in and tow the boats and seine. I have taken the forward house off and put in new ceiling, and given the William Hatfield a thorough overhauling, and am expecting to use her for a carry-away instead of the Black Bird, and now I think we have a pretty good rig. We have taken the sloops to Greenport and had them painted, and were prepared to start out fishing on the 1st of May, when all hands came on board the sloops.

May 2d, Tuesday: We started down bay; the wind was very light from the east; we saw a few fish above Robins Island, but they were going before the wind, so that I could not catch them very well; there was a sail-boat put off from the north shore of the bay—where there is a haul-seine located—with a number of men in it, and followed us to Robins Island; I had heard that there had been a law passed in Albany prohibiting purse fishing in some part of the bay, but was not able to learn whether it was Little or Great Peconic Bay; we caught on our way down 4,000 fish in Noyack Bay, which we sent in the U. S. Grant to Glover's Works, as our factory was not ready to take fish yet; I went to Greenport, and thought to find out for certain which bay we were not to be allowed to fish in; so I went up to the office of the Suffolk Weekly Times, and the editor told me he had just received a letter from our assemblyman at Albany; he wrote that purse fishing was not prohibited anywhere in this State except Little Peconic Bay. *Wednesday, 3d:* We went down in Gardiner's Bay; caught 8,000 fish, which we sent in the U. S. Grant to the Miamogue works; pleasant day. *Thursday, 4th:* A hard east storm; did not fish. *Friday, 5th:* The storm continues; we lay in Greenport. *Saturday, 6th:* We came up to Jamesport with the sloops, and worked on the seine; wind blew hard.

Monday, 8th: Wind blew hard, northwest; did not fish. *Tuesday, 9th:* Went out in Great Peconic Bay, which is the bay above Robins Island; we found fish scattered—a play here and there—all over; we made one set, but caught none; our friends in the sail-boat lay off in the bay watching us; but I paid no attention to them, as I thought the law prohibited fishing in Little Peconic Bay, which is below Robins Island. (But I *afterwards* learned that our assemblyman had made a mistake, and that it was *Great* instead of *Little* Peconic Bay, as he had *written*.) Very calm and fine. *Wednesday, 10th:* We went out in Great Peconic Bay and found a good bunch of fish, and set around them about sunrise; pursed them up and had them scooped into the William Hatfield; there were 51,000 fish, which we sent to the Miamogue Works before my friends in the sail-boat could get to us; it was quite calm; they went immediately to the district attorney and made a complaint against us; we dropped off a number of times during the day, but, fish being so scattered, we caught no more; pleasant. *Thursday, 11th:* Went out in Peconic Bay; caught none; the fish continue in very bad shape for catching with a purse-seine; the haul-seines are doing quite well; at night we went to Greenport to get some things we needed; fair. *Friday, 12th:* Went out fishing, but caught none; weather fine. *Saturday, 13th:* Caught none; came home; weather continues fine; the sheriff came down to see me, and read some papers to me that I suppose he thought would interest me.

The full record from 1872 to 1880 is as follows:

1872.

I have purchased a small carry-away called the New York in the place of the William Hatfield, which I have lost. I let the man that was expecting to sail her for me during the fishing season take her and go to New York and get a load of merchandise, and during a heavy squall, while reefing, a schooner came up from astern, ran into and sunk her off the south point of Heart Island. The crew of the William Hatfield saved themselves by springing on board the schooner, losing their clothes and effects, except what they had on their persons. I afterwards saw the owners of the schooner, but could make no settlement with them, when I employed a lawyer and libeled the schooner, compelling them to pay for the sloop and cargo. We have the sloops painted, and commence fishing in May.

May 13th, Monday: We went down bay; caught in Noyack Bay 37,000 fish, which we sent in the New York to the Algonquin; fine. *Tuesday, 14th:* We caught in Peconic Bay 47,000 fish, which we sent in the U. S. Grant to the Algonquin; pleasant day. *Wednesday, 15th:* Caught in Peconic Bay 29,500 fish, which we sent in the New York to the Algonquin; weather pleasant. *Thursday, 16th:* Went out in Gardiner's Bay; caught 36,300 fish, which we sent in the U. S. Grant to the Algonquin; fine. *Friday, 17th:* Caught in Gardiner's Bay 27,500 fish, which we sent in the U. S. Grant to the Algonquin; pleasant. *Saturday, 18th:* We came to Jamesport with the sloops; weather is pleasant; have had no rain in some time and the ground is getting very dry. *Monday, 20th:* The Algonquin is to be fixed, so we will have to take our fish elsewhere until they get her in readiness. We went out in Peconic Bay, caught 9,496 fish, which we sent in the U. S. Grant to Jamesport for the farmers; pleasant weather. *Tuesday, 21st:* Caught in Peconic Bay 22,750 fish, which we sent in the New York to Jamesport; fine weather. *Wednesday, 22d:* We caught in Peconic Bay 59,300 fish, which we sent in the U. S. Grant to Jamesport; fine weather. *Thursday, 23d:* Caught in Peconic Bay 35,000 fish, which we sent in the New York, and 38,991 in the U. S. Grant, to Jamesport; weather continues pleasant. *Friday, 24th:* We caught in Peconic Bay 25,000 fish, which we sent in the New York, and 19,540 in the U. S. Grant to Jamesport; we are having very pleasant weather. *Saturday, 25th:* Caught in Peconic Bay 34,786 fish, which we sent in the New York to Jamesport; pleasant day. *Monday, 27th:* We caught in Peconic Bay 49,541 fish, which we sent in the U. S. Grant to Jamesport; pleasant. *Tuesday, 28th:* Caught in Peconic Bay 30,222 fish, which we sent in the New York, and 31,000 in the U. S. Grant, to Jamesport; fine. *Wednesday, 29th:* We caught in Peconic Bay 7,300 fish, which we sent in the New York to Jamesport; weather pleasant. *Thursday, 30th:* Caught in Peconic Bay 22,900 fish, which we sent in the U. S. Grant to Jamesport; weather pleasant. *Friday, 31st:* We caught in Little Peconic Bay 31,000 fish, which we sent in the New York, and 16,371 in the U. S. Grant, to Jamesport; weather continues fine.

June 1st, Saturday: We did not fish; mended seine; pleasant. *Monday, 3d:* We caught in Little Peconic Bay 22,600 fish, which we sent in the New York to Jamesport; pleasant day. *Tuesday, 4th:* We caught none; the wind blew hard from the east; we anchored in the New Suffolk Cove. *Wednesday, 5th:* The wind continued to blow hard from the east; I went to New York to see about getting a new seine. *Thursday, 6th:* We caught in Peconic Bay 41,338 fish, which we sent in the U. S. Grant to Jamesport; pleasant day. *Friday, 7th:* Caught in Little Peconic Bay 32,800 fish, which we sent in the New York, and 28,179 in the U. S. Grant, to Jamesport; weather continues fine. *Saturday, 8th:* Did not fish; weather fair. *Monday, 10th:* Caught in Peconic Bay 12,196 fish, which we sent in the New York to Jamesport; pleasant. *Tuesday, 11th:* We caught in Little Peconic Bay 51,000 fish, which we sent in the U. S. Grant, and 26,179 in the New York, to Jamesport; weather pleasant. *Wednesday, 12th:* Caught in Peconic Bay 57,577 fish, which we sent in the U. S. Grant to Jamesport; weather fine. *Thursday, 13th:* We caught in Peconic Bay 34,000 fish, which we sent in the New York, and 27,500 in the U. S. Grant, to Jamesport; weather continues fine. *Friday, 14th:* Caught in Peconic Bay 36,043 fish, which we sent in the New York to Jamesport; weather fine. *Saturday, 15th:* We did not fish; mended seine, &c. *Monday, 17th:* Caught in Peconic Bay 44,500 fish, which we sent in the U. S. Grant to the Algonquin, as she is now prepared to take fish again; weather pleasant. *Tuesday, 18th:* We caught in Little Peconic Bay 40,500 fish, which we sent in the New York, and 4,000 in the U. S. Grant, to the Algonquin; weather continues pleasant. *Wednesday, 19th:* Caught in Peconic Bay 57,500 fish, which we sent in the U. S. Grant, and 36,200 in the New York, to the Algonquin, and 12,218, which we took to Jamesport in the Starlight; plenty of fish; pleasant weather. *Thursday, 20th:* We caught in Peconic Bay 57,000 fish, which

we sent in the U. S. Grant to the Algonquin, and 20,656 in the New York to Jamesport; weather pleasant. *Friday, 21st:* We caught in Little Peconic Bay 38,000 fish, which we sent in the New York, and 61,000 in the U. S. Grant, to the Algonquin; weather continues pleasant. *Saturday, 22d:* Caught in Peconic Bay 27,238 fish, which we sent in the New York to Jamesport; weather fine. *Monday, 24th:* Caught in Little Peconic Bay 50,000 fish, which we sent in the U. S. Grant, and 24,000 in the New York, to the Miamogue Works, as the Algonquin cannot take fish for a few days, owing to the fact that they are putting in a patent drier for drying scrap; weather pleasant. *Tuesday, 25th:* Caught in Peconic Bay 3,500 fish, which we sent in the U. S. Grant to Jamesport; weather continues fine. *Wednesday, 26th:* We caught in Little Peconic Bay 13,500 fish, which we sent in the New York to the Miamogue Works; fine. *Thursday, 27th:* We went to Greenport and ripped out and tarred the seine; pleasant day. *Friday, 28th:* Hung the seine; weather fine. *Saturday, 29th:* Did not fish; came home.

July 1st, Monday: We caught in Gardiner's Bay 38,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Tuesday, 2d:* We caught in Gardiner's Bay 39,000 fish, which we sent in the New York, and 58,000 in the U. S. Grant, and took 27,000 in the Starlight, to the Miamogue Works; fine. *Wednesday, 3d:* The factories are all full and the farmers are busy harvesting; we cannot sell any more fish at present, so we came to Jamesport with the sloops, and wait a few days for the glut to get over; weather pleasant. *Thursday, 4th:* At home; very warm weather. *Friday, 5th:* I worked around home a. m.; went out among the farmers collecting fish money p. m. *Saturday, 6th:* At work about home; weather continues pleasant. *Monday, 8th:* We came down to Greenport; pleasant day. *Tuesday, 9th:* We went in the sound and west as far as Norwalk Islands; saw plenty of fish but would not catch them, as we did not know where the Algonquin was, or if she was prepared to take fish; pleasant day; wind SSW. *Wednesday, 10th:* We went over to Huntington Bay, but the Algonquin was not there, so we concluded that she was in New Haven yet, where they took her to get the driers put in; then we came down to Milford to see if we could sell our fish there until the Algonquin was prepared to take them; caught 35,000 fish, which we sent in the New York to the Welch Point Works, where we succeeded in selling them; pleasant. *Thursday, 11th:* Caught off Stratford Point and Milford 48,000 fish, which we sent in the U. S. Grant, and 22,000 in the New York, to the Welch Point Works; weather pleasant. *Friday, 12th:* Caught off Milford 16,800 fish, which we sent in the U. S. Grant to the Welch Point Works; pleasant. *Saturday, 13th:* We did not fish, but went to New Haven to see if the Algonquin was ready to take fish, or was ever likely to be ready; pleasant day. *Sunday, 14th:* In New Haven; very warm day. *Monday, 15th:* Caught off New Haven 36,000, which we sent in the New York to the Welch Point Works; pleasant. *Tuesday, 16th:* Caught off Milford 18,300 fish, which we sent in the U. S. Grant to the Welch Point Works; pleasant. *Wednesday, 17th:* We caught off Milford 26,500 fish, which we sent in the New York to the Welch Point Works; pleasant. *Thursday, 18th:* We caught off Black Rock 42,400 fish, which we sent in the U. S. Grant to George W. Miles's Works; pleasant. *Friday, 19th:* We caught off Southport 21,000 fish, which we sent in the New York to the Welch Point Works; pleasant. *Saturday, 20th:* We came over to Northport, expecting to see the Algonquin anchored in Huntington Bay, as they calculated to be ready this week, but she is not here yet; we went into Northport and purchased our week's stores, put the seine on the beach to dry, and improved our time by mending the holes; fine. *Monday, 22d:* The wind blew hard NNW.; we went out in the sound, but came to anchor under the land off Southport. *Tuesday, 23d:* We caught off Southport 37,500 fish, which we sent in the U. S. Grant to the Algonquin, as she has arrived and is anchored in Huntington Bay; pleasant. *Wednesday, 24th:* Caught off Glen Cove and Captain's Island 27,500 fish, which we sent in the New York to the Algonquin; weather continues pleasant. *Thursday, 25th:* Caught off Cold Spring 15,500 fish, which we sent in the U. S. Grant to the Algonquin; pleasant. *Friday, 26th:* Stormy day; came into Northport and hauled out the sloops on the railways. *Saturday, 27th:* Had the sloops painted; pleasant; the fish do not seem to be very plenty in the sound, and Mr. C. H. Tuthill, who has charge of the Algonquin, hearing that the fishing is good in Gardiner's Bay, has gone to Greenport, and, if the report is true, is to send me a dispatch early Monday morning, and we are to start down. *Monday, 29th:* Early in the morning went to the telegraph office, and had a dispatch to come; we sent word to the ship, and they sent a dispatch to New York for a tug to tow the Algonquin down; we made a set in Northport Bay as we were going out and caught 16,200 fish, which we sent in the U. S. Grant to the Algonquin; then we went down the sound, had a good breeze SW., and arrived at Plum Gut just after dark. *Tuesday, 30th:* We caught in Gardiner's Bay 50,000 fish, which we sent in the U. S. Grant to the Miamogue Works, as the Algonquin has not arrived yet; pleasant. *Wednesday, 31st:* We went out in Gardiner's Bay, where there appeared to be plenty of fish; caught 58,000, which we put in the U. S. Grant, and just as we finished scooping them in we saw the Algonquin, with a tug ahead, coming through Plum Gut; they anchored her behind Cedar Island, and about as soon as she was anchored the U. S. Grant was alongside of her, and we had 37,000 fish scooped in the New York and going towards her; weather continues fine.

August 1st, Thursday: Caught in Gardiner's Bay 54,500 fish, which we sent in the U. S. Grant, and 24,200 in the New York, to the Algonquin; weather continues pleasant. *Friday, 2d:* We went out in Gardiner's Bay; caught 56,300 fish, which we sent in the U. S. Grant, and 42,500 in the New York, to the Algonquin; weather fine. *Saturday, 3d:* They do not want any more fish this week, therefore did not go out, but went home; pleasant. *Monday, 5th:* Went out in Gardiner's Bay; caught 44,300 fish, which we sent in the New York, and 51,500 in the U. S. Grant, to the Algonquin; weather continues fine. *Tuesday, 6th:* Went out in Gardiner's Bay; caught 44,000 fish, which we sent in the New York, and 32,800 in the U. S. Grant, to the Algonquin; pleasant day. *Wednesday, 7th:* Caught in Gardiner's Bay 44,300 fish, which we sent in the New York to the Algonquin; weather fine. *Thursday, 8th:* We caught in Gardiner's Bay 52,000 fish, which we sent in the U. S. Grant to the Algonquin; pleasant. *Friday, 9th:* Went out in Gardiner's Bay; made two sets; caught 64,000 fish, which we put on the U. S. Grant, and 19,500, which we took on the Starlight, to the Algonquin. The fish are so plenty that they do not want more than 50,000 a day from a gang; but if we make a large haul we take them in, as we do not want to throw them

away after we catch them. The fish have been so plenty in Gardiner's Bay, for a few days, that we could have loaded two or three sloops every day; pleasant weather; wind SW. *Saturday, 10th:* We tarred a new seine; pleasant. *Monday, 12th:* They have concluded to let us send them as many fish as we can, the first of the week, if we will "light up" the last of the week, so they can get cleared up. Went out in Gardiner's Bay; caught 56,500 fish, which we sent in the U. S. Grant, and 35,500 in the New York, to the Algonquin; pleasant. *Tuesday, 13th:* Caught in Gardiner's Bay 44,000 fish, which we sent in the New York, and 52,000 in the U. S. Grant, to the Algonquin; weather continues pleasant. *Wednesday, 14th:* Caught in Gardiner's Bay 40,500 fish, which we sent in the New York, and 43,800 in the U. S. Grant, to the Algonquin; and we sold $40.50 worth of fish to a smack; pleasant day. *Thursday, 15th:* Went out in Gardiner's Bay; caught 39,000 fish, which we sent in the New York, and 38,000 in the U. S. Grant, to the Algonquin; weather pleasant. *Friday, 16th:* They want no more fish at the factory this week, therefore we hung our new seine; pleasant. *Saturday, 17th:* Showery. *Monday, 19th:* We caught in Gardiner's Bay 42,500 fish, which we sent in the New York to the Algonquin; fine. *Tuesday, 20th:* Caught in Gardiner's Bay 56,000 fish, which we sent in the U. S. Grant, and 40,700 in the New York, to the Algonquin; weather continues pleasant and the fish plenty. They have been obliged to stop us from bringing fish to the Algonquin, as they are blocked up with scrap. The fish have been plenty ever since we came from the sound. We go out in Gardiner's Bay two or three miles and find all the fish we want, and come back to Greenport, where we arrive by middle of p. m., if we have a breeze of wind. As we cannot sell our fish or dispose of them any way to the fish works, we thought we would catch a few and send them up bay and try to sell some to the farmers. *Wednesday, 21st:* Went out in Gardiner's Bay; caught 50,000 fish, which we sent in the U. S. Grant, and 21,100 in the New York, to Jamesport; and we went up with the Starlight to see about selling them. *Thursday, 22d:* We attended to selling the fish, and as there is camp meeting at Jamesport we concluded to stay and attend that the remainder of the week. *Monday, 26th:* We caught in Gardiner's Bay 50,000 fish, which we sent in the U. S. Grant, and 24,300 in the New York, to Jamesport; pleasant day. *Tuesday, 27th:* Sold the fish at Franklinville, laying the sloops on shore. They have city boarders in Jamesport and do not like to have fish landed on the wharf. After getting the fish out we went to Greenport. *Wednesday, 28th:* Caught in Gardiner's Bay 40,700 fish, which we sent up to Jamesport in the New York; pleasant. *Thursday, 29th:* I left the sloop in Greenport and came to Jamesport on the cars to try and sell the fish. We laid the New York on the shore just west of Jamesport, and I sold the fish by taking a horse and wagon and driving three or four miles among the farmers; pleasant day; evening I took the cars to Greenport. *Friday, 30th:* The ship is not ready to take fish yet, and all the fish works have all they can do to take care of their own gang's fish. So I cannot sell to them, and they do not want me to land fish on the wharf at Jamesport, as the boarders do not like it, so we have concluded to quit for the week.

September 2d, Monday: The Algonquin is not prepared for fish yet, so we lay in Greenport. I tried to be patient, but I think I *did* fret a little. *Tuesday, 3d:* We had word the Algonquin was ready for fish; went out in Gardiner's Bay; caught 55,500 fish, which we sent in the U. S. Grant to the Algonquin; pleasant. *Wednesday, 4th:* Caught in Gardiner's Bay 42,000 fish, which we sent in the New York, and 15,500 in the U. S. Grant, to the Algonquin; weather continues pleasant. *Thursday, 5th:* We caught in Gardiner's Bay 46,200 fish, which we sent in the New York, and 16,000 in the U. S. Grant, to the Algonquin; also sold $20 worth to a smack; pleasant day. *Friday, 6th:* Caught in Gardiner's Bay 35,800 fish, which we sent in the New York, and 21,000 in the U. S. Grant, to the Algonquin; weather fine. *Saturday, 7th:* We hauled out the sloops on the railways and scrubbed them; pleasant day. *Monday, 9th:* Went out in Gardiner's Bay; the wind came on to blow strong, so we went into Napeague. *Tuesday, 10th:* Went out below Gardiner's Island; caught 34,000 fish, which we sent in the New York, and 46,000 in the U. S. Grant, to the Algonquin; pleasant. *Wednesday, 11th:* Caught below Gardiner's Island 43,000 fish, which we sent in the New York and 47,500 in the U. S. Grant, to the Algonquin; weather continued pleasant. *Thursday, 12th:* Caught in Gardiner's Bay 36,000 fish, which we sent in the New York, and 24,300 in the U. S. Grant, to the Algonquin; weather continues fine. *Friday, 13th:* We caught in Gardiner's Bay 6,000 fish, which we sold to a smack for $15; pleasant. *Saturday, 14th:* As they do not want fish on Saturday, we went home; weather pleasant. *Monday, 16th:* A stormy day; did not fish. *Tuesday, 17th:* Went out in Gardiner's Bay; caught 50,500 fish, which we sent in the U. S. Grant to the Algonquin; fine. *Wednesday, 18th:* Wind east; caught none. *Thursday, 19th:* East storm; lay in Greenport. *Friday, 20th:* Windy; did not go out. *Saturday, 21st:* Did not fish; went home. *Monday, 23d:* Went out in Gardiner's Bay; caught 36,800 fish, which we sent in the New York, and 39,000 in the U. S. Grant, to the Algonquin; pleasant day. *Tuesday, 24th:* Caught in Gardiner's Bay 35,800 fish, which we sent in the New York to the Algonquin; pleasant. *Wednesday, 25th:* We caught in Gardiner's Bay 59,000 fish, which we sent in the U. S. Grant, and 16,500 in the New York, to the Algonquin; weather continues pleasant. *Thursday, 26th:* Stormy day; Hauled out the sloops on the railways. *Friday, 27th:* Stormed hard. *Saturday, 28th:* Tarred and hung the seine. *Monday, 30th:* Went out in Gardiner's Bay; caught 29,150 fish; sent them in the U. S. Grant to the Algonquin; pleasant.

October 1st, Tuesday: Caught in Gardiner's Bay 17,500 fish, which we sent in the New York to the Algonquin; weather fine. *Wednesday, 2d:* We quit for the week and attended the Suffolk County Fair. *Monday, 7th:* Went out in Gardiner's Bay; caught 72,000 fish, which we sent in the U. S. Grant to the Algonquin; fine. *Tuesday, 8th:* Caught in Gardiner's Bay 6,500 fish, which we sent in the New York to the Algonquin; weather pleasant. *Wednesday, 9th:* We caught in Gardiner's Bay 20,700 fish; sent in the U. S. Grant to the Algonquin; pleasant. *Thursday, 10th:* Caught in Gardiner's Bay 7,600 fish, which we sent in the New York to the Algonquin; weather fine. *Friday, 11th:* Wind blew hard; caught none. *Saturday, 12th:* Did not fish; I came home. *Monday, 14th:* Went out in Gardiner's Bay; caught 12,000 fish, which we sent in the U. S. Grant to the Algonquin; fine. *Tuesday, 15th:* Caught in Gardiner's Bay 23,700 fish, which we sent in the New York to the Algonquin; weather pleasant. *Wednesday, 16th:* Wind blew

hard; we lay in Napeague. *Thursday, 17th:* Went out below Gardiner's Island; caught 41,300 fish, which we sent in the U. S. Grant to the Algonquin; weather continues very pleasant. *Friday, 18th:* We caught below Gardiner's Island 12,300 fish, which we sent in the New York to the Algonquin; fine. *Saturday, 19th:* Caught none; went to Greenport, then went home; fine. *Monday, 21st:* Went out in Gardiner's Bay; caught 28,100 fish, which we sent in the U. S. Grant to the Algonquin; pleasant. *Tuesday, 22d:* Went out in Gardiner's Bay, but caught none; fine. *Wednesday, 23d:* Caught in Gardiner's Bay 10,000 fish; sent in the New York to the Algonquin; weather pleasant. *Thursday, 24th:* An east storm; we lay in Greenport; the new three-masted schooner Mary Freeland was launched today, and she slid down into the water splendidly. *Friday, 25th:* East wind continues; did not fish. *Saturday, 26th:* East wind continues; we came up to Jamesport with the sloop. *Monday, 28th:* Wind blew hard from the east; did not go out. *Tuesday, 29th:* Wind still continues east; we went out in p. m. and anchored under the lee of Gardiner's Island. *Wednesday, 30th:* Wind continued east; we looked along under the lee of Gardiner's Island for fish, but could find none; then we went on shore at the end of Gardiner's Point to see a schooner that had run ashore on the east side of the point, and a steam cutter was trying to pull her off, after which we went to Greenport and got our things and came up to Jamesport with them all, and stowed them away as soon as we could, and the fishing season of 1872 has come to a close with us.

1873.

I have made arrangements to fish for the Hawkins Brothers, who own the Miamogue Works. Have made no change in rig, except have purchased a carry-away, in place of the New York, which is a larger and better boat, called the North Star. *We have the sloops painted, and everything is in readiness to start.*

May 6th, Tuesday: We put the seine in the boats and started down bay; went to Greenport, put some ballast in the North Star, and got things in readiness to fish. *Wednesday, 7th:* We went down through Gardiner's Bay, and below Gardiner's Island, but saw no fish, when we came back to Greenport and purchased a new stove for the Starlight; for we must have something to eat, and it is necessary to have a good stove to cook with; pleasant day. *Thursday, 8th:* The wind was east, and we came up to Jamesport with the sloops. *Friday, 9th:* An east storm; did not fish. *Saturday, 10th:* Wind continued east; did not go out. *Monday, 12th:* We went down through Peconic Bay, and Gardiner's Bay, and below Gardiner's Island, but saw no fish; came to anchor east of Gardiner's Island, in what is called Tobacco Lot, which is a little bend on the east side of the island; pleasant day. *Tuesday, 13th:* We saw no fish, so we started for Montauk; the wind came on to blow very hard from the southwest, so we were obliged to turn back; went into Napeague Harbor. *Wednesday, 14th:* We went out, but could find no fish; went into Napeague again; wind blew fresh SW. *Thursday, 15th:* Made a set, and tore our seine on the rocks; then went to Greenport and mended the seine; pleasant. *Friday, 16th:* Went down in Gardiner's Bay, but caught no fish; then came up through Peconic Bay to Jamesport; fine. *Saturday, 17th:* As there seems to be no fish, we do not go out. *Monday, 19th:* We went down through Peconic Bay, and in Gardiner's Bay, but found no fish; weather pleasant. *Tuesday, 20th:* Went out in Gardiner's Bay; caught none; pleasant. *Wednesday, 21st:* Went down below Gardiner's Island; caught none; fine. *Thursday, 22d:* Went out below Gardiner's Island; caught 9,000 fish, which we sent in the North Star to the Miamogue Works; fine. *Friday, 23d:* Caught below Gardiner's Island 16,500 fish, which we sent in the U. S. Grant to the Miamogue Works; then came to Jamesport with the sloops; weather fine. *Saturday, 24th:* I went up in the pine woods and bought a large tree to make a new bowsprit for the U. S. Grant. *Monday, 26th:* We went down through Peconic and Gardiner's Bays, but saw no fish; then went below Gardiner's Island and started for Montauk. When down near Shagwarm Reef, saw fish, and caught 52,000, which we sent in the North Star to the Miamogue Works; pleasant. *Tuesday, 27th:* We caught off Shagwarm and Fort Pond 58,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues pleasant. *Wednesday, 28th:* Caught off Fort Pond 21,500 fish, which we sent in the North Star to the Miamogue Works; weather fine. *Thursday, 29th:* We found no fish; went down nearly to Watch Hill; weather pleasant. *Friday, 30th:* We found no fish; looked up through Gardiner's and Peconic Bays and came to Jamesport with the sloops; weather pleasant. *Saturday, 31st:* We did not fish.

June 2d, Monday: We went down through Peconic, and in Gardiner's Bay, but caught no fish; weather pleasant. *Tuesday, 3d:* Went below Gardiner's Island, but found no fish; fine. *Wednesday, 4th:* We found no fish; weather continues pleasant. *Thursday, 5th:* We caught, off Gardiner's Point, 3,000 fish, which we sent in the U. S. Grant, to the Miamogue Works; then came to Greenport, and ripped out and tarred the seine; weather very pleasant. *Friday, 6th:* We hung the seine, and carted it down and put it in the water; then put it on the reel; had a shower at night. *Saturday, 7th:* We looked up through Peconic Bay, and came to Jamesport with the sloops; we worked on the sloops and seine boats; pleasant day. *Monday, 9th:* We went down through Peconic and Gardiner's Bays, and below Gardiner's Island, but found no fish; then came to Greenport; weather continues fine. *Tuesday, 10th:* We started out through Gardiner's Bay, and as we could see no fish we went in the sound, and went west as far as Charles Island, but found no fish; fine. *Wednesday, 11th:* We came down the sound and went east of Gardiner's Island, and came to anchor in Tobacco Lot; pleasant. *Thursday, 12th:* We found no fish; came to Greenport; pleasant. *Friday, 13th:* We came up in Peconic Bay; caught 20,500 fish, which we sent in the North Star to the Miamogue Works; fine. *Saturday, 14th:* We did not fish; pleasant day. *Monday, 16th:* Went down through Peconic and Gardiner's Bays and down to Fisher's Island before we found any fish; we made a set just south of Fisher's Island; caught 24,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day; as many years as I have fished, I never saw the fish so scarce as they have been this spring. *Tuesday, 17th:* We came to Greenport and got ready to go to Barren Island to fish for Hawkins Brothers' Works that are located there. *Wednesday, 18th:* We started up the sound; at night came to anchor just west of Crane Neck; pleasant day. *Thursday, 19th:* We anchored at night at Astoria;

weather pleasant. *Friday, 20th:* Arrived at Prince's Bay; weather continues fine. *Saturday, 21st:* Caught in Prince's Bay 10,700 fish, which we sent in the North Star to Hawkins' Works, Barren Island; pleasant. *Monday, 23d:* Wind east; we caught none; we lay in by Coney Island. *Tuesday, 24th:* East wind, and rained; did not fish. *Wednesday, 25th:* We caught, in Prince's Bay, 17,300 fish, which we sent in the U. S. Grant, and 22,500 in the North Star to Hawkins' Works; pleasant day. *Thursday, 26th:* Caught in Prince's Bay 10,350 fish, which we sent in the U. S. Grant to the Hawkins Works; pleasant. *Friday, 27th:* We went outside of Sandy Hook, down the New Jersey beach a few miles; found some fish and made a set; caught one arm of the seine on rocks and tore it very badly; saved in the other arm 24,300 fish, which we sent in the U. S. Grant to the Hawkins Works; we came in behind Sandy Hook and took the seine on the shore just south of the wharf, and mended it; weather pleasant, but wind blew fresh S.W. *Saturday, 28th:* Finished mending seine; then went in the Wreckers' Basin, Staten Island; pleasant day. *Monday, 30th:* Caught, in Prince's Bay, 12,400 fish, which we sent in the North Star to Hawkins' Works; weather pleasant.

July 1st, Tuesday: We caught in Prince's Bay 43,650 fish, which we sent in the U. S. Grant to the Hawkins Works; pleasant. *Wednesday, 2d:* Went out in Prince's Bay; caught 15,600 fish, which we sent in the North Star to Hawkins' Works; fine day. *Thursday, 3d:* We came home with the sloops; the wind was fair and we made the run in one day; we came through Plum Gut about 8 o'clock p. m.; good breeze in p. m. southwest. *Friday, 4th:* We sailed all night and arrived at Jamesport in the morning; spent the fourth at home; pleasant. *Saturday, 5th:* I sold the New York and launched her; fine. *Monday, 7th:* We went down through Peconic Bay and in Gardiner's Bay, when I went to the masthead and could see bunches of fish deep down that could not be seen from the deck; the U. S. Grant was nearly a mile from us, and about this time we saw her jib go down, and the man that run her dropped off in his little boat; we knew at once that he had discovered a good bunch of fish and went towards him; when we reached him the bunch had separated, but we selected the best we could and caught 29,000 fish, which we sent in the U. S. Grant; and then we made another set as soon as we could and caught 31,500, which we sent in the North Star to the Miamogue Works; it was dark before we had the last set scooped out; these fish were the best I ever saw at this season of the year; they were as good as any Eastern fish that we catch in the fall; pleasant day. *Tuesday, 8th:* Went out in Gardiner's Bay; could see fish from masthead, but could not see them in the boats well enough to catch them; weather continues fine. *Wednesday, 9th:* Went out in Gardiner's Bay; caught 6,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and $10.50 worth of fish we sold to a smack; weather pleasant. *Thursday, 10th:* Caught in Gardiner's Bay 34,000 fish, which we sent in the North Star to the Miamogue Works; fine. *Friday, 11th:* We caught in Gardiner's Bay 15,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Saturday, 12th:* Went out in Gardiner's Bay; caught none; pleasant. *Monday, 14th:* We went out in Gardiner's Bay; caught none; pleasant. *Tuesday, 15th:* Caught in Gardiner's Bay 12,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 16th:* We caught in Gardiner's Bay 51,500 fish, which we sent in the North Star to the Miamogue Works; pleasant. *Thursday, 17th:* Caught in Gardiner's Bay 51,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Friday, 18th:* Went out in Gardiner's Bay; caught 24,500 fish, which we sent in the North Star to the Miamogue Works; fine. *Saturday, 19th:* Did not fish; I went home; pleasant day. *Monday, 21st:* Went out in Gardiner's Bay; caught 53,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues pleasant. *Tuesday, 22d:* Caught in Gardiner's Bay 54,000 fish, which we sent in the North Star to the Miamogue Works; pleasant. *Wednesday, 23d:* We caught in Gardiner's Bay 54,500 fish, which we sent in the U. S. Grant, and 18,500 in the North Star to the Miamogue Works; weather continues fine. *Thursday, 24th:* Caught in Gardiner's Bay 41,000 fish, which we sent in the U. S. Grant to the Miamogue Works; also, sold $10 worth of fish to a smack; pleasant. *Friday, 25th:* We caught in Gardiner's Bay 46,500 fish, which we sent in the North Star and 20,500 in the U. S. Grant to the Miamogue Works; weather pleasant. *Saturday, 26th:* We did not fish; hauled out the sloops on the railways and cleaned them; weather pleasant. *Monday, 28th:* Went out in Gardiner's Bay; caught 42,000 fish, which we sent in the North Star to the Miamogue Works; weather fine. *Tuesday, 29th:* We caught in Gardiner's Bay 25,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Wednesday, 30th:* Caught in Gardiner's Bay 45,000 fish, which we sent in the North Star to the Miamogue Works, and we sold 22,000 fish to some smacks for $4 per M., amounting to $88; the fish continue fat, and the factories are paying $2.50 per M.; pleasant. *Thursday, 31st:* We caught in Gardiner's Bay 21,000 fish, which we sent in the U. S. Grant, and 21,000 in the North Star, and the U. S. Grant coming out again we sent in her 26,500 fish; all to the Miamogue Works; weather fine.

August 1st, Friday: Caught in Gardiner's Bay 15,500 fish, which we sent in the North Star to the Miamogue Works; pleasant. *Saturday, 2d:* Went out in Gardiner's Bay; caught 14,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues pleasant. *Monday, 4th:* Went out in Gardiner's Bay; caught 9,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fine. *Tuesday, 5th:* Looked through Gardiner's Bay, but caught no fish; weather continues pleasant. *Wednesday, 6th:* Caught in Gardiner's Bay 13,000 fish, which we sent in the North Star to the Miamogue Works; pleasant. *Thursday, 7th:* Did not fish, but ripped out the seine and tarred it; weather continues pleasant. *Friday, 8th:* A. m. we finished hanging the seine; p. m. we came up in Peconic Bay; weather pleasant. *Saturday, 9th:* We caught in Peconic Bay 9,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Monday, 11th:* We caught in Peconic Bay 17,000 fish, which we sent in the North Star, and 7,500 in the U. S. Grant to the Miamogue Works; pleasant day. *Tuesday, 12th:* Windy; caught no fish. *Wednesday, 13th:* Hard east storm; we lay in Greenport. *Thursday, 14th:* East storm continues; in Greenport. *Friday, 15th:* We went down as far as Gardiner's Island, then up in Peconic Bay, but caught no fish; pleasant. *Saturday, 16th:* We caught in Peconic Bay 5,500 fish, which we sent in the U. S. Grant to the Miamogue Works. *Monday, 18th:* Went down through Peconic Bay; caught none; stopped at Greenport; wind east. *Tuesday, 19th:* Went out in

Gardiner's Bay; caught none; very calm. Wednesday, 20th: Went out in Gardiner's Bay, and as we could see no fish we went into the sound and went to Saybrook; pleasant day. *Thursday, 21st:* An east storm; we lay in Saybrook. *Friday, 22d:* Went out in the sound, and went west a few miles; saw no fish, then went in the bay, and around Gardiner's Island, but caught no fish; pleasant. *Saturday, 23d:* Did not fish, but went home; weather pleasant. *Monday, 25th:* Went down through the bay, but saw no fish; then went in the sound and went to Saybrook; fine. *Tuesday, 26th:* Went out and went west, and just east of Faulkland Island we caught 53,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fine. *Wednesday, 27th:* We caught just west of Faulkland Island 28,500 fish, which we put in the North Star and sent into Fowler's Works, at Guilford; we made a harbor in Sachem's Head; weather fine. *Thursday, 28th:* We caught near Faulkland Island 12,000 fish, which we sent to Fowler's Works in the North Star; weather fine. *Friday, 29th:* We made a set near Faulkland Island; caught only 2,500 fish, which we put in the U. S. Grant, and steered for Gardiner's Bay; caught no more; sent the U. S. Grant to the Miamogue Works, and we went into Greenport; weather pleasant. *Saturday, 30th:* We hauled the sloops out on the railways; pleasant.

September 1st, Monday: Went down in the bay, but the wind coming on to blow hard we went into Napeague. *Tuesday, 2d:* Caught below Gardiner's Island 10,500 fish, which we sent in the North Star to the Miamogue Works; fine. *Wednesday, 3d:* We went out below Gardiner's Island, but caught none; weather pleasant. *Thursday, 4th:* Caught below Gardiner's Island 47,500 fish, which we sent in the U. S. Grant to the Miamogue Works. *Friday, 5th:* We caught below Gardiner's Island 41,500 fish, which we sent in the North Star to the Miamogue Works; weather still continues pleasant. *Saturday, 6th: Caught in Gardiner's Bay 20,500 fish, which we sent in the U. S. Grant to the* Miamogue Works; fine. *Monday, 8th:* Caught in Gardiner's Bay 14,000 fish, which we sent in the North Star to the Miamogue Works; and as the fish were scarce in the bay we went into the sound, and came to anchor near the mouth of Connecticut River; pleasant day. *Tuesday, 9th:* Went west; found some fish near Faulkland Island, and caught 34,000, which we sent in the U. S. Grant to Fowler's Works, at Guilford; weather fine. *Wednesday, 10th:* Caught near Faulkland Island 17,500 fish, which we sent in the North Star to Fowler's Works; pleasant. *Thursday, 11th:* We caught near Faulkland Island 50,500 fish, which we put in the U. S. Grant; and as Fowler's Works are "blocked" we *all came in Gardiner's Bay, and sent the U. S. Grant to the Miamogue Works*; weather fine. *Friday, 12th:* Caught in Gardiner's Bay 21,500 fish, which we sent in the North Star to the Miamogue Works; pleasant. *Saturday, 13th:* We caught in Gardiner's Bay 19,500 fish, which we sent in the North Star to the Miamogue Works, and sold 4,000 for $16 to a smack; the fish are good yet, but not quite as fat as they were in July and August; weather continues pleasant. *Monday, 15th:* Went out in Gardiner's Bay; caught 32,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Tuesday, 16th:* Caught in Gardiner's Bay 19,000 fish, which we sent in the North Star to the Miamogue Works, and sold 1,000 fish for $4 to a smack; weather pleasant. *Wednesday, 17th:* Went out in Gardiner's Bay; caught 31,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 18th:* We went out, but caught no fish; then went to Greenport; weather continues fine. *Friday, 19th:* We hauled the sloops out on the railways; it rained a part of the day. *Saturday, 20th:* We tarred a new seine, and had the sloops painted; pleasant day. *Monday, 22d:* We went out in Gardiner's Bay; caught 15,000 fish, which *we sent in the U. S. Grant, and 15,000* in the North Star to the Miamogue Works; weather fine. *Tuesday, 23d:* Caught in Gardiner's Bay 8,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Wednesday, 24th:* Went out in Gardiner's Bay; caught 10,500 fish, which we sent in the North Star to the Miamogue Works; fine. *Thursday, 25th:* Caught in Gardiner's Bay 20,000 fish, which we sent in the U. S. Grant to the Miamogue Works; we also sold 1,000 fish for $4 to a smack; weather fine. *Friday, 26th:* We hung the new seine. *Saturday, 27th:* Finished the seine and went home. *Monday, 29th:* Went out in Gardiner's Bay, but caught none; fine. *Tuesday, 30th:* Wind blew hard; we caught none.

October 1st, Wednesday: Went out in Gardiner's Bay; caught 12,000 fish, which we sent in the North Star to the Miamogue Works; fine. *Thursday, 2d:* As the fishing was poor, we concluded to go to Jamesport with the sloops and attend the Suffolk County fair, which was held at Riverhead. *Monday, 6th:* Went down through Peconic and into Gardiner's Bay; caught 6,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Tuesday, 7th:* Hard east storm; did not fish. *Wednesday, 8th:* Windy; did not fish. *Thursday, 9th:* Windy; did not go out. *Friday, 10th:* Went out in Gardiner's Bay; caught none; came to anchor in Cherry Harbor, which is on the west side of Gardiner's Island; wind continues east. *Saturday, 11th:* We went below Gardiner's Island and off Fort Pond; caught 33,000 fish, which we sent in the North Star to the Miamogue Works; very calm in p. m.; we did not get to Greenport until 10 o'clock p. m. *Monday, 13th:* We went down in Gardiner's Bay; found a shoal of fish close under Gardiner's Point; we set around them and caught 56,500, which we put in the U. S. Grant; and as the North Star has not come *out, we put the remainder on the Starlight, 25,500, and took them into the Miamogue Works*; pleasant day. *Tuesday, 14th:* We looked through Gardiner's Bay, but did not have the luck to catch a single bunker; weather fine. *Wednesday, 15th:* We caught in Gardiner's Bay 58,500 fish, which we sent in the U. S. Grant, and 24,500 in the North Star to the Miamogue Works; weather pleasant. *Thursday, 16th:* We went out in Gardiner's Bay; caught only 2,000 fish, which we sent in the North Star to the Miamogue Works; weather continues fine. *Friday, 17th:* We caught in Gardiner's Bay 24,000 fish, which we sent in the U. S. Grant, and 13,500 in the North Star, to the Miamogue Works; pleasant. *Saturday, 18th:* Caught in Gardiner's Bay 8,500 fish, which we sent in the North Star to the Miamogue Works; pleasant day. *Monday, 20th:* A hard east storm; did not fish. *Tuesday, 21st:* Windy; did not fish. *Wednesday, 22d:* Went down to Fort Pond; caught none. *Thursday, 23d:* We looked for fish below Gardiner's Island, but found none that we could catch; pleasant. *Friday, 24th:* We went out in Gardiner's Bay; caught 8,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather pleasant. *Saturday, 25th:* Caught in Gardiner's Bay 12,000 fish, which we *sent in the North Star to the Miamogue Works; weather fine. Monday, 27th: The wind blew hard southwest, and it* stormed; we lay in Greenport. *Tuesday, 28th:* Went out in Gardiner's Bay; caught 46,000 fish, which we sent in the U. S. Grant, and 30,000 in the North Star, to the Miamogue Works; pleasant day. *Wednesday, 29th:* Wind blew hard

from the northwest; could not fish. *Thursday, 30th:* Caught in Gardiner's Bay 42,000 fish, which we sent in the North Star to the Miamogue Works, and sold 1,500 to a smack for $6; weather continues pleasant. *Friday, 31st:* Wind blew hard; we did not go out.

November 1st, Saturday: Did not fish; went home. *Monday, 3d:* Went out, but wind blowing hard we came back to Greenport. *Tuesday, 4th:* Caught in Gardiner's Bay 3,500 fish, which we sent in the U. S. Grant to the Miamogue Works; wind blew quite strong NW. *Wednesday, 5th:* We made a set to the west of Gardiner's Point; and sailing along close to the point we saw a good bunch close to the point on the east side, when we sailed around the end of the point and found the fish where we saw them, and caught a good haul; we sent in the North Star 52,500 fish, and in the U. S. Grant 55,500, and took 30,000 on the Starlight, to the Miamogue Works; pleasant, but the wind blew quite strong NW. *Thursday, 6th:* Caught in Gardiner's Bay 28,500 fish, which we took in the Starlight, as the carry-aways did not get to us; pleasant. *Friday, 7th:* Wind blew hard from the east; we did not fish. *Saturday, 8th:* Wind blew hard; did not fish. *Monday, 10th:* The wind blew hard from the northwest; we did not fish. *Tuesday, 11th:* Wind continued to blow; did not fish. *Wednesday, 12th:* We went out in Gardiner's Bay, but caught no fish; went to the factory, and concluded to quit. *Thursday, 13th:* We came up to Jamesport with the sloops, seine, and all the things; wind blew very hard from the northwest, with snow-squalls; the leach rope to the Starlight's mainsail parted, and we had to mend the sail before we could proceed; arrived at Jamesport just at dark. *Friday, 14th:* We carted out the seine, stowed away the boats, and put the sloops in the creek as soon as the weather permitted; this has been a remarkable season; the fishing was very poor, but in July a run of fish came in the bay larger and fatter than I ever knew before or since; we have not caught a very large quantity of fish, but the quality being good, it has proved a profitable season.

1874.

I am having the North Star fixed over this spring.

May 12th, Tuesday: I went to work on the North Star in the morning, but word came to us that they were catching fish in Gardiner's Bay; then I sent word to all hands to come on, so as to start to-morrow morning, and got the things on board the Starlight; launched the seine-boats, &c. *Wednesday, 13th:* We put the seine on the boats and went to Greenport; pleasant day. *Thursday, 14th:* We went down in Gardiner's Bay; caught 54,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Friday, 15th:* Caught in Gardiner's Bay 26,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Saturday, 16th:* An east storm; we came up to Jamesport with the sloops. *Monday, 18th:* We went down bay; caught no fish; pleasant. *Tuesday, 19th:* Went out in Gardiner's Bay; caught 30,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues pleasant. *Wednesday, 20th:* We caught in Gardiner's Bay 40,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 21st:* Caught in Gardiner's Bay 27,500 fish, which we sent in the U. S. Grant to the Miamogue Works; it rained and blew in squalls nearly all day; rough weather. *Friday, 22d:* A windy day; we staid in Greenport and worked on the Petrel, a little sloop I have engaged to take the place of the North Star until they have her completed. *Saturday, 23d:* In the morning we went down to Gardiner's Point, but found no fish; then we came to Jamesport with the sloops; pleasant day. *Monday, 25th:* Stormy day; did not go out fishing. *Tuesday, 26th:* We went down through Peconic Bay, and just below Robin's Island we caught 20,000 fish, which we sent in the Petrel to the Miamogue Works; fine. *Wednesday, 27th:* We went down in Gardiner's Bay; caught 30,500 fish, which we sent to the Miamogue Works in the U. S. Grant; weather fine. *Thursday, 28th:* We went through Gardiner's Bay and below Gardiner's Island, and off Fort Pond we found a good bunch of fish, and caught at one set 54,000, which we took in the U. S. Grant, and 48,000 in the Petrel, and took 30,000 in the Starlight to the Miamogue Works; weather continues fine. *Friday, 29th:* We caught in Gardiner's Bay 34,000 fish, which we sent in the Petrel, and 46,500 in the U. S. Grant, to the Miamogue Works; pleasant day. *Saturday, 30th:* We started for Jamesport with the sloops; caught in Peconic Bay 34,000 fish, which we sent in the Petrel to Jamesport; weather good.

June 1st, Monday: Went out in Peconic Bay; caught 51,000 fish, which we sent in the U. S. Grant, and 26,000 in Petrel, to the Miamogue Works; pleasant. *Tuesday, 2d:* Caught in Peconic Bay 49,000 fish, which we sent in the U. S. Grant, and 33,500 in the Petrel, to the Miamogue Works; weather continues fine. *Wednesday 3d:* We caught in Peconic Bay 30,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 4th:* Stormy day; did not fish, but lay in Jamesport. *Friday, 5th:* Went out in Peconic Bay; caught 35,000 fish, which we sent in the Petrel to the Miamogue Works; weather continues pleasant. *Saturday, 6th:* Caught in Peconic Bay 20,100 fish, which we sent to Jamesport in the U. S. Grant; weather fine. *Monday, 8th:* We caught in Peconic Bay 40,000 fish, which we sent in the Petrel, and 22,500 in the U. S. Grant, to the Miamogue Works; went to Greenport; pleasant. *Tuesday, 9th:* Went down in Gardiner's Bay; caught 37,000 fish, which we sent in the Petrel, and 45,000 in the U. S. Grant, to the Miamogue Works; weather pleasant. *Wednesday, 10th:* Caught in Gardiner's Bay 33,500 fish, which we sent in the Petrel to the Miamogue Works; pleasant. *Thursday, 11th:* We lay in Greenport; fixed the bunt to the seine; wind east, and stormy. *Friday, 12th:* We started down to go into Gardiner's Bay, but it was so foggy and calm we could not get down in time to do anything. *Saturday, 13th:* The wind blew hard, northwest; we came to Jamesport with the sloops and hauled the seine on the beach. *Monday, 15th:* Went down through Peconic Bay into Gardiner's Bay, where we caught 9,500 fish, which we sent in the U. S. Grant to Miamogue Works; pleasant. *Tuesday, 16th:* Caught in Gardiner's Bay 11,500 fish, which we sent in the Petrel to the Miamogue Works; pleasant. *Wednesday, 17th:* Went out in Gardiner's Bay; caught none; came into Greenport; wind blew strong. *Thursday, 18th:* We hauled the Starlight out on the railways and took her mainsail in the loft to be fixed; wind blew hard. *Friday, 19th:* Had the Starlight painted and fixed the center-board. *Saturday, 20th:* I came home to Jamesport. *Monday,*

22d: We launched the Starlight, and caught in Gardiner's Bay 20,500 fish, which we sent in the Petrel to the Miamogue Works; pleasant day. *Tuesday, 23d:* We came up in Peconic Bay; caught 25,500 fish, which we sent in the Petrel to the Miamogue Works; just at night had a heavy thunder shower. *Wednesday, 24th:* Wind blew hard northwest, so we came to Greenport, ripped out and tarred the seine. *Thursday, 25th:* We hung the seine and carted it down just at night and put it in the boat. *Friday, 26th:* We came up bay; caught 11,000 fish, which we sent to Jamesport in the U. S. Grant; and then we came into Jamesport and helped put the mast in what was the North Star, but is now named the Flora; pleasant day. *Saturday, 27th:* We did not fish, but staid in and helped launch the Flora; weather continues fine. *Monday, 29th:* Went out in Peconic Bay; caught 52,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fine. *Tuesday, 30th:* We caught in Peconic Bay 34,500 fish, which we sent in the Flora, and 9,500 in the U. S. Grant, to the Miamogue Works; weather continues fine.

July 1st, Wednesday: Caught in Peconic Bay 56,000 fish, which we sent in the U. S. Grant, and 1,500 in the Flora, to the Miamogue Works; weather good. *Thursday, 2d:* Went down in Gardiner's Bay; caught 38,000 fish, which we sent in the Flora, and 9,000 in the U. S. Grant, to the Miamogue Works; then we came to Jamesport; have quit for the week, so that the men at the factory can keep the Fourth; weather continues good, but had a thunder shower in the evening. *Friday, 3d:* I mended seine; have it spread on the shore. *Saturday, 4th:* We took out a sailing party in the Starlight; had a thunder squall just at night. *Monday, 6th:* Wind east and blew hard; did not go out. *Tuesday, 7th:* Went out in Peconic Bay; caught 10,000 fish, which we sent in the Flora to the Miamogue Works; then we went down and came to anchor in by the Miamogue Works; pleasant day. *Wednesday, 8th:* The wind blew very hard from the west, so we could not fish; but went into Greenport and put a new piece of seine in our bunt. *Thursday, 9th:* We went through Gardiner's Bay and below Gardiner's Island nearly to Montauk; saw no fish, but saw two whales; then we came up, and at night anchored just west of Shelter Island; pleasant. *Friday, 10th:* We came up in Peconic Bay, above Robins Island, where we found some good bunches of fish; we caught 24,000, which we sent down in the U. S. Grant, and 56,500 in the Flora to the Miamogue Works; a pleasant day, but the wind blew up quite strong in the evening from the southwest; there was a sloop coming up through the bay with a sailing party from Riverhead on board; and just about the time we finished scooping in our last haul her mast went overboard, breaking short above the deck. We went to their assistance, and, taking a line to the sloop, towed them into Jamesport. *Saturday, 11th:* In the morning went out in the bay, but the wind breezed up quite strong, and we came back to Jamesport. *Monday, 13th:* Went out in Peconic Bay; caught 46,500 fish, which we sent in the U. S. Grant, and 52,000 in the Flora to the Miamogue Works, and sold $7.50 worth to a smack; the wind blew quite strong from the southwest. *Tuesday, 14th:* We caught in Peconic Bay 35,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 15th:* Caught in Peconic Bay 54,500 fish, which we sent in the Flora to the Miamogue Works; weather fine. *Thursday, 16th:* We caught in Peconic Bay 24,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 17th:* Caught in Peconic Bay 8,500 fish, which we sent in the Flora to the Miamogue Works; we went into Greenport to get stores; weather continues fine. *Saturday, 18th:* We went out in Gardiner's Bay; caught none; then started up bay, but it was nearly calm, and we did not get to Jamesport until dark. *Monday, 20th:* Went down through Peconic Bay; caught none; went to Greenport; pleasant day. *Tuesday, 21st:* Went out in Gardiner's Bay; caught none; pleasant. *Wednesday, 22d:* In the morning we tanned the seine; in the afternoon we went out in Gardiner's Bay; caught 24,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $1 worth of fish to a smack; weather pleasant. *Thursday, 23d:* Went through Gardiner's Bay and then in the sound, and near the mouth of Connecticut River we caught 26,000 fish, which we sent in the Flora to the Miamogue Works, and sold $2 worth of fish to a smack; pleasant day. *Friday, 24th:* We caught near Cornfield light-ship 52,500 fish, which we sent in the U. S. Grant, and 40,000 in the Flora, to the Miamogue Works; we caught nearly all at one set; we pursed the seine without using the big lead—cutting under, it is sometimes called; pleasant day. *Saturday, 25th:* We made a set in Gardiner's Bay; caught 3,000 fish, which we sent in the U. S Grant to the Miamogue Works, and caught at the same time 400 bluefish, which we sold in Greenport for $21.40; weather continues pleasant. *Monday, 27th:* We went through Gardiner's Bay and below Gardiner's Island, but saw no fish; then went to Saybrook; pleasant. *Tuesday, 28th:* Caught near the mouth of Connecticut River 30,000 fish, which we sent in the Flora to the Miamogue Works; weather continues pleasant. *Wednesday, 29th:* We caught near Faulkland Island 28,000 fish, which we sent in the U. S. Grant to the Miamogue Works; we stopped in Thimble Islands. *Thursday, 30th:* We went from Thimble Islands to Saybrook; caught none; wind northwest. *Friday, 31st:* Caught off the mouth of Connecticut River 6,500 fish, which we sent in the Flora to the Miamogue Works; weather good.

August 1st, Saturday: We hauled the sloops on the railways to clean them; weather continues good. *Monday, 3d:* We went down in Gardiner's Bay; caught 45,000 fish, which we sent in the U. S. Grant, and 70,000 in the Flora, to the Miamogue Works; pleasant. *Tuesday, 4th:* Caught in Gardiner's Bay 56,000 fish, which we sent in the U. S. Grant, and 17,000 in the Flora, to the Miamogue Works; weather fine. *Wednesday, 6th:* Went out in Gardiner's Bay; caught 28,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Thursday, 6th:* Caught in Gardiner's Bay 23,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Friday, 7th:* Went out in Gardiner's Bay, but the wind coming on to blow very hard, we came into Greenport. *Saturday, 8th:* Stormy; did not fish; came home. *Monday, 10th:* Went out in Gardiner's Bay; caught 44,500 fish, which we sent in the U. S. Grant, and 37,500 in the Flora, to the Miamogue Works; pleasant. *Tuesday, 11th:* We caught in Gardiner's Bay 12,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fair. *Wednesday, 12th:* Caught in Gardiner's Bay 3,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 13th:* We did not fish, but tanned and mended seine. *Friday, 14th:* We caught in Gardiner's Bay 44,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 15th:* We came to Jamesport with the Starlight. *Monday, 17th:* We went out in Gardiner's Bay; caught 55,000 fish, which we sent in the U. S. Grant, and 4,000 in the Flora, to the Miamogue

Works; weather fine. *Tuesday, 18th:* We caught in Gardiner's Bay 44,000 fish, which we sent in the Flora to the Miamogue Works; fine day. *Wednesday, 19th:* Caught in Gardiner's Bay 29,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 20th:* Went out in Gardiner's Bay; caught 15,000 fish, which we sent in the Flora to the Miamogue Works; then the wind commenced to blow hard, and we came into Greenport and dried our seine. *Friday, 21st:* We caught in Gardiner's Bay 55,500 fish, which we sent in the U. S. Grant, and 22,500 in the Flora, to the Miamogue Works; a very warm day. *Saturday, 22d:* The wind was east, and storming; we came to Jamesport with the Starlight. *Monday, 24th:* Went out in Gardiner's Bay; caught 20,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Tuesday, 25th:* We lay under the lee of Gardiner's Island, off Bostwick Creek; did not fish, as the wind blew hard from the east; we went on shore and picked a few blackberries. *Wednesday, 26th:* We caught in Gardiner's Bay 54,500 fish, which we sent in the Flora, and 32,000 in the U. S. Grant, to the Miamogue Works; pleasant day. *Thursday, 27th:* Caught in Gardiner's Bay 24,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Friday, 28th:* Went out in Gardiner's Bay; caught 27,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues pleasant. *Saturday, 29th:* Did not fish; came home; pleasant day. *Monday, 31st:* Went out in Gardiner's Bay; caught none; pleasant.

September 1st, Tuesday: Went out in Gardiner's Bay; caught 29,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather good. *Wednesday, 2d:* We caught in Gardiner's Bay 14,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 3d:* Caught in Gardiner's Bay 11,500 fish, which we sent in the U. S. Grant to the Miamogue Works; we tore the seine on the rocks and had to mend it; weather continues pleasant. *Friday, 4th:* We hauled the sloops out on the railways and tanned the seine; weather fair. *Saturday, 5th:* We had the sloops painted; weather good. *Monday, 7th:* Went out in Gardiner's Bay; caught 38,500 fish, which we sent in the Flora to the Miamogue Works; weather continues good. *Tuesday, 8th:* We caught in Gardiner's Bay 8,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fair. *Wednesday, 9th:* Caught in Gardiner's Bay 41,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 10th:* Went out in Gardiner's Bay; saw no fish, and the wind blowing up fresh southwest we came into Greenport. *Friday, 11th:* Caught in Gardiner's Bay 21,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Saturday, 12th:* Wind east; we did not fish, but I went home. *Monday, 14th:* Went out in Gardiner's Bay; caught 8,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Tuesday, 15th:* Looked in Gardiner's Bay, but caught no fish; fine. *Wednesday, 16th:* Went out, but it came on to storm in p. m.; we came into Greenport. *Thursday, 17th:* An east storm; did not fish. *Friday, 18th:* East storm continues; staid in Greenport. *Saturday, 19th:* Wind continues east; did not fish. *Monday, 21st:* We went out in Gardiner's Bay; caught 15,500 fish, which we sent in the U. S. Grant to the Miamogue Works; a few we sold to a smack; pleasant day. *Tuesday, 22d:* We caught in Gardiner's Bay 27,500 fish, which we sent in the Flora to the Miamogue works; pleasant day. *Wednesday, 23d:* Caught in Gardiner's Bay 36,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues fine. *Thursday, 24th:* We caught in Gardiner's Bay 28,000 fish, which we sent in the Flora to the Miamogue Works, and sold $10 worth of fish to a smack; fine. *Friday, 25th:* Went out in Gardiner's Bay; caught 16,000 fish, which we sent in the Flora to the Miamogue Works; weather continues fine. *Saturday, 26th:* Went out in the bay in a. m., but caught no fish; then we came into Greenport; pleasant. *Monday, 28th:* Went out in Gardiner's Bay; caught 23,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather pleasant. *Tuesday, 29th:* Caught in Gardiner's Bay 12,500 fish, which we put in the Flora, and as the wind was blowing hard from the east and storming, I thought it would be too rough to unload into the Miamogue Works, so we sent the Flora to the floating factory Falcon, which was anchored in Orient Harbor; we came up to Greenport. *Wednesday, 30th:* Windy; we did not go out, but tanned and worked on the seine.

October 1, Thursday: Windy weather; did not fish; we bent the new sail on the Starlight; then went up to Jamesport with her and spent the remainder of the week at home; attended the Suffolk County fair. *Monday, 5th:* Went down in Gardiner's Bay, but caught no fish; weather pleasant. *Tuesday, 6th:* Looked through Gardiner's Bay, but could find no fish; pleasant day. *Wednesday, 7th:* The wind blew strong from the east; we worked on the sloops, fixing jib sheets, &c. *Thursday, 8th:* Wind continued to blow from the east; did not fish, but lay in Greenport. *Friday, 9th:* We went out in Gardiner's Bay, but could find no fish; weather pleasant. *Saturday, 10th:* Went out in Gardiner's Bay; caught no fish; pleasant. *Monday, 12th:* Went out in Gardiner's Bay; caught none; at night we anchored off Ben's Point; weather fine. *Tuesday, 13th:* Caught off Gardiner's Point 52,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues fine. *Wednesday, 14th:* We caught, in Gardiner's Bay, 17,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 15th:* Went below Gardiner's Island; caught 44,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues pleasant. *Friday, 16th:* Caught below Gardiner's Island 42,000 fish, which we sent in the Flora, and 60,500 in the U. S. Grant, to the Miamogue Works; pleasant day. *Saturday, 17th:* We caught in Gardiner's Bay 18,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Monday, 19th:* Wind blew hard; did not fish, but lay in Greenport. *Tuesday, 20th:* Went out in Gardiner's Bay; caught 22,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Wednesday, 21st:* Caught in Gardiner's Bay 15,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 22d:* We caught in Gardiner's Bay 12,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 23d:* Went out in Gardiner's Bay, but caught none; fine. *Saturday, 24th:* Foggy; we did not fish. *Monday, 26th:* Went out in Gardiner's Bay; thick and foggy; caught no fish. *Tuesday, 27th:* We caught a few fish, but did not send them to the factory; made a harbor in Napeague; pleasant. *Wednesday, 28th:* Went out below Gardiner's Island; caught 57,000 fish, with those we caught yesterday, and sent them in the Flora and 36,500 in the U. S. Grant, to the Miamogue Works; pleasant day. *Thursday, 29th:* Caught below Gardiner's Island 36,000 fish, which we sent in the Flora to the Miamogue Works; at night we stopped in Napeague; pleasant. *Friday,*

30th: We caught, below Gardiner's Island off Fort Pond 39,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather good. *Saturday, 31st:* We caught none; came to Greenport.

November 2d, Monday: We went below Gardiner's Island; caught a good haul of fish, but a whip-tail shark or thrasher tore the seine and let most of them out; we saved 24,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Tuesday, 3d:* We caught none; weather continues pleasant. *Wednesday, 4th:* We caught a very few fish off Fort Pond, but did not send them up; we stop in Napeague nights for a harbor; calm, pleasant day. *Thursday, 5th:* We caught a few, and, with yesterday's fish, sent in the U. S. Grant 23,000 to the Miamogue Works; then we went to Greenport. *Friday, 6th:* We went to the Miamogue Works and made arrangements to close for the season; went to Jamesport with sloops and stowed sloops and things away as soon as possible, and the fishing season of 1874 is ended.

1875.

We have succeeded in getting the sloops out of the creek, and were prepared to go out on the 11th of May.

May 11th, Tuesday: In the morning we succeeded in getting the U. S. Grant off the shore; the wind had blown hard and she had dragged her anchor; then we went down bay, made a set in Peconic Bay and caught 3,000 fish, which we sent in the Flora to the Miamogue Works; we went to Greenport; fine. *Wednesday, 12th:* We went down in Gardiner's Bay and below Gardiner's Island, but the wind coming on to blow hard we came back to Greenport. *Thursday, 13th:* We went down below Gardiner's Island; caught 8,000 fish, which we sent in the U. S. Grant to the Miamogue Works; and as we saw but few fish we came up, and at night anchored in Town Harbor, which is just above Greenport; pleasant. *Friday, 14th:* We came up through Peconic Bay; saw a good many fish, but they were not in good shape to catch; so we caught none; weather fine. *Saturday, 15th:* We caught in Peconic Bay 35,500 fish in a.m., which we sent in the Flora to the Miamogue Works; weather good. *Monday, 17th:* We went out in Peconic Bay; caught 46,000 fish, which we sent in the Flora to the Miamogue Works; weather continues fine. *Tuesday, 18th:* We caught in Little Peconic Bay 13,100 fish, which we put in the U. S. Grant, and as the wind came on to blow hard from the east, we sent her to Jamesport, and we came to anchor in the cove near New Suffolk. *Wednesday, 19th:* Wind continued to blow; we came up to Jamesport. *Thursday, 20th:* The wind blew very hard from the southwest; we went to Greenport. *Friday, 21st:* We went through Gardiner's Bay and below Gardiner's Island, but saw no fish; so we came up to Jamesport; very pleasant day. *Saturday, 22d:* Went out in Peconic Bay; caught 33,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and 13,275 in the Flora to Jamesport, for farmers; weather continues fine. *Monday, 24th:* We made a set in Peconic Bay; caught 5,225 fish, which we sent in the U. S. Grant to Jamesport; weather good. *Tuesday, 25th:* Went out in Peconic Bay; caught 23,000 fish, which we sent in the Flora to the Miamogue Works; weather continues fine. *Wednesday, 26th:* Caught in Peconic Bay 9,250 fish, which we sent in the U. S. Grant to Jamesport, for farmers; weather continues pleasant. *Thursday, 27th:* Went out in Peconic Bay; caught none. *Friday, 28th:* Saw no fish that were in shape to catch; then came into Jamesport and worked on the sloops; painted the starlight's top, &c.; pleasant day. *Saturday, 29th:* Worked on the sloops and boats; weather fine. *Monday, 31st:* We went out in Peconic Bay; caught 7,500 fish, which we sent in the Flora to the Miamogue Works; we went to Greenport; weather good.

June 1st, Tuesday: Went out in Gardiner's Bay; caught 36,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Wednesday, 2d:* We went down to Watch Hill, but saw no fish; fine. *Thursday, 3d:* We looked below Gardiner's Island, off Fort Pond; then came into Napeague; dropped our anchor and hauled the seine out on deck to-day; pleasant day. *Friday, 4th:* We came up in Gardiner's Bay, but saw no fish; then came up in Noyack Bay; made a set and caught 3,500 fish, which we sent in the Flora to the Miamogue Works; we came to anchor and stopped over night in Noyack Bay; pleasant. *Saturday, 5th:* We caught in Peconic Bay 7,150 fish, which we sent in the U. S. Grant to Jamesport; weather fine. *Monday, 7th:* Went out in Peconic Bay; caught 5,500 fish, which we sent in the Flora to the Miamogue Works; weather pleasant. *Tuesday, 8th:* We caught in Peconic Bay 8,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 9th:* Caught in Peconic Bay 7,000 fish, which we sent in the Flora to the Miamogue Works; weather fair. *Thursday, 10th:* We caught in Peconic Bay 6,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 11th:* Caught in Peconic Bay 7,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 12th:* We caught in Peconic Bay 12,150 fish, which we sent in the U. S. Grant to Jamesport; weather good; through the week there has been but few fish in Peconic Bay, and they have been so scattered we could do but little with them; but we could not learn that they were doing much in the lower bays; therefore concluded to fight it out on this line the whole week. *Monday, 14th:* Went out in Peconic Bay; caught 8,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Tuesday, 15th:* Went down in Gardiner's Bay; caught 47,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Wednesday, 16th:* We caught in Gardiner's Bay 11,000 fish, which we sent in the Flora, and 24,500 in the U. S. Grant, to the Miamogue Works; weather thick. *Thursday, 17th:* Caught in Gardiner's Bay 29,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Friday, 18th:* We lay in Greenport; stormy day. *Saturday, 19th:* Tanned and mended seine; then came up to Jamesport with the sloops; weather good. *Monday, 21st:* We caught in Peconic Bay 17,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Tuesday, 22d:* Went out in Gardiner's Bay; caught 54,500 fish, which we sent in the Flora, and 31,500 in the U. S. Grant, to the Miamogue Works; pleasant day. *Wednesday, 23d:* Caught in Gardiner's Bay 7,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 24th:* We had the sloops hauled out on the railways and cleaned them, and worked on the seine; fine. *Friday, 25th:* We hung the seine and had the sloops painted; weather continues pleasant. *Saturday, 26th:* Came to Jamesport with the sloops. *Monday, 28th:* We caught in Peconic Bay 18,500 fish, which we sent in the

U. S. Grant to the Miamogue Works; fine. *Tuesday, 29th:* Wind blew hard; caught none. *Wednesday, 30th:* Went out in Gardiner's Bay; caught 39,000 fish, which we sent in the Flora, and 9,000 in the U. S. Grant, to the Miamogue Works; pleasant day.

July 1st, Thursday: We caught in Gardiner's Bay 35,000 fish, which we sent in the Flora to the Miamogue Works; weather continues pleasant. *Friday, 2d:* Caught in Gardiner's Bay 35,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Saturday, 3d:* We came up to Jamesport with the sloops. *Monday, 5th:* We did not fish; staid home and kept the Fourth. *Tuesday, 6th:* Went through Peconic Bay into Gardiner's Bay; caught 44,500 fish, which we sent in the Flora to the Miamogue Works, and sold 90 cents' worth to a smack; weather continues very pleasant. *Wednesday, 7th:* Caught in Gardiner's Bay 41,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $3 worth to a smack; weather fine. *Thursday, 8th:* We caught in Gardiner's Bay 18,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Friday, 9th:* Caught in Gardiner's Bay 12,500 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $3.50 worth to a smack; weather pleasant. *Saturday, 10th:* We tanned and mended the seine in a. m.; came home in p. m.; weather good. *Monday, 12th:* We went out in Gardiner's Bay; caught 47,500 fish, which we sent in the Flora to the Miamogue Works, and sold $1 worth of fish to a smack; pleasant. *Tuesday, 13th:* Caught in Gardiner's Bay 27,500 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $20.10 worth to a smack; weather fine. *Wednesday, 14th:* We caught in Gardiner's Bay 30,500 fish, which we sent in the Flora to the Miamogue Works, and sold $8.50 worth of fish to a smack; weather good. *Thursday, 15th:* Caught in Gardiner's Bay 16,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $6.60 worth of fish to a smack; pleasant. *Friday, 16th:* We caught in Gardiner's Bay 27,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 17th:* We went to Jamesport with the sloops, and took off the Starlight's sails, spread them on the beach, and limed them; weather pleasant. *Monday, 19th:* We went down through Peconic and into Gardiner's Bay; caught none; weather fine. *Tuesday, 20th:* Went out in Gardiner's Bay, then in the sound, and nearly to Faulkland Island; caught no fish, so came back in the bay; weather continues fine. *Wednesday, 21st:* We caught in Gardiner's Bay 40,500 fish, which we sent in the U. S. Grant, and 18,000 in the Flora, to the Miamogue Works; weather fine. *Thursday, 22d:* We caught in Gardiner's Bay 17,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $13.50 worth of fish to a smack; fine. *Friday, 23d:* Caught in Gardiner's Bay 54,500 fish, which we sent in the Flora, and 18,500 in the U. S. Grant, to the Miamogue Works; weather pleasant. *Saturday, 24th:* We caught in Gardiner's Bay 31,500 fish, which we sent in the U. S. Grant to the Miamogue Works. *Monday, 26th:* We went out in Gardiner's Bay; caught 48,000 fish, which we sent in the Flora, and 23,500 in the U. S. Grant, to the Miamogue Works; weather fine. *Tuesday, 27th:* We caught in Gardiner's Bay 53,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Wednesday, 28th:* Caught in Gardiner's Bay 52,000 fish, which we sent in the U. S. Grant, and 35,000 in the Flora, to the Miamogue Works; weather pleasant. *Thursday, 29th:* Went out in Gardiner's Bay, but the wind blew up quite strong, and we came into Greenport. *Friday, 30th:* Went out in Gardiner's Bay; caught 12,500 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $10.50 worth to a smack; in p. m. we came into Greenport and tanned the seine; fine. *Saturday, 31st:* We worked on the seine in a. m.; came home in p. m.; fine.

August 2d, Monday: An east storm; we anchored in Noyack Bay. *Tuesday, 3d:* We went down below Gardiner's Island; it rained a part of the day, and some of the time it was foggy. *Wednesday, 4th:* We caught below Gardiner's Island 54,000 fish, which we sent in the Flora, and 33,000 in the U. S. Grant, to the Miamogue Works, and sold $6 worth to a smack; weather pleasant. *Thursday, 5th:* We caught off Fort Pond 55,500 fish, which we sent in the U. S. Grant, and 56,500 in the Flora, and we took 13,500 in the Starlight, to the Miamogue Works; weather continues fine. *Friday, 6th:* Caught east of Gardiner's Island 57,000 fish, which we sent in the Flora to the Miamogue Works, and sold $5.25 worth to a smack; weather good. *Saturday, 7th:* Caught in Gardiner's Bay 52,500 fish, which we sent in the U. S. Grant, and 33,500 in the Flora, to the Miamogue Works; the fish were in good shoals and quite plenty; we caught them at two sets; had them caught and scooped in by 9 o'clock a. m.; we had the U. S. Grant loaded before the Flora got to us, and were holding on to the fish waiting for her; as soon as she reached us, the man that ran her said that Captain Hawkins could take but one boat-load from us to-day; but as we had them caught I would not let them go, but sent them to the factory; very pleasant day. *Monday, 9th:* Went out in Gardiner's Bay; caught 51,500 fish, which we sent in the U. S. Grant, and 43,000 in the Flora, to the Miamogue Works, and sold $6 worth of fish to a smack; weather pleasant. *Tuesday, 10th:* We caught in Gardiner's Bay 41,500 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $10.50 worth to a smack; weather good. *Wednesday, 11th:* We caught in Gardiner's Bay 12,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 12th:* We caught in Gardiner's Bay 26,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 13th:* We hauled the sloops out on the railways to clean them, and worked on the seine; weather good. *Saturday, 14th:* We caught in Gardiner's Bay 54,500 fish, which we sent in the U. S. Grant to the Miamogue Works; then we started for Jamesport, and in Peconic Bay made a set and caught 12,000 fish, which we sent in the Flora to Jamesport; weather fine. *Monday, 16th:* Caught in Peconic Bay 14,000 fish, which we sent in the Flora to the Miamogue Works; weather good. *Tuesday, 17th:* We caught in Gardiner's Bay 48,000 fish, which we sent in the U. S. Grant, and 21,000 in the Flora, to the Miamogue Works; weather continues fine. *Wednesday, 18th:* Caught in Gardiner's Bay 20,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 19th:* We caught in Gardiner's Bay 52,500 fish, which we sent in the U. S. Grant, and 17,000 in the Flora, to the Miamogue Works; weather continues pleasant. *Friday, 20th:* Caught in Gardiner's Bay 52,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Saturday, 21st:* We tanned and mended the seine; then went to Jamesport with the sloops; weather fine. *Monday, 23d:* Went out in Gardiner's Bay; caught 53,000 fish, which we sent in the Flora, and 59,000 in the U. S. Grant, to the Miamogue Works; weather good. *Tuesday, 24th:* Caught in Gardiner's Bay 56,000 fish, which we sent in the Flora, and 32,500

in the U. S. Grant, to the Miamogue Works; weather continues fine. *Wednesday, 25th:* We caught in Gardiner's Bay 17,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 26th:* Caught in Gardiner's Bay 28,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Friday, 27th:* We caught in Gardiner's Bay 31,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 28th:* Caught in Gardiner's Bay 34,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Monday, 30th:* Went out in Gardiner's Bay; caught 24,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Tuesday, 31st:* Caught in Gardiner's Bay 31,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fine.

September 1st, Wednesday: We caught in Gardiner's Bay 42,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 2d:* Caught in Gardiner's Bay 56,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Friday, 3d:* We caught in Gardiner's Bay 38,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 4th:* We did not fish, but went home; weather fine. *Monday, 6th: Went out in Gardiner's Bay;* caught 54,000 fish, which we sent in the U. S. Grant, and 47,000 in the Flora, to the Miamogue Works; pleasant. *Tuesday, 7th:* Caught in Gardiner's Bay 59,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Wednesday, 8th:* We caught in Gardiner's Bay 52,000 fish, which we sent in the Flora, and 28,500 in the U. S. Grant, to the Miamogue Works; pleasant day. *Thursday, 9th:* Caught in Gardiner's Bay 47,500 fish, which we sent in the Flora, and 18,000 in the U. S. Grant, to the Miamogue Works; weather fine. *Friday, 10th:* Windy; did not fish, but mended seine. *Saturday, 11th:* We hauled out the Flora on the railways, and went home with the Starlight; pleasant. *Monday, 13th:* Went out in Gardiner's Bay; caught 53,000 fish, which we sent in the Flora, and 23,500 we were obliged to take on the Starlight, to the Miamogue Works, as the U. S. Grant did not come out; pleasant. *Tuesday, 14th:* We caught in Gardiner's Bay 32,000 fish, which we sent in the Flora, and 28,000 in the U. S. Grant, to the Miamogue Works; pleasant. *Wednesday, 15th:* Caught in Gardiner's Bay 42,000 fish, which we sent in the Flora, and 32,000 in the U. S. Grant, to the Miamogue Works; we also sold $3 worth to a smack; fine. *Thursday, 16th:* We caught in Gardiner's Bay 54,000 fish, which we sent in the Flora, and 23,500 in the U. S. Grant, to the Miamogue Works; quite pleasant. *Friday, 17th:* Wind blew hard; we did not fish, but hauled the sloops out on the railways, and tarred a new seine. *Saturday, 18th:* Painted sloops and seine-boats; pleasant. *Monday, 20th:* Went out in Gardiner's Bay; caught 41,000 fish, which we sent in the Flora, and 4,000 in the U. S. Grant, to the Miamogue Works; pleasant. *Tuesday, 21st:* Caught in Gardiner's Bay 47,500 fish, which we sent in the U. S. Grant, and 12,000 in the Flora, to the Miamogue Works; weather fine. *Wednesday, 22d:* Wind blew hard; caught no fish. *Thursday, 23d:* We caught in Gardiner's Bay 52,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Friday, 24th:* We did not fish, but hung our new seine; fine. *Saturday, 25th:* Finished hanging the seine in a. m.; went home in p. m. *Monday, 27th:* Wind blew hard; we caught no fish. *Tuesday, 28th:* Went out in Gardiner's Bay; caught 50,500 fish, which we sent in the Flora, and 39,000 in the U. S. Grant, to the Miamogue Works; also sold $21 worth to a smack; pleasant. *Wednesday, 29th:* Wind blew hard; could not fish, so lay in Greenport. *Thursday, 30th:* Caught in Gardiner's Bay 16,500 fish, which we sent in the Flora to the Miamogue Works; weather fine.

October 1, Friday: We caught in Gardiner's Bay 11,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Saturday, 2d:* We did not fish; we stowed away the old seine. *Monday, 4th:* Went out in Gardiner's Bay; caught 11,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Tuesday, 5th:* We caught in Gardiner's Bay 43,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 6th:* An east storm; did not fish. *Thursday, 7th:* East storm continues; lay in Greenport. *Friday, 8th:* Went out in Gardiner's Bay; caught 11,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 9th:* Did not fish; I went home. *Monday, 11th:* Caught none; the weather bad and fish scarce. *Tuesday, 12th:* Caught none; the wind continues to blow. *Wednesday, 13th:* We went below Gardiner's Island; caught 12,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 14th:* We looked below Gardiner's Island and through Gardiner's Bay, but could find no fish, so we came to Greenport; weather continues good. *Friday, 15th:* An east storm; we lay in Greenport. *Saturday, 16th:* Wind continues to blow; did not fish. *Monday, 18th:* We went out in Gardiner's Bay; caught 50,500 fish, which we sent in the Flora to the Miamogue Works; it came on dark, and the man that had charge of her run her on a rock off Little Ram Head and stove a hole through her port bow; he ran her on shore; they came with a sloop and plenty of help from the factory, took the fish out of her, nailed a canvas over the hole, took her to Greenport, hauled her out on the railways, and had her fixed; pleasant day. *Tuesday, 19th:* We caught in Gardiner's Bay 35,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Wednesday, 20th:* Caught in Gardiner's Bay 28,000 fish, which we sent in the Petrel to the Miamogue Works; they have let us take the Petrel while the Flora is being fixed; pleasant. *Thursday, 21st:* The wind blew hard; did not fish, but lay in Greenport. *Friday, 22d:* We caught in Gardiner's Bay 26,500 fish, which we sent in the Petrel, and 48,000 in the U. S. Grant, to the Miamogue Works; weather fine. *Saturday, 23d:* Caught in Gardiner's Bay 22,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Monday, 25th:* Went through Gardiner's Bay below Gardiner's Island, but saw no fish; came to anchor in Napeague Harbor; fine. *Tuesday, 26th:* Went out below Gardiner's Island; caught 23,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Wednesday, 27th:* Stormy day; we lay in Greenport. *Thursday, 28th:* Windy day; we lay in Greenport. *Friday, 29th:* We went out in Gardiner's Bay, but caught no fish. *Saturday, 30th:* Windy; did not go out; it came on to storm in p. m.

November 1st, Monday: The wind blew so hard we did not go out. *Tuesday, 2d:* Went out in the morning, but the wind sprung up and blew a gale from the northwest; we came to anchor under the lee of Ben's Point. *Wednesday, 3d:* Went out in Gardiner's Bay; caught 53,500 fish at two sets, which we sent in the U. S. Grant to the Miamogue Works; it was very cold; wind northwest; we had to whip our hands to keep warm. *Thursday, 4th:* A stormy day; did not fish. *Friday, 5th:* We came up to Jamesport with the sloops, and closed up for the season.

1876.

We had the sloops out of the creek, sails bent, and tops painted, ready for another season.

May 1st, Monday: We carried the stove and dishes, bed, and bedding on board the Starlight, ready to fish; quite cold and blew hard from the northwest; there was a little snow on the ground in the morning, but it melted away very soon. *Tuesday, 2d:* We went down bay to Greenport, and fixed the deck-boards to the carry-away sloops; wind blew quite strong from the northwest. *Wednesday, 3d:* We went down as far as Gardiner's Island; saw two small bunches of fish, but caught none; wind blew from the east and stormed in p. m. *Thursday, 4th:* We went out in Gardiner's Bay; found fish and made a set between Gardiner's Point and Plum Gut; caught 51,500 fish, which we sent in the U. S. Grant, and 37,500 in the Flora, to the Miamogue Works; pleasant, but wind blew quite strong in p. m. from west. *Friday, 5th:* Went below Gardiner's Island; caught 20,500 fish, which we sent in the U. S. Grant to the Miamogue Works, after which we came to anchor under Hicks Island, which is near the mouth of Napeague Harbor; pleasant day; in p. m. wind southwest. *Saturday, 6th:* Stormy day; came to Jamesport with the sloops. *Monday, 8th:* We went through Peconic and Gardiner's Bays, below Gardiner's Island; caught none; pleasant. *Tuesday, 9th:* We caught east of Gardiner's Island 27,000 fish, which we sent in the Flora to the Miamogue Works; then we went into Napeague Harbor; pleasant day. *Wednesday, 10th:* We caught below Gardiner's Island 38,500 fish, which we sent in the U. S. Grant to the Miamogue Works; at night we went into Napeague for a harbor; we caught a number of codfish in the schools of menhaden; they seemed to be chasing them; it was rainy and foggy most of the day. *Thursday, 11th:* The wind blew very hard from the northwest; we staid in Napeague. *Friday, 12th:* We went out, but caught no fish; it came on to blow and storm, so we went to Greenport. *Saturday, 13th:* In the morning we went down in Gardiner's Bay, but saw no fish; then came to Jamesport with the sloops; pleasant day. *Monday, 15th:* Went through Peconic and Gardiner's Bays, down below Gardiner's Island, nearly to Montauk; saw nothing but some small fish; weather fine. *Tuesday, 16th:* We saw no fish, so we went down to Shagwam Reef and tried to catch a few codfish with hook and line; weather continues fine. *Wednesday, 17th:* Could find no fish; at night went up to Greenport; weather fine. *Thursday, 18th:* We could hear of no fish; so in the morning we looked through Gardiner's Bay and down nearly to Montauk; it came on to storm in p. m., and we went into Napeague Harbor. *Friday, 19th:* We went down nearly to Montauk, then came up to Greenport; we saw a few fish in Gardiner's Bay, but they were not in shape to catch; pleasant. *Saturday, 20th:* We came up bay; saw a bunch of small fish, not much more than half grown; concluded we would catch them to find out just what they were; we saved 7,500 fish, by measure, that did not go through the meshes; we took them to Jamesport and I had them carted on my farm; fine. *Monday, 22d:* We went down through Peconic Bay and into Gardiner's Bay, and came to anchor under the lee of Fire Place Point, as the wind was blowing strong from the southwest; but before morning the wind shifted to the northwest and blew very hard, and we had to shift our anchorage. *Tuesday, 23d:* In the morning it blew hard northeast; so to make a good lee we went under Gardiner's Island and came to anchor in Cherry Harbor, near Mr. Gardiner's house, and as we had nothing that we could do we concluded to go on shore; we went up to Mr. Gardiner's house and talked with him, and then took a look at his race-course he was having fixed, &c., after which we went up to the burying-ground, and were much interested in the grave of Lyon Gardiner, and having a pencil and paper at hand I made a memorandum of it on the spot, which reads as follows:

"In memory of Lyon Gardiner, and Mary Williamson, his wife, who came from Worden, in Holland, to London July 10th, and arrived in America Nov. 28th, 1635. After commanding the garrison at Saybrook four years, he removed to the Isle of Wight, which he purchased of the Indians, called by them Manchangonoc. Being the first Englishman settled in the State of New York. He died 1663. She died 1665.

"David, their son, born at Saybrook April 29th, 1636. The first white child born in Connecticut.

"This monument was erected June, 1806, by John Lyon Gardiner, the seventh proprietor of the Isle of Wight, or Gardiner's Island. Sacred to the memory of his ancestors."

The wind died out in p. m., and we went out in Gardiner's Bay, made one set, and caught 16,000 fish, which we sent in the U. S. Grant to the Miamogue Works, after which we went up to Greenport. *Wednesday, 24th:* Went out in Gardiner's Bay; caught 19,000 fish, which we sent in the Flora to the Miamogue Works; at night we went in by the works and anchored; fine. *Thursday, 25th:* We caught in Gardiner's Bay 6,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 26th:* Went out in Gardiner's Bay, but caught none; after looking until we were tired, we came into Greenport; fine. *Saturday, 27th:* We came up to Jamesport with the sloops; pleasant. *Monday, 29th:* Went down through Peconic Bay, and when we passed Jessup's Point, in what we call Noyack Bay, we found a few fish; caught 13,000, which we sent in the Flora to the Miamogue Works; fine. *Tuesday, 30th:* We caught in Noyack Bay 18,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 31st:* We caught in Noyack Bay 28,000 fish, which we sent in the Flora to the Miamogue works; fine.

June 1st, Thursday: Caught in Noyack Bay 8,000 fish, which we sent in the U. S. Grant to the Miamogue Works; then we went down in Gardiner's Bay, but saw no fish, after which we came up to Greenport; pleasant. *Friday, 2d:* We looked through Peconic Bay, but saw no fish that we thought were catchable, so went to Jamesport; weather good. *Saturday, 3d:* We laid the Starlight on the shore and cleaned her bottom and scraped the mast, and took off and limed the U. S. Grant's sails; weather pleasant. *Monday, 5th:* Went down through Peconic Bay, and in Noyack Bay caught 35,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Tuesday, 6th:* We went down in Gardiner's Bay; caught none; fine. *Wednesday, 7th:* We caught in Gardiner's Bay 29,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 8th:* Caught in Gardiner's Bay 11,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Friday, 9th:* We were looking for fish in Gardiner's Bay, and the fishing yacht

Dauntless ran into, stove, and sank our purse-boat. It was blowing quite strong, and the gang signaled the man in the yacht to come and pick them up; he lashed his helm up and went forward to hoist up the bob-jib, and before he could get aft and cast off the tiller rope she had smashed our boat and came near striking the Starlight; we took the Tom, oars, seine, &c., in the other boat; lost nothing except one of the loggerheads; after we had the seine secured we took and lashed the broken boat close to the sloop as we could pull her, and started for Greenport; we took the boat to the boat-builders, and they went immediately at work on it, and as we could not fish while the boat was being fixed, we thought we would haul the sloops out on the railways and have them painted; pleasant day. *Saturday, 10th:* We scraped and sand-papered the bottoms of the sloops, and the painters painted them; fine. *Monday, 12th:* It stormed; did not fish, but lay in Greenport. *Tuesday, 13th:* We went out in Gardiner's Bay; caught 44,000 fish, which we sent in the U. S. Grant to the Miamogue Works. *Wednesday, 14th:* We caught in Gardiner's Bay 48,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 15th:* We caught in Gardiner's Bay 57,000 fish, which we sent in the U. S. Grant, and 18,000 in the Flora, to the Miamogue Works; pleasant. *Friday, 16th:* Caught in Gardiner's Bay 43,500 fish, which we sent in the U. S. Grant, and 8,000 in the Flora, to the Miamogue Works; for the last four days it has been foggy in the morning and cleared off in the afternoon, but we stopped nights at Bunker City, where the Miamogue Works are situated, and by steering out in the morning east or east by north we just ran into the fish; the wind being very light, by listening we could hear them play, and when close to them could see them. *Saturday, 17th:* Caught in Gardiner's Bay 4,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Monday, 19th:* Went out in Gardiner's Bay; caught 6,500 fish, which we sent in the Flora to the Miamogue Works; weather continues fine. *Tuesday, 20th:* Caught in Gardiner's Bay 28,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 21st:* We caught in Gardiner's Bay 18,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 22d:* Caught in Gardiner's Bay 7,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 23d:* We caught in Gardiner's Bay 23,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 24th:* We came to Jamesport with the sloops; pleasant. *Monday, 26th:* Went down into Gardiner's Bay; caught 32,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather pleasant. *Tuesday, 27th:* We caught in Gardiner's Bay 17,000 fish, which we sent in the Flora to the Miamogue Works, and sold $3 worth of fish to a smack; weather pleasant. *Wednesday, 28th:* Caught in Gardiner's Bay 4,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 29th:* We caught in Gardiner's Bay 22,000 fish, which we sent in the Flora to the Miamogue Works, and sold to a smack $1.90 worth of fish; fine day. *Friday, 30th:* Caught in Gardiner's Bay 10,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine.

July 1st, Saturday: We caught in Gardiner's Bay 27,000 fish, which we sent in the Flora to the Miamogue Works; are not expecting to fish any more until after the 4th; weather fine. *Wednesday, 5th:* We went out in Gardiner's Bay; caught 25,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold to a smack $2.05 worth of fish; weather continues fine. *Thursday, 6th:* Went out in Gardiner's Bay; caught none; fine. *Friday, 7th:* We caught in Gardiner's Bay 57,500 fish, which we sent in the Flora, and 20,000 in the U. S. Grant, to the Miamogue Works; weather fine. *Saturday, 8th:* Caught in Gardiner's Bay 34,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Monday, 10th:* We caught in Gardiner's Bay 17,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Tuesday, 11th:* Caught in Gardiner's Bay 48,000 fish, which we sent in the Flora, and 11,000 in the U. S. Grant, to the Miamogue Works; pleasant. *Wednesday, 12th:* We caught in Gardiner's Bay 12,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 13th:* Caught in Gardiner's Bay 33,000 fish, which we sent in the U. S. Grant, and 16,500 in the Flora, to the Miamogue Works, also sold 60 cents worth to a smack; weather fine. *Friday, 14th:* We caught in Gardiner's Bay 35,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Saturday, 15th:* We tanned and mended the seine a. m.; came home p. m.; weather pleasant. *Monday, 17th:* Went down in the bay; caught a few fish and sold them to a smack for $3; weather fine. *Tuesday, 18th:* Caught in Gardiner's Bay 24,000 fish, which we sent in the Flora to the Miamogue Works; sold to a smack $15 worth of fish; fine day. *Wednesday, 19th:* Caught in Gardiner's Bay 57,000 fish, sent in the Flora, and 16,000 in the U. S. Grant, to the Miamogue Works; weather continues pleasant. *Thursday, 20th:* We caught no fish; foggy. *Friday, 21st:* We caught in Gardiner's Bay 9,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Saturday, 22d:* We did not fish; went home; weather pleasant. *Monday, 24th:* Went out in Gardiner's Bay; caught 50,000 fish, which we sent in the U. S. Grant, and 12,000 in the Flora, to the Miamogue Works; weather good. *Tuesday, 25th:* Went out in Gardiner's Bay, but caught none; the wind blew quite strong; we witnessed a yacht race in Gardiner's Bay; the Madeline (one of the yachts) passed within twenty rods of us; it was a splendid sight; they had all the wind they wanted; her lee-scuppers were under water, and she was passing through the water as finely as anything I ever saw; I will be obliged to say that she passed the Starlight, and we think she sails well. *Wednesday, 26th:* Went out in the bay, but caught none; fine. *Thursday, 27th:* Caught in Gardiner's Bay 26,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 28th:* We caught 1,500 fish; sent in U. S. Grant to the Miamogue Works; weather pleasant. *Saturday, 29th:* Caught in Gardiner's Bay 6,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Monday, 31st:* Stormy day; wind southeast; did not fish.

August 1st, Tuesday: Went out in Gardiner's Bay; caught 37,000 fish, which were sent in the U. S. Grant to Miamogue Works. *Wednesday, 2d:* Caught in Gardiner's Bay 47,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 3d:* We caught in Gardiner's Bay 6,500 fish, which we sent in the U. S. Grant to the Miamogue Works. *Friday, 4th:* We hauled out the sloops on the railways and cleaned them and tanned the seine; pleasant. *Saturday, 5th:* We limed the sails. *Monday, 7th:* Went out in Gardiner's Bay; caught 32,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Tuesday, 8th:* Caught in Gardiner's Bay 32,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 9th:* We caught in Gardiner's Bay 6,500 fish, which

we sent in the Flora to the Miamogue Works; there are plenty of small fish in the bay, but not very many large ones; we are very much bothered to tell large from small fish, and often drop off in the boats and lay close to the fish, and as they play watch to see if they are large or small, and sometimes while laying there we will see some plays that we are sure are large, and so set for the bunch and get a few large fish, but the bulk proves to be small ones, and our seine will be meshed full of them, and it takes hours to shake them out and clear up the seine, but after a few lessons of this kind we learn to be sure what they are before we set the seine; pleasant day. *Thursday, 10th:* Went out in Gardiner's Bay; saw plenty of small fish but no large ones; they are about half grown, just right to mesh in the seine; in all my fishing I never saw so many small fish in the bay; in fact they have bothered us all the season; we were getting tired of looking at good shoals of fish and none that we could catch, so we went to Jamesport with the sloops and attended camp-meeting for the remainder of the week. *Monday, 14th:* Caught 12,000 fish in Gardiner's Bay, which we sent in the U. S. Grant to the Miamogue Works; they were part small ones; weather pleasant. *Tuesday, 15th:* We thought we would take a cruise off to see if we could find some large fish; went to Block Island; weather continues pleasant. *Wednesday, 16th:* When we "turned out" in the morning the wind was blowing a good breeze from the east, so we came to the west again, and off Fort Pond we saw plenty of fish, but we dare not try them, for they looked too small for our seine; some of the gangs have small-mesh seines so as to catch them, but they are not worth much, for there is but little oil in them; we went up to Greenport; arrived about sundown. *Thursday, 17th:* We caught in Gardiner's Bay 28,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Friday, 18th:* Caught in Gardiner's Bay 58,500 fish, which we sent in the U. S. Grant to the Miamogue Works; there were a few small ones mixed with most of them; pleasant. *Saturday, 19th:* We tarred a new seine; we have been so bothered with the fish meshing nearly the whole season, that I have ordered my new seine 2¼ instead of 2⅜ inch mesh, which I have been using. *Monday, 21st:* Went out in Gardiner's Bay, but saw no fish that we were certain were large ones, therefore caught none; fine. *Tuesday, 22d:* Saw no fish that we dare set for, so went down to Stonington; weather pleasant; in the p. m. wind blew hard SW. *Wednesday, 23d:* We saw no fish except small ones; came to Greenport and worked on the seine; weather fine. *Thursday, 24th:* We lay in Greenport; hung the new seine; pleasant. *Friday, 25th:* We went in the Sound and west nearly to Faulkland Island; caught 44,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Saturday, 26th:* We caught between Faulkland Island and Cornfield light-ship 56,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fine. *Monday, 28th:* Went out in Gardiner's Bay; caught 57,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Tuesday, 29th:* Caught in Gardiner's Bay and below Gardiner's Island 54,000 fish, which we sent in the U. S. Grant, and 20,000 in the Flora, to the Miamogue Works; pleasant day. *Wednesday, 30th:* We caught off Fort Pond 54,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine day. *Thursday, 31st:* Caught off Fort Pond 32,000 fish, which we sent in the Flora to the Miamogue Works; pleasant.

September 1st, Friday: We caught in Gardiner's Bay 40,500 fish, which we sent in the U. S. Grant to the Miamogue Works; most of the fish we have caught the past week have been large ones, but occasionally we get deceived and get around some that mesh in our seine; fine day. *Saturday, 2d:* Did not fish; went home; weather good. *Monday, 4th:* Went out in Gardiner's Bay; caught 43,000 fish, which we sent in the Flora, and 13,000 in the U. S. Grant to the Miamogue Works; weather continues fine. *Tuesday, 5th:* Went out, but the wind blew hard, and we caught none. *Wednesday, 6th:* Caught in Gardiner's Bay 23,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday, 7th:* We caught in Gardiner's Bay 49,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Friday, 8th:* It stormed a. m.; we lay in Greenport p. m.; we hauled out the sloops on the railways; fine day. *Saturday, 9th:* Had the sloops painted; weather good. *Monday, 11th:* We went out in Gardiner's Bay; caught 52,500 fish, which we sent in the U. S. Grant, and 13,500 in the Flora, to the Miamogue Works; weather good. *Tuesday, 12th:* Caught in Gardiner's Bay 43,500 fish, which we sent in the U. S. Grant, and 35,000 in the Flora, to the Miamogue Works; weather pleasant. *Wednesday, 13th:* We caught in Gardiner's Bay 7,500 fish, which we sent in the U. S. Grant, and sold $1.20 worth to a smack; weather continues pleasant. *Thursday, 14th:* Caught in Gardiner's Bay 58,000 fish, which we sent in the Flora, and 58,500 in the U. S. Grant, to the Miamogue Works; weather fine. *Friday, 15th:* We caught in Gardiner's Bay 56,000 fish, which we sent in the Flora, and 36,000 in the U. S. Grant, to the Miamogue Works; weather continues fine. *Saturday, 16th:* An east storm; did not fish. *Monday, 18th:* Wind continues east; caught none. *Tuesday, 19th:* Went out in Gardiner's Bay; caught 20,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Wednesday, 20th:* Caught in Gardiner's Bay 52,000 fish, which we sent in the U. S. Grant, and 46,000 in the Flora, to the Miamogue Works; wind blew from the east, but the fish showed good. *Thursday, 21st:* We caught none; the wind blew from the east. *Friday, 22d:* Caught in Gardiner's Bay 40,500 fish, which we sent in the U. S. Grant to the Miamogue Works; wind still east. *Saturday, 23d:* We did not get out; the wind continues to blow from the east. *Monday, 25th:* Wind east; caught none. *Tuesday, 26th:* Went out in Gardiner's Bay; caught 51,500 fish, which we sent in the Flora, and 4,500 in the U. S. Grant, to the Miamogue Works; weather good. *Wednesday, 27th:* We lay in Greenport; the wind blew hard from the northwest. *Thursday, 28th:* The wind continued to blow hard from the northwest; we went down in Gardiner's Bay and came to anchor at a place we call the Springs. *Friday, 29th:* We caught in Gardiner's Bay 57,500 fish, which we sent in the Flora, and 18,000 in the U. S. Grant, to Miamogue Works; weather fair. *Saturday, 30th:* In Greenport; did not fish; weather continues fine.

October 2d, Monday: Went out in Gardiner's Bay; caught 30,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Tuesday, 3d:* We caught in Gardiner's Bay 34,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 4th:* The wind blew hard; we came to Greenport. *Thursday, 5th:* Went out in Gardiner's Bay; caught 32,000 fish, which we sent in the Flora to Miamogue Works; fine. *Friday, 6th:* Wind blew hard; we went into Napeague. *Saturday, 7th:* We came out of Napeague early in the morning, but the wind came on to blow very hard from the NW., so we came to anchor under the lee of Gardiner's Island; it blew hard all day, so we went

back into Napeague Harbor just at night. Sunday, 8th: The wind continued to blow hard; we spent the day in Napeague. *Monday, 9th:* We went out to the east of Gardiner's Island; caught 19,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather pleasant. *Tuesday, 10th:* We caught in Gardiner's Bay 55,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Wednesday, 11th:* Wind blew hard; we lay in Greenport; tanned and mended seine. *Thursday, 12th:* We made a set southeast of Little Gull Island; caught 19,000 fish, which we sent in the U. S. Grant to the Miamogue Works; we saw a number of bunches of fish near Race Rock, but did not like to try them for fear we would catch the seine on rocks; went into New London; pleasant day. *Friday, 13th:* Started out of New London; went east of Gardiner's Island, and met a fishing-gang from Greenport that told me my child was dead; we came to Greenport and I went right home; did not fish any more this week; weather good. *Monday, 16th:* Wind blew hard NW.; did not go out. *Tuesday, 17th:* Wind continued to blow; did not fish. *Wednesday, 18th:* Went down through Gardiner's Bay; saw no fish, so went to Stonington; weather good. *Thursday, 19th:* We came over to Fort Pond; caught 21,500 fish, which we sent in the Flora to the Miamogue Works; weather continues fine. *Friday, 20th:* We caught off Fort Pond 59,000 fish, which we sent in the U. S. Grant to the Miamogue Works; and we put 39,000 in the Flora, which we sent to Luce's Floating Fish Works (which were at this time lying in Napeague harbor), because we wanted a carry-away with us in the morning, and we did not think the U. S. Grant could get back in time; the fish we caught to-day were partly eastern fish; weather fine. *Saturday, 21st:* Caught off Fort Pond 29,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Monday, 23d:* Went through Gardiner's Bay and below Gardiner's Island; caught 37,500 fish, which we sent in the Flora to the Miamogue Works; weather pleasant. *Tuesday, 24th:* We caught off Fort Pond 19,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 25th:* Caught off Fort Pond 13,500 fish, which we sent in the Flora to the Miamogue Works; fine day. *Thursday, 26th:* Went out in the morning; made a set east of Gardiner's Island; caught 5,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and the wind blowing up strong we went in Napeague Harbor, came to anchor, and hanked out the seine to let it dry. *Friday, 27th:* We lay in Napeague, as the wind continued to blow hard. *Saturday, 28th:* We caught below Gardiner's Island 25,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Monday, 30th:* We went through Gardiner's Bay and below Gardiner's Point; we saw a good shoal of fish and dropped off in the boats for them; I knew it was very rocky east of the point, but I thought the fish were clear of the rocks, so we set the seine around them, and no sooner was the seine out of the boats than the cork-line went down; I saw we had trouble, and went to taking the seine in the boats as fast as we could, but we did not get in much seine before we found it was fast; we would then pull until the seine either slipped over the rock or tore loose, and thus we continued to work; at last we anchored one of the carry-aways to the west of us, as the tide was running strong ebb, and run a line from her to the seine, and tried to pull it clear of the rocks by heaving on the windlass, which helped us very much; after much trouble we succeeded in getting the seine, which was very badly torn; proceeded to Greenport and spread it on the lot, and got the old seine out of the house, and put in the boats, putting off the mending for windy weather; a pleasant day. *Tuesday, 31st:* Went below Gardiner's Island; caught 10,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day.

November 1st, Wednesday: Caught off Fort Pond 43,500 fish, which we sent in the Flora to the Miamogue Works; fine day. *Thursday, 2d:* We caught east of Gardiner's Island 19,500 fish, which we sent in the U. S. Grant, and in Gardiner's Bay 20,000 fish, which we sent in the Flora, all to the Miamogue Works; weather fine. *Friday, 3d:* We did not fish, but are mending the seine which we tore on Monday. *Saturday 4th:* We finished mending the seine. *Monday, 6th:* I called all hands at 4 o'clock, and we went below Gardiner's Island; made a set and caught 11,500 fish, which we sent in the Flora to the Miamogue Works, and as it was quite rough, the wind being east, the Starlight's jib-stay parted, and we were obliged to go back to Greenport. *Tuesday, 7th:* A cold, stormy day; did not fish; I went home to vote. *Wednesday, 8th:* Went out in Gardiner's Bay; caught 18,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Thursday, 9th:* Quit for the season; went home with the sloops and stowed the things away, and the fishing season of 1876 is ended.

1877.

We have the sloops out and ready.

April 30th, Monday: We got things on board the sloops ready to go out fishing; pleasant day.

May 1st, Tuesday: We went down through Peconic and Gardiner's Bays, and below Gardiner's Island; caught 11,000 fish; sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 2d:* Windy and stormy; caught none. *Thursday, 3d:* Wind blew hard from the north; we lay in Napeague Harbor. *Friday, 4th:* Went out, but caught no fish; went to Greenport, then to Jamesport. *Saturday, 5th:* Worked on fishing things; pleasant. *Monday, 7th:* We went down through Peconic and Gardiner's Bays, below Gardiner's Island; caught none; pleasant. *Tuesday, 8th:* Went out below Gardiner's Island, and, as we saw no fish, we went down to Montauk, and caught a few cod with hook and line; fine day. *Wednesday, 9th:* An east storm; we lay in Napeague Harbor. *Thursday, 10th:* Went out, but caught no fish; weather good. *Friday, 11th:* We caught up by Gardiner's Point 16,000 fish, which we sent in the Flora to the Miamogue Works; then we came to Greenport; weather fine. *Saturday, 12th:* Did not fish; I came home. *Monday, 14th:* We went down through Gardiner's Bay, and around Montauk outside of Long Island, but caught no fish; weather pleasant. *Tuesday, 15th:* Caught none; weather continues pleasant. *Wednesday, 16th:* We saw a large bunch of herring off Fort Pond; we set the seine in them and caught a few, just to see what they were; weather fine. *Thursday, 17th:* We came to Greenport; ripped out the seine, and hauled out the sloops on the railways; fine. *Friday, 18th:* We tarred and worked on the seine, and worked on the sloops; weather continues fine. *Saturday, 19th:* We finished hanging the seine and painting the sloops; weather good. *Monday, 21st:* Went out in Gardiner's Bay; caught 45,000

fish, which we sent in the U. S. Grant to the Miamogue Works; weather pleasant. *Tuesday, 22d:* We caught in Gardiner's Bay 24,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Wednesday, 23d:* Caught in Gardiner's Bay 6,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday, 24th:* We caught none; weather fine. *Friday, 25th:* Caught none; weather continues fine. *Saturday, 26th:* We went to Jamesport with the sloops; pleasant. *Monday, 28th:* We went through Peconic and Gardiner's Bays; caught none; weather fine. *Tuesday, 29th:* Went out below Gardiner's Island, and off Fort Pond; caught 57,500 fish, which we sent in the Flora, and 49,500 in the U. S. Grant, to the Miamogue Works; weather fine. *Wednesday, 30th:* We caught below Gardiner's Island 16,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 31st:* Went out below Gardiner's Island; caught none, pleasant day; some of the gangs did well outside of the island.

June 1st, Friday: We started early in the morning from Fort Pond, where we lay anchored through the night, and went around Montank, outside of Long Island, when we found a good bunch of fish that were laying perfectly still with their fins out of water; we set the seine around them and pursed them nearly up without putting on the tow, and they never struck the seine until we had them all pursed; and when we commenced to take on the seine they settled down and took the cork-line down, and came near upsetting one of the boats; some of the crew thought the fish would all go out, and I think about half of them did go out before we could get the cork-line up; we saved 51,500 fish, which we sent in the U. S. Grant, and 49,500 in the Flora, to the Miamogue Works; we had the fish scooped in by 11 o'clock a. m., but it was so calm the sloops did not get to the oil-works until 9 o'clock in the evening; we went to Greenport with the Starlight, where we arrived at 10 o'clock p. m. *Saturday, 2d:* We did not fish, but fixed up the reel; pleasant. *Monday, 4th:* We went down through Gardiner's Bay and below Gardiner's Island; caught 53,000 fish, which we sent in the U. S. Grant, and 35,000 in the Flora, to the Miamogue Works; pleasant. *Tuesday, 5th:* We caught below Gardiner's Island 57,000 fish, which we sent in the U. S. Grant, and 24,000 in the Flora, to the Miamogue Works; pleasant day. *Wednesday, 6th:* Caught below Gardiner's Island 53,000 fish, which we sent in the U. S. Grant, and 16,500 in the Flora, to the Miamogue Works; weather fine. *Thursday, 7th:* It was foggy and stormy; caught none. *Friday, 8th:* We caught below Gardiner's Island 53,000 fish, which we sent in the U. S. Grant, and 14,000 in the Flora, to the Miamogue Works; weather fine. *Saturday, 9th:* We caught in Gardiner's Bay 42,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Monday, 11th:* We went out in Gardiner's Bay; caught 14,500 fish, which we sent in the Flora, to the Miamogue Works; fine. *Tuesday, 12th:* Caught in Gardiner's Bay 24,000 fish, which were sent in the U. S. Grant to the Peconic Works; pleasant. *Wednesday, 13th:* We caught in Gardiner's Bay 29,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 14th:* Went out in Gardiner's Bay; saw no fish, so went up sound a few miles, but caught none; weather continues pleasant. *Friday, 15th:* We caught in Gardiner's Bay 32,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $1 worth to a smack; pleasant day. *Saturday, 16th:* Stormy day; lay in Greenport. *Monday, 18th:* Went out in Gardiner's Bay; caught 24,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Tuesday, 19th:* We caught in Gardiner's Bay 34,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 20th:* We could find no fish in Gardiner's Bay; so we crossed the sound and went into Saybrook; pleasant. *Thursday, 21st:* We made a set by the mouth of Connecticut River, and the wind blowing up strong we went into Saybrook and came to anchor; and the carry-aways followed us, but the Flora's halyards caught, and the boy went aloft to clear it and fell and broke his leg; I sent on shore for a doctor, who came and set it; then we took him in the Starlight and took him home; sent the Flora to the Miamogue Works with 8,000 fish. *Friday, 22d:* We tanned and mended the seine; pleasant. *Saturday, 23d:* Did not fish. *Monday, 25th:* Went out in Gardiner's Bay; caught none; at night we went into Sag Harbor; pleasant day. *Tuesday, 26th:* Looked through Gardiner's Bay; found no fish, so went into the Miamogue Works and came to anchor. *Wednesday, 27th:* In the morning the wind blew hard from the east, and we came to Greenport. *Thursday, 28th:* Went down through Gardiner's Bay and below Gardiner's Island, and at night anchored in Fort Pond; weather continues fine. *Friday, 29th:* We caught off Fort Pond 36,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Saturday, 30th:* Caught below Gardiner's Island 17,500 fish, which we sent in the Flora to the Miamogue Works; fine.

July 2d, Monday: We caught none; the wind blew strong NW. *Tuesday, 3d:* Caught in Gardiner's Bay 6,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Wednesday, 4th:* Did not fish; at home. *Thursday, 5th:* We caught in Gardiner's Bay 3,500 fish, which we sent in the Flora to the Miamogue Works, and sold $6.75 worth to a smack; continues fine. *Friday, 6th:* As the fish were very scarce in Gardiner's Bay we concluded that we had better take a look in Peconic Bay, so we went up above Robin's Island, where we found plenty of fish, and caught 50,000, which we sent in the U. S. Grant, and 44,000 in the Flora, to the Miamogue Works, and put 19,500 on the Starlight, which we took into Jamesport for the farmers; pleasant day. *Saturday, 7th:* We caught in Peconic Bay 30,000 fish, which we sent in the U. S. Grant, and 22,000 in the Flora, to the Miamogue Works; continues pleasant. *Monday, 9th:* We went out in Peconic Bay; made one set; caught 56,000 fish, which we sent in the Flora; the Grant stopped at Greenport over Sunday and had not arrived yet, so we got the Starlight alongside of the seine, but the fish began to die and we could not hold them, so were obliged to slack them down, for the bunt commenced to rip, and it was as much as we could do to get our seine from under them; in fact, we had to work quite a while to do it, exerting all our strength, and the strain on the seine was so great that we tore it some; I do not think there was over 75,000 in the seine when we came alongside with the Starlight, but the water was warm and they began to die; the Flora we sent to the Miamogue Works, and we had 1,500 on board the Starlight, which we scooped out by lashing a pole on the big scoop-net handle before we had to let them go; we took them to Jamesport, where we went and hauled the seine on the beach to mend. *Tuesday, 10th:* Went out in Peconic Bay; caught 29,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fine. *Wednesday, 11th:* Caught in Peconic Bay 56,000 fish, which we sent in the Flora, and 48,000 in the U. S. Grant, to the Miamogue Works; weather fine.

Thursday, 12th: Caught in Peconic Bay 6,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Friday, 13th:* We caught in Peconic Bay 23,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold $1.25 worth of fish to a smack; fine. *Saturday, 14th;* We tanned the seine, and then went to Jamesport with the sloops; pleasant day. *Monday, 16th:* Caught in Peconic Bay 54,000 fish, which we sent in the Flora to the Miamogue Works, and 49,000 in the U. S. Grant to the Peconic Oil Works; weather fine. *Tuesday, 17th:* We caught in Peconic Bay 56,000 fish, which we sent in the Flora, and 44,500 in the U. S. Grant, to the Miamogue Works; pleasant day. *Wednesday, 18th:* Caught in Little Peconic Bay 58,000 fish, which we sent in the Flora, and 51,000 in the U. S. Grant to the Miamogue Works; pleasant day. *Thursday, 19th:* The wind blew a gale SW.; we did not fish, but lay at anchor close under the land in Indian Neck. *Friday, 20th:* We caught in Little Peconic Bay 59,000 fish, which we sent in the Flora to the Peconic Works, and 56,500 in the U. S. Grant to the Miamogue Works; pleasant day. *Saturday, 21st:* They have all the fish they want this week, so we went to Jamesport with the sloops; pleasant. *Monday, 23d:* Went out in Peconic Bay; caught 18,000 fish, which we sent in the Flora to the Peconic Works; fine. *Tuesday, 24th:* We caught in Peconic Bay 50,500 fish, which we sent in the U. S. Grant, and 20,000 in the Flora, to the Miamogue Works; fine day. *Wednesday, 25th:* Caught in Little Peconic Bay 38,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine day. *Thursday, 26th:* We caught in Noyack Bay 12,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Friday, 27th:* We went down in Gardiner's Bay; caught 53,500 fish, which we sent in the U. S. Grant, and 48,000 in the Flora, to the Miamogue Works; fine day. *Saturday, 28th:* Caught in Noyack Bay 19,500 fish, which we sent in the U. S. Grant to the Miamogue Works, and started for Jamesport, but on our way up we saw a good bunch of fish, so we caught 30,000 and sent them in the Flora to Jamesport for the farmers; pleasant day. *Monday, 30th:* We caught in Peconic Bay 54,000 fish, which we sent in the U. S. Grant, and 30,500 in the Flora, to the Miamogue Works; pleasant day. *Tuesday, 31st:* Caught in Peconic Bay 48,000 fish, which we sent in the U. S. Grant, and 46,000 in the Flora, to the Miamogue Works; pleasant.

August 1, *Wednesday:* Wind blew hard from the east; we tanned the seine. *Thursday, 2d:* Wind continues to blow from the east; we went up in the bay, and anchored in New Suffolk Cove. *Friday, 3d:* We caught in Little Peconic Bay 42,500 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant day. *Saturday, 4th:* Caught in Peconic Bay 19,500 fish, which we sent in the Flora to the Miamogue Works; fine day. *Monday, 6th:* Went out in Peconic Bay; caught 50,000 fish, which we sent in the U. S. Grant, and 45,000 in the Flora, to the Miamogue Works; fine day. *Tuesday, 7th:* We caught in Little Peconic Bay 44,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 8th:* Caught in Little Peconic Bay 27,000 fish, which we sent in the Flora to the Miamogue Works; fine. *Thursday, 9th:* Went down in Gardiner's Bay; caught 32,000 fish, which we sent in the U. S Grant to the Miamogue Works; fine. *Friday, 10th:* Caught in Gardiner's Bay 61,000 fish, which we sent in the Flora, and 25,500 in the U. S. Grant, to the Miamogue Works; the Flora came out again and we put 20,500 fish in her, which we sent to Jamesport to the farmers, as the factory has all the fish they can manage for this week; pleasant. *Saturday, 11th:* Mended seine, and went home. *Monday, 13th:* Went out in Gardiner's Bay; caught 57,500 fish, which we sent in the U. S. Grant, and 49,500 in the Flora, to the Miamogue Works; weather pleasant. *Tuesday, 14th:* Caught in Gardiner's Bay 42,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Wednesday, 15th:* We caught in Gardiner's Bay 42,500 fish, which we sent in the U. S. Grant, and 13,500 in the Flora, to the Miamogue Works; continues very fair. *Thursday, 16th:* Caught in Gardiner's Bay 17,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Friday, 17th:* We caught in Gardiner's Bay 44,000 fish, which we sent in the Flora, and 19,000 in the U. S. Grant, to the Miamogue Works; fine day. *Saturday, 18th:* We did not fish; tanned and mended the seine. *Monday, 20th:* Went out in Gardiner's Bay; caught 63,000 fish, which we sent in the Flora, and 58,000 in the U. S. Grant, to the Miamogue Works; pleasant day. *Tuesday, 21st:* We caught in Gardiner's Bay 56,000 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Wednesday, 22d:* Caught in Gardiner's Bay 25,500 fish, which we sent in the U. S. Grant to the Miamogue Works; then we caught 13,000 fish which we sold to a farmer that was out in the bay with a boat to purchase fish; weather continues fine. *Thursday, 23d:* We caught in Gardiner's Bay 58,000 fish, which we sent in the Flora, and 21,500 in the U. S. Grant, to the Miamogue Works; weather good. *Friday, 24th:* As they have as many fish at the factory as they care for at present, we concluded to go up to Jamesport and attend camp-meeting. *Monday, 27th:* Went out in Gardiner's Bay; caught 29,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Tuesday, 28th:* We caught in Gardiner's Bay 59,500 fish, which we sent in the Flora, and 33,500 in the U. S. Grant, to the Miamogue Works; weather fine. *Wednesday, 29th:* Caught in Gardiner's Bay 45,500 fish, which we sent in the Flora, and 49,500 in the U. S. Grant, to the Miamogue Works; fine day. *Thursday, 30th:* We caught in Gardiner's Bay 59,500 fish, which we sent in the Flora, and 51,000 in the U. S. Grant, to the Miamogue Works; pleasant day. *Friday, 31st:* Caught in Gardiner's Bay 38,500 fish, which we sent in the Flora to the Miamogue Works; fine day.

September 1st, Saturday: Did not fish; mended seine, &c. *Monday, 3d:* Went into Gardiner's Bay; caught 53,500 fish, which we sent in the U. S. Grant, and 7,500 in the Flora, to the Miamogue Works; fine day. *Tuesday, 4th:* We caught in Gardiner's Bay 3,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday, 5th:* Caught in Gardiner's Bay 52,500 fish, which we sent in the Flora, and 33,500 in the U. S. Grant, to the Miamogue Works; fine day. *Thursday, 6th:* We caught in Gardiner's Bay 18,700 fish, which we sent to Jamesport; then we went into Greenport and tarred a new seine. *Friday, 7th:* An east storm; did not fish. *Saturday, 8th:* The wind continues to blow from the east. *Monday, 10th:* Went out in Gardiner's Bay; caught 47,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather fine. *Tuesday, 11th:* We caught in Gardiner's Bay 48,000 fish, which we sent in the U. S. Grant to the Miamogue Works; pleasant. *Wednesday, 12th:* Caught in Gardiner's Bay 42,500 fish, which we sent in the Flora to the Miamogue Works; fair. *Thursday, 13th:* We caught in Gardiner's Bay 29,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and sold 50 cents' worth of fish to a smack; pleasant. *Friday,*

14*th:* We hauled out the sloops on the railways and worked on the new seine; pleasant. *Saturday*, 15*th:* Had the sloops painted and finished hanging the new seine; pleasant day. *Monday*, 17*th:* Went out in Gardiner's Bay; caught 5,000 fish, which we sent in the Flora to the Miamogue Works; weather continues fine. *Tuesday*, 18*th:* We caught in Gardiner's Bay 52,500 fish, which we sent in the U. S. Grant, and 40,000 in the Flora, to the Miamogue Works; fine day. *Wednesday*, 19*th:* Caught in Peconic Bay 49,000 fish, which we sent in the U. S. Grant to the Miamogue Works, and we put 45,400 in the Flora, which we sent up to Jamesport; fine day. *Thursday*, 20*th:* We caught in Peconic Bay 51,500 fish, which we sent in the Flora to the Miamogue Works; fine. *Friday*, 21*st:* Wind blew very hard; we did not fish. *Saturday*, 22*d:* Windy; did not fish. *Monday*, 24*th:* Caught in Peconic Bay 44,500 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues fine. *Tuesday*, 25*th:* We caught in Peconic Bay 16,500 fish, which we sent in the Flora to the Miamogue Works. *Wednesday*, 26*th:* We caught in Peconic Bay 20,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine day. *Thursday*, 27*th:* We attended the Suffolk County Fair. *Friday*, 28*th:* Caught in Peconic Bay 45,500 fish, which we sent in the U. S. Grant to the Miamogue Works, and 7,000 in the Flora to Jamesport; pleasant day. *Saturday*, 29*th:* Wind east; did not fish.

October 1*st*, *Monday:* Went out in Gardiner's Bay; caught 49,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Tuesday*, 2*d:* We caught in Gardiner's Bay 46,500 fish, which we sent in the Flora to the Miamogue Works; fine day. *Wednesday*, 3*d:* Caught in Gardiner's Bay 33,500 fish, which we sent in the Flora to the Miamogue Works; pleasant. *Thursday*, 4*th:* A very hard southeast storm; we lay in Greenport. *Friday*, 5*th:* The wind in the night shifted from southeast to northwest and blew and rained very hard. We had to put on our "oilers" and work to keep the boats from being injured alongside of the wharf. In the morning we heard the Massachusetts was ashore abreast of East Marion, on the sound shore, and went up to see them land the passengers. The wind blew hard from the northwest the remainder of the week, so we could not fish. *Monday*, 8*th:* Wind east; we beat down to Gardner's Island, but the wind blew hard and we came back to Greenport. *Tuesday*, 9*th:* East storm; lay in Greenport. *Wednesday*, 10*th:* Went out in Gardiner's Bay; caught 33,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Thursday*, 11*th:* Caught in Gardiner's Bay 29,500 fish, which we sent in the Flora to the Miamogue Works; fine day. *Friday*, 12*th:* Caught in Gardiner's Bay 46,000 fish, which we sent in the U. S. Grant, and 15,500 in the Flora, to the Miamogue Works; weather fine. *Saturday*, 13*th:* Wind blew hard northwest; did not fish. *Monday*, 15*th:* We went out in Gardiner's Bay; caught 48,500 fish, which we sent in the U. S. Grant, and 9,500 in the Flora, to the Miamogue Works; fine day. *Tuesday*, 16*th:* Went below Gardiner's Island; caught 35,500 fish, which we sent in the U. S. Grant to the Miamogue Works. *Wednesday*, 17*th:* Caught below Gardiner's Island 32,000 fish, which we sent in the Flora to the Miamogue Works; continues fine. *Thursday*, 18*th:* We caught in Gardiner's Bay 53,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine day. *Friday*, 19*th:* Caught in Gardiner's Bay 56,500 fish, which we sent in the Flora to the Miamogue Works; fine day. *Saturday*, 20*th:* Wind east, and stormed; did not fish. *Monday*, 22*d:* It continued to blow from the east, so we lay in Greenport. *Tuesday*, 23*d:* Went out in Gardiner's Bay; caught 28,500 fish, which we sent in the U. S. Grant to the Miamogue Works; fine. *Wednesday*, 24*th:* We caught in Gardiner's Bay 27,500 fish, which we sent in the Flora to the Miamogue Works; fine day. *Thursday*, 25*th:* Caught in Gardiner's Bay 43,000 fish, which we sent in the U. S. Grant to the Miamogue Works; fine day. *Friday*, 26*th:* East storm; we lay in Greenport. *Saturday*, 27*th:* Wind continues to blow from the east; I went home. *Monday*, 29*th:* We went through Gardiner's Bay and below Gardiner's Island; the wind did not blow hard in the morning, but it gradually increased, so when we had arrived where the gangs were finding fish it was blowing quite strong SW.; we found a very large body—I think I never saw a larger one—they were a reddish color, and extended as far as my eye could reach; we dropped off from the sloop and set into them, laying the seine narrow, for the wind was blowing strong and I did not wish to get too large a haul; we scooped 51,400 in the Flora, and it blew so hard she came near filling; I kept near her and told the man that sailed her to go into Napeague, and I sold them at Green's Works in Napeague. *Tuesday*, 30*th:* Went out, and off Fort Pond we caught 48,000 fish, which we sent in the U. S. Grant, and 31,500 in the Flora, to the Miamogue Works; weather fine. *Wednesday*, 31*st:* Went out below Gardiner's Island; caught 22,000 fish, which we sent in the U. S. Grant to the Miamogue Works; weather continues pleasant.

November 1*st*, *Thursday:* Caught below Gardiner's Island 32,000 fish, which we sent in the Flora, and 41,500 in the U. S. Grant, to the Miamogue Works; weather good. *Friday*, 2*d:* Storm from the south; heavy wind; did not fish. *Saturday*, 3*d:* Did not fish; I went home. *Monday*, 5*th:* Went out in Gardiner's Bay; caught 48,000 fish, which we sent in the Flora, and 58,000 in the U. S. Grant, to the Miamogue Works; wind blew quite strong SW. *Tuesday*, 6*th:* Wind blew hard; we lay in Greenport; I went up to election. *Wednesday*, 7*th:* We caught in Gardiner's Bay 55,000 fish, which we sent in the Flora, and 24,000 in the U. S. Grant, to the Miamogue Works; fine day. *Thursday*, 8*th:* Caught in Gardiner's Bay 50,000 fish, which we sent in the Flora, and 40,000 in the U. S. Grant, to the Miamogue Works; pleasant. *Friday*, 9*th:* Stormy; did not go out, but lay in Greenport. *Saturday*, 10*th:* Went up to Jamesport with the sloops; quit for the season and stowed the fishing things away soon as we could.

1878.

The Hawkins Brothers have been building a new steamer, which will make three, as they had two before. They want me to go in one of the steamers, which I have at last decided to do. They purchased my seines, and I will have to dispose of my sloops, &c. I am to go in the steamer William Floyd, and we have brought her to Jamesport.

April 15*th*, *Monday:* The crew came on board. *Tuesday*, 16*th:* We got the seine out of the house and went to Greenport; wind blew quite strong NW. *Wednesday*, 17*th:* We lay in Greenport, fixing the hoisting-gear, big net, &c.; wind N.W. *Thursday*, 18*th:* We went out on our first cruise in the Wm. Floyd; went around Montauk and

west as far as Annagansett, but saw no fish, so we came up to the Miamogue Works and coaled up; weather pleasant. *Friday, 19th:* We started out of Greenport early in the morning; went down to Montauk, but it being too rough to go around we came back to Greenport and hauled the steamer out on the railways and cleaned her bottoms; weather good. *Saturday, 20th:* We sand-papered the Wm. Floyd and fixed the reel; the painters painted her; continues pleasant. *Monday, 22d:* We went around Montauk and caught outside of Long Island 55,200 fish, which we took to the Miamogue Works. Weather continues fine; wind SW. *Tuesday, 23d:* An east storm; we lay in Greenport. *Wednesday, 24th:* The storm continues; we lay in Greenport doing odd jobs on the Wm. Floyd. *Thursday, 25th:* We went out, but caught no fish; at night we anchored off Hick's Island; pleasant day. *Friday, 26th:* We caught at one set, off Fort Pond, 153,600 fish, which we took to the Miamogue Works; fine. *Saturday, 27th:* We caught in Gardiner's Bay 4,000 fish, which we took to the Miamogue Works; it was foggy a part of the day. *Monday, 29th:* We caught off Fort Pond, at one set, 182,000 fish; we had a pretty good pull to raise them, but the steamer helped us by turning first back and then ahead; I do not think we could have got them up alongside of a carry-away; and then hoisting them out by steam we get them out so fast they do not get smothered and die, as they would where we hoist them by hand; we took them to the Miamogue Works; foggy in the morning, but clearing off pleasant. *Tuesday, 30th:* We caught off Fort Pond 136,400 fish, at one set, which we took to the Miamogue Works; foggy in the morning.

May 1st, Wednesday: We went below Gardiner's Island and off Fort Pond, where we found a gang which had more fish than they could handle, and they whistled for help; so we went and helped them get their fish up so they could scoop them; another gang whistled for assistance, and we helped them also; after which the fish appeared to be scarce, and we could find none; pleasant day; at night we anchored off Hick's Island. *Thursday, 2d:* We went around Montauk and outside of Long Island; we caught 141,500 fish, which we took to the Peconic Works, as the Miamogue Works could not take them; weather pleasant. *Friday, 3d:* We went around Montauk, outside; made one set and missed the fish, but caught some river shad; weather pleasant. *Saturday, 4th:* We did not fish. *Monday, 6th:* Went down as far as Montauk; caught none; fine. *Tuesday, 7th:* Went around Montauk, and west as far as Bridgehampton; caught 184,800 fish, which we took to the Miamogue Works; it was a very pleasant day; there were about eighteen or twenty steamers outside. *Wednesday, 8th:* Went outside of Long Island; caught 132,800 fish, which we took to the Miamogue Works; fine day. *Thursday, 9th:* We lay in Greenport; the inspectors came from New York and inspected the William Floyd; pleasant. *Friday, 10th:* Went around Montauk and outside of Long Island; caught 108,800 fish, which we took to the Miamogue Works; fine. *Saturday, 11th:* We caught 40,800 fish east of Gardiner's Island; took them to the Miamogue Works; fine day. *Monday, 13th:* We went around Montauk and outside of Long Island, but found no fish; pleasant. *Tuesday, 14th:* Went outside again, but found no fish; fine. *Wednesday, 15th:* Wind east and storming; we lay in Greenport. *Thursday, 16th:* Went down as far as Fort Pond and Montauk; caught no fish; weather pleasant. *Friday, 17th:* Went around Montauk outside of Long Island; made three sets and put 256,800 fish on the William Floyd, but we were obliged to let some of the last haul go, as she was loaded, and decks to the water's edge; we took them to the Miamogue Works; very pleasant. *Saturday, 18th:* Went down as far as Fort Pond; caught none; fine. *Monday, 20th:* Went around Montauk outside of Long Island, but caught none; it was rough; wind SSE.; we came back and anchored off Hick's Island. *Tuesday, 21st:* It stormed in the morning, but cleared off about 10 o'clock a. m., when we started and looked through the bay and went to the fish works and coaled up; then went to Greenport. *Wednesday, 22d:* We went around Montauk and outside of Long Island; caught 51,000 fish, which we took to the Miamogue Works; pleasant day; wind N. *Thursday, 23d:* Went outside of Long Island; caught 110,000 fish, which we took to the Miamogue Works; weather fine. *Friday, 24th:* We went outside of Long Island and went west as far as Southampton and caught at three sets 212,000 fish, which we took to the Miamogue Works; it was a beautiful day, but it is a long run to Southampton and back. *Saturday, 25th:* We did not fish, but lay in Greenport mending seine, &c.; pleasant day. *Monday, 27th:* We went outside of Long Island; caught 164,000 fish, which we took to the Miamogue Works; the wind blew a good breeze from the NW. *Tuesday, 28th:* Went around Montauk and outside of Long Island again, but found no fish; so we went to Stonington; the weather fine. *Wednesday, 29th:* Went outside of Long Island, but could find no fish; then went up through the bay to the Miamogue Works and coaled up and went to Greenport for water; pleasant day. *Thursday, 30th:* Went in the sound and the wind came on to blow from the east; we set the sail and steered west and anchored off the mouth of Cow Bay in the head of the sound. *Friday, 31st:* The east storm continued; we went into Port Washington and came to anchor near the village and purchased some stores.

June 1st, Saturday: The east storm continued; we went in Cow Bay. *Monday, 3d:* In the morning it was foggy; we started out of the harbor, but as it was so thick we came to anchor again off the mouth of the harbor; about noon it cleared off and we made five sets near Stepping Stones and Execution Lights; started down the sound about sundown, and before we reached Crane Neck the fog was so thick we could not see the length of the steamer; we run slow, blowing the whistle quite often, and went through Plum Gut about 7 o'clock p. m., without seeing land on either side; we saw no land from the time the fog came on until we made Little Ram Head, which is close to the Miamogue Works; we arrived about 8 o'clock; had 116,000 fish. *Tuesday, 4th:* After unloading the fish and coaling up, we went to Greenport and filled the tank with water, where we staid the remainder of the day, as it came on foggy again in p. m. *Wednesday, 5th:* Went in the sound and west as far as Faulkland Island; caught 110,000 fish, which we took to the Miamogue Works, where we arrived about sundown; fine. *Thursday, 6th:* We went around Montauk outside of Long Island; went around a shoal of fish, and just as we came together with the boats, there was a whale came up and blowed in the middle of our haul; we immediately took our seine on; I suppose he must have gone under the seine, for it was not injured; the fish were quite plenty, and we soon found other bunches and caught 208,000, which we took to the Miamogue Works; weather pleasant. *Friday, 7th:* We went around Montauk outside of Long

Island, but found no fish, so we came back; and east of Gardiner's Point caught 38,000, which we took to the Miamogue Works; weather continues pleasant. *Saturday, 8th:* We did not fish; lay in Greenport. *Monday, 10th:* An east storm; did not go out. *Tuesday, 11th:* We went down through Gardiner's Bay, and below Gardiner's Island; saw no fish, so went over to New London; wind blew quite hard. *Wednesday, 12th:* Went around Montauk, and west as far as Bridgehampton; caught 49,800 fish, which we took to the Miamogue Works; very pleasant day. *Thursday, 13th:* We went outside of Long Island again; caught 148,000 fish, which we took to the Miamogue Works; fine. *Friday, 14th:* Went around Montauk, outside of Long Island, but saw no fish; and the steamers to the west, as far as we could see, were finding none, so we turned back and came to Greenport, ripped out and tarred the seine; weather fine. *Saturday, 15th:* We hung the seine; pleasant. *Monday, 17th:* The wind blew hard, so we did not fish, but fixed our deck-boards, scoop-net, &c. *Tuesday, 18th:* We concluded it would be too rough outside of Long Island, so we went in the sound, and went west as far as New Haven; caught 134,400 fish, and reached the Miamogue Works with them about 9 o'clock p. m.; a mild rain nearly all day. *Wednesday, 19th:* Went up the sound as far as Milford; caught 73,600 fish, and arrived at the Miamogue Works with them about 10 o'clock p. m.; pleasant day. *Thursday, 20th:* Went up sound, and near Faulkland Island caught 18,000 fish; reached the Miamogue Works with them about sundown; weather fine. *Friday, 21st:* We took a look up in Peconic Bay, but found no fish; pleasant. *Saturday, 22d:* Stormy day; wind SE.; we lay in Greenport. *Monday, 24th:* We went up in Peconic Bay; caught 28,000 fish, and took them to the Miamogue Works; wind blew hard from the NW. *Tuesday, 25th:* Went up in Peconic Bay and caught a few fish, but not enough to go to the works with, so we anchored off Jamesport; the wind blew hard NW. *Wednesday, 26th:* We caught a few in Peconic Bay, and went down to the Miamogue Works; had, with what we caught the day before, 65,000 fish; weather fair. *Thursday, 27th:* We caught in Peconic Bay 17,500 fish, which we took to the Miamogue Works; weather pleasant. *Friday, 28th:* We went up sound nearly to Faulkland Island; caught 52,000 fish, which we took to the Miamogue Works; weather continues fine. *Saturday, 29th:* We went up sound nearly to Faulkland Island; caught 11,000 fish, which we took to Miamogue Works; fine.

July 1st, Monday: We went in the sound and went west as far as New Haven; caught 130,800 fish and arrived at the Miamogue Works with them before sundown; fine. *Tuesday, 2d:* Went in the sound in a. m.; it was thick and foggy, so we ran slow, and about 10 o'clock a. m. the fog "lit up"; we were abreast of New Haven, and we saw fish and went to work; caught 104,000, which we took to the Miamogue Works; weather very fine after the fog cleared away. *Wednesday, 3d:* We lay in Greenport; hauled out the Wm. Floyd on the railways; painted and fixed her; we did not fish any more this week; pleasant. *Monday, 8th:* Went west as far as Norwalk Islands; caught none; at night stopped in Black Rock Harbor; weather good. *Tuesday, 9th:* Went west as far as Norwalk Islands; caught off Southport 90,800 fish, and came down to the Miamogue Works; had a heavy thunder squall in p. m., while we were coming down sound. *Wednesday, 10th:* We caught in Gardiner's Bay 94,400 fish and took them in to the Miamogue Works; we had a shower just at night. *Thursday, 11th:* We caught in Gardiner's Bay and off Fort Pond 74,000 fish, which we took to the Miamogue Works. *Friday, 12th:* We caught off Fort Pond 102,800 fish, which we took to the Miamogue Works; weather pleasant. *Saturday, 13th:* Wind east; did not fish. *Monday, 15th:* Went down below Gardiner's Island and caught off Fort Pond 100,000 fish, which we landed at the Miamogue Works; fine day. *Tuesday, 16th:* We caught in Gardiner's Bay 11,200 fish, which we took to the Miamogue Works; weather good. *Wednesday, 17th:* Went up sound just west of Faulkland Island; we caught 46,800 fish, which we took to the Miamogue Works; weather continues fine. *Thursday, 18th:* Went up sound and near Faulkland Island we caught 92,000 fish, which we took to the Miamogue Works; fine day. *Friday, 19th:* We caught off New Haven 149,600 fish, which we took to the Miamogue Works; very warm day. *Saturday, 20th:* We caught in Gardiner's Bay 6,000 fish, which we took to the Miamogue Works; pleasant. *Monday, 22d:* Went out in the bay, but the wind blowing cool from the NW. the fish would not show, so we caught none. *Tuesday, 23d:* We caught off Fort Pond 216,400 fish, which we took to the Miamogue Works; weather fine. *Wednesday, 24th:* We caught in Gardiner's Bay 102,800 fish, which we took to the Miamogue Works; weather fine. *Thursday, 25th:* We caught in Gardiner's Bay 109,600 fish, and the wind coming on to blow very hard from the SW., we started for and arrived at the Miamogue Works at 3 o'clock p. m. *Friday, 26th:* The wind blew hard from the SW.; we caught none, and soon came into Greenport. *Saturday, 27th:* Wind blew hard; did not go out. *Monday, 29th:* We caught in Gardiner's Bay 128,600 fish, which we took to the Miamogue Works; very pleasant. *Tuesday, 30th:* An east storm; we lay in Greenport. *Wednesday, 31st:* We went below Gardiner's Island, and off Fort Pond caught 224,000 fish, which we took to the Miamogue Works; weather fine.

August 1st, Thursday: We caught off Fort Pond 93,000 fish, which we took to the Miamogue Works; pleasant, but had a shower just at night. *Friday, 2d:* We caught below Gardiner's Island 102,800 fish, which we took to the Miamogue Works; after which we came to Greenport; pleasant, except a heavy thunder shower just at night. *Saturday, 3d:* We hauled out the William Floyd on the railways to fix the condenser, and we took the seine in the lot, ripped out, and tarred, and partly hung it in the lines; pleasant day. *Monday, 5th:* We finished hanging the seine and launched the William Floyd; pleasant. *Tuesday, 6th:* We caught in Gardiner's Bay 30,400 fish and took them to the Miamogue Works; weather fine. *Wednesday, 7th:* Went up in Peconic Bay; caught 77,600 fish, which we took to the Miamogue Works; pleasant; wind light NW. *Thursday, 8th:* We caught in Noyack Bay 12,000 fish, which we took to the Miamogue Works; pleasant day. *Friday, 9th:* Went down in Gardiner's Bay, but the wind blew hard from the SW., so we caught none, and soon came into Greenport. *Saturday, 10th:* Did not fish. *Monday, 12th:* We went up sound and caught off Faulkland Island 90,000 fish, which we took to the Miamogue Works; fine day. *Tuesday, 13th:* Went in the sound, and just west of Faulkland Island we caught 52,000 fish, which we took to the Miamogue Works; weather continues fine. *Wednesday, 14th:* Wind E.; we looked through Gardiner's Bay, but caught no fish; so came to Greenport. *Thursday, 15th:* Wind E., and we did not start out of Greenport until 8 o'clock a. m., when we went down through Gardiner's Bay; and below Gardiner's Island and off Fort Pond we found some very good

bunches of fish, and caught 160,800, which we took to the Miamogue Works; the wind died out and we had very good weather. *Friday, 16th:* We caught off Fort Pond 14,400 fish, which we took to the Miamogue Works; weather fine. *Saturday, 17th:* Did not fish. *Monday, 19th:* We went around Montauk and outside of Long Island, but found no fish; weather fine. *Tuesday, 20th:* Went in the sound, and went west as far as Faulkland Island; caught 55,200 fish, and took them to the Miamogue Works; weather continues fine. *Wednesday, 21st:* Went up Long Island Sound, and caught off New Haven 87,600 fish, which we took to the Miamogue Works; we had rain and darkness to contend with, but reached the works in safety. *Thursday, 22d:* Wind blew from the east; we lay in Greenport. *Friday, 23d:* We went down through the bay to Fort Pond, where we caught 48,400 fish, which we took to the Miamogue Works; weather good. *Saturday, 24th:* We caught off Fort Pond 29,600 fish, which we took to the Miamogue Works; fine day. *Monday, 26th:* We went in the sound, and off Faulkland Island caught 66,600 fish, which we took to the Miamogue Works; weather pleasant. *Tuesday, 27th:* We went below Gardiner's Island and caught 6,400 fish, which we landed at the Miamogue Works; fine. *Wednesday, 28th:* Went up sound, and near Faulkland Island we caught 161,600 fish, and took down to the Miamogue Works; very fine day. *Thursday, 29th:* Went in Long Island Sound; followed the south shore, and off Luce's Landing we fell in with fish; caught 66,400, which we took to the Miamogue Works; fine day. *Friday, 30th:* Went in the sound, and just west of Horton's Point caught 36,800 fish, which we took to the Miamogue Works; continues very pleasant. *Saturday, 31st:* Went below Gardiner's Island, and off Fort Pond we caught 27,200 fish, which we landed at the Miamogue Works; weather continues fine.

September 2d, Monday: Went down through Gardiner's Bay, and below Gardiner's Island caught 197,200 fish, which we took to the Miamogue Works; weather continues fine. *Tuesday, 3d:* Went down below Gardiner's Island, caught 183,200 fish, and took them to the Miamogue Works; fish plenty; fine. *Wednesday 4th:* Wind blew hard from the east, so we could not fish; we came up to Greenport. *Thursday, 5th:* The wind continues to blow from the east; we lay in Greenport. *Friday, 6th:* We went below Gardiner's Island; caught 95,600 fish, which we landed at the Miamogue Works; fine. *Saturday, 7th:* In Greenport; wind E.; I went home. *Monday, 9th:* We went out in Gardiner's Bay, and near the end of Gardiner's Point we made two sets of about equal size, just loading the steamer, and started with them for the Miamogue Works at half past eleven a. m.; there were 253,600 fish; weather pleasant. *Tuesday, 10th:* We caught in Gardiner's Bay 66,400 fish, which we took to the Miamogue Works; fine day. *Wednesday, 11th:* Went below Gardiner's Island, and off Fort Pond we caught 76,800 fish, which we took to the Miamogue Works; the wind is east, but does not blow very hard, and it has been in that direction most of the week. *Thursday, 12th:* Wind E. and stormy; we lay in Greenport. *Friday, 13th:* Wind continued to blow; we did not fish. *Saturday, 14th:* We went out in Gardiner's Bay; caught 61,600 fish, which we took to the Miamogue Works; weather fine. *Monday, 16th:* We went down through Gardiner's Bay and below Gardiner's Island to Fort Pond; the wind was blowing from the east, and it was quite rough; but we could make a lee in Fort Pond, so we made two small sets in Fort Pond; and then the weather moderated, and we went off shore and made a good set; so that when we had them scooped in we had over 100,000 fish; then we found another bunch and caught them, and put all we could on the steamer, and had enough left in the seine to nearly load another steamer, which we had to let go; they handled easy; we had no trouble in raising them; we had in all 236,009 fish, which we took to the Miamogue Works, arriving there about 7 o'clock p. m. *Tuesday, 17th:* We caught off Gardiner's Point 98,400 fish, which we took to the Miamogue Works; pleasant day. *Wednesday, 18th:* We caught in Gardiner's Bay 57,600 fish, when the grate-bars fell down and we were obliged to burn wood to get to the Miamogue Works; fine. *Thursday, 19th:* We went in the sound and caught, off Horton's Point, 114,800 fish, which we took to the Miamogue Works; we arrived at the works about 8 o'clock; fine. *Friday, 20th:* We went in Long Island Sound; caught off Faulkland Island 158,400 fish; and we arrived at the Miamogue Works about 9 p. m.; pleasant day. *Saturday, 21st:* We came into Greenport and mended seine. *Monday, 23d:* We went through Gardiner's Bay, and below Gardiner's Island caught 23,200 fish, which we took to the Miamogue Works; weather continues fine. *Tuesday, 24th:* We went in the sound, and caught off Faulkland Island 65,600 fish, which we took to the Miamogue Works; weather fine. *Wednesday, 25th:* We caught off Faulkland Island 100,400 fish, which we took to the Miamogue Works; fine day. *Thursday, 26th:* Went in the sound, but the wind blew quite strong from the southwest, so we followed the south shore in hopes the wind might die out; we went up as far as Mattituck, but the wind continued to blow, so we came back to Greenport. *Friday, 27th:* Wind blew quite hard NW.; went in the sound, and nearly to Faulkland Island, but the wind continued to blow, so we turned back and went into the Miamogue Works; pleasant day. *Saturday, 28th:* We tarred a new seine; pleasant. *Monday, 30th:* We went in the sound and west as far as New Haven, where we caught 127,000 fish, which we took to the Miamogue Works; pleasant weather.

October 1st, Tuesday: We went in the sound, and off Luce's Landing caught 152,000 fish, which we took to the Miamogue Works; weather continues fine. *Wednesday, 2d:* Went in the sound, and off Riverhead we caught 88,800 fish, which we took to the Miamogue Works; weather continues fine. *Thursday, 3d:* Went in the sound, and off Luce's Landing and Mattituck caught 111,200 fish, which we took to the Miamogue Works; weather fine. *Friday, 4th:* Went in the sound; caught off Riverhead 155,600 fish, which we took to the Miamogue Works; fine day. *Saturday, 5th:* We did not fish; it has been a very pleasant week—just like summer. *Monday, 7th:* Went up sound, and off Riverhead and Wading River caught 119,600 fish, which we took to the Miamogue Works; fine day. *Tuesday, 8th:* Started to go up sound, but the wind blew hard, and we were obliged to turn back and go into Greenport. *Wednesday, 9th:* We went out in the morning; went up sound a ways, but the wind blew hard, so we turned back and came to Greenport, and went to work on the new seine. *Thursday, 10th:* We finished hanging the new seine. *Friday, 11th:* We attended the Suffolk County Fair. *Saturday, 12th:* An east storm. *Monday, 14th:* Went through Gardiner's Bay and below Gardiner's Island, where we caught 42,400 fish, which we took to the Miamogue Works; fine day. *Tuesday, 15th:* We caught in Gardiner's Bay 44,400 fish, which we took to the Miamogue Works; fine day. *Wednesday, 16th:*

Went out in Gardiner's Bay; caught none; pleasant. *Thursday*, 17th: Wind blew hard; we lay in Greenport. *Friday*, 18th: We caught in Gardiner's Bay 16,800 fish, which we took to the Mianogue Works; fine day. *Saturday*, 19th: Windy and cold; did not go out, but lay in Greenport. *Monday*, 21st: We started from Greenport in the morning, and went through the Bay down to Montauk, and then south of Block Island, after which we passed Point Judith and Beaver-tail light into Newport; as we passed into the harbor we saw Fort Adams and the man-of-war Minnesota; after we arrived in the town we went up and saw "Old Mill," as they call it, which was built ages before this country was settled by the English. *Tuesday*, 22d: We started out of Newport in a. m. as early as we could see, and came to the north of Block Island and Montauk, and looked in by Fort Pond and up through the bay, but could see no fish; reached Greenport at 4 p. m.; pleasant. *Wednesday*, 23d: A hard east storm; we lay in Greenport. *Thursday*, 24th: The wind blew very hard NW.; lay in Greenport. *Friday*, 25th: Went below Gardiner's Island and under Gin Beach; just east of Fort Pond we caught at one set 160,000 fish, which we took to the Mianogue Works; weather good. *Saturday*, 26th: We caught off Fort Pond 78,000 fish, which we took to the Mianogue Works; pleasant day. *Monday*, 28th: We went below Gardiner's Island; the wind blew quite strong from the north, so we anchored off Goose Pond and stopped all night. *Tuesday*, 29th: We caught off Fort Pond 60,000 fish, which we took to the Mianogue Works; pleasant day. *Wednesday*, 30th: Stormy day; went to Greenport. *Thursday*, 31st: Wind blew hard, and we caught no fish.

November 1st, Friday: Windy; we lay in Greenport. *Saturday*, 2d: Wind continued to blow; did not fish. *Monday*, 4th: Went down to Fort Pond; made one set and caught 25,000 fish, but the wind blew up so strong from the northwest we were obliged to leave; there were plenty of good *beaches of fish*, but close in on a lee shore; some of the gangs got large hauls and had a hard time, part having to turn their fish out, for the wind blew a gale; I had as much as I could do to keep our boats from sinking while on our way to the Mianogue Works. *Tuesday*, 5th: Wind blew hard; did not fish. *Wednesday*, 6th: Went out; looked through Gardiner's Bay and Fort Pond, but could see no fish; it snowed and rained by turns all day. *Thursday*, 7th: We found a bunch of fish close in-shore in Cherry Harbor; caught and took them to the Mianogue Works; there were 97,800; pleasant day. *Friday*, 8th: The wind blew hard from the northwest, and we came up to Greenport from the fish works. *Saturday*, 9th: Wind blew very hard from the northwest; did not fish; I came home. *Monday*, 11th: Went down to Gin Beach; caught at one set 150,000 fish, which we took to the Mianogue Works; weather fine. *Tuesday*, 12th: In Greenport, getting the boiler fixed. *Wednesday*, 13th: Windy; did not fish. *Thursday*, 14th: Wind blew hard; we lay in Greenport. *Friday*, 15th: Pleasant day; we went out through Gardiner's Bay and below Gardiner's Island, but saw no fish; so we came up to Greenport and on to Jamesport, and carried the seine up in the lot to dry it, and stripped the William Floyd ready to lay her up; and the fishing season of 1878 is ended.

1879.

April 22d, Tuesday: We brought the William Floyd up to Jamesport, and the crew came on board, and we commenced fixing her for business; pleasant day. *Wednesday*, 23d: We carried the seine and put it in the boats in a. m., and got ready to go down bay; p. m. we went to Greenport; after we arrived we shipped the cranes as they have been presenting the William Floyd with a set of cranes, which she very much needed; fine. *Thursday*, 24th: We rove the falls in the cranes and fixed the seine-boats, hoisting fall, and overhauled things in general; some of the steamers went out to-day, but saw no fish; pleasant day. *Friday*, 25th: I fixed my room, and we fixed the tow blocks and pen, or deck boards, to the William Floyd, &c.; some of the steamers went out, but saw no fish; weather very good for fishing, although it is cloudy. *Saturday*, 26th: We went down to the Mianogue Oil Works in a. m. and coaled up; p. m. I came home. *Monday*, 28th: Foggy, so that we did not go out. *Tuesday*, 29th: It rained in the morning, but it lit up, and we started down bay about 9 o'clock a. m.; went down as far as Gardiner's Point, but it was so thick and foggy that we came to anchor close by the Point and waited for it to clear up; but as it did not, we came back to Greenport. *Wednesday*, 30th: Foggy in the morning; we started out at 8 o'clock and went down as far as Shagwam Reef, but saw no fish, so we anchored off Goose Pond, Gardiner's Island; pleasant.

May 1st, Thursday: Wind blew quite strong from the northwest; we went down as far as Montauk and saw some of the steamers coming back; so we went back and anchored off Goose Pond, Gardiner's Island. *Friday*, 2d: We went around Montauk, and west as far as Amagansett; saw no fish, and the steamers, as far as we could see, seemed to be finding no fish; so we came back, and came to the Mianogue Works and coaled up, and then to Greenport and blew off the boiler; pleasant. *Saturday*, 3d: I went home on morning train. *Monday*, 5th: We went around Montauk, and west as far as Amagansett; caught no fish; and as it was quite rough we turned back and came inside and anchored off Hicks' Island; a part of the steamers caught a few fish to-day, which were the first caught this season. *Tuesday*, 6th: We went around Montauk, and west as far as Bridgehampton; and, as it was quite rough, we turned back and came inside; and close under Gin Beach, saw and caught 16,800 fish, which we took to the Mianogue Works; weather good. *Wednesday*, 7th: We went around Montauk, and west as far as Bridgehampton; fish quite plenty; made two sets; caught 130,800 fish; arrived at the Mianogue Works 9 o'clock p. m.; pleasant day; wind NW., which made it smooth. *Thursday*, 8th: Went around Montauk, and west as far as Southampton; caught a few fish, and stopped outside through the night as the weather was fine. *Friday*, 9th: We went west of Pond Quogue light; made two sets, and then came to the Mianogue Works; had 92,000 fish; pleasant day. *Saturday*, 10th: We caught below Gardiner's Island 24,000 fish, which we took to the Mianogue Works; pleasant. *Monday*, 12th: Foggy in the morning; went down to Fort Pond, but saw no fish; so we came to Greenport and had a little work done on the steamer. *Tuesday*, 13th: Foggy in the morning; we went down to Montauk; made one set, and caught 12,000 fish, which we took to the Mianogue Works; fine day. *Wednesday*, 14th: We went around Montauk, but caught no fish; fine. *Thursday*, 15th: Went

around Montauk, and west as far as Bridgehampton; caught 152,400 fish and started for the Miamogue Works, but before we arrived at Gardiner's Point it came on a thick fog, but we found our way into the works without much trouble; if there is anything I dread it is a fog. *Friday, 16th:* Foggy; we went down and anchored in Fort Pond, and as it continued thick in p. m. we went up and came to anchor off Hicks' Island. *Saturday, 17th:* We caught below Gardiner's Island 32,000 fish, which we took to the Miamogue Works; it continues foggy most of the time. *Monday, 19th:* We caught just west of Gardiner's Point 36,400 fish, which we took to the Miamogue Works; foggy morning and night. *Tuesday, 20th:* Fog continues; we caught in Gardiner's Bay 149,200 fish, which we took to the Miamogue Works. *Wednesday, 21st:* Foggy in a. m.; we went down as far as Fort Pond, but caught no fish; then came up to Greenport. *Thursday, 22d:* We went around Montauk, and west as far as Easthampton, where we caught 68,800 fish; and as it was getting rough we started for the Miamogue Works, where we arrived at 9 o'clock p. m. *Friday, 23d:* We went below Gardiner's Island, but the wind blew so hard from the northeast that we came to Greenport; bent new sail, &c. *Saturday, 24th:* Did not fish. *Monday, 26th:* Started early in the morning; went around Montauk, and when about 5 miles west of Montauk found the George F. Morse (which is one of Hawkins Brothers' steamers) broke down, so we took a line from her and towed her to New London; pleasant, wind north. *Tuesday, 27th:* Went outside of Long Island, and west as far as Southampton, where we caught 92,800 fish, which we took to the Miamogue Works; fine day. *Wednesday, 28th:* Went outside of Long Island, and west as far as Fort Pond, where we caught 36,800 fish, which we took to the Miamogue Works; pleasant. *Thursday, 29th:* Went outside of Long Island, and west as far as Pond Quogue Light, where we caught 205,600 fish, and arrived at the Miamogue Works 11 p. m.; a very pleasant day. *Friday, 30th:* Went outside of Long Island, and west as far as Amagansett; caught 208,800 fish, and arrived at the Miamogue Works at sundown; it was very fine weather in a. m., but in p. m. it blew up quite strong from the southwest, so that it began to be rough. *Saturday, 31st:* Did not fish, but mended seine, &c.

June 2d, Monday: We went outside of Long Island and west as far as Southampton; caught none; it was quite rough; we came back around Montauk and anchored off Hicks's Island. *Tuesday, 3d:* An east storm; we came to the Miamogue Works and coaled up, and then to Greenport; in p. m. it rained and blew very hard. *Wednesday, 4th:* It stormed in a. m., but before noon it broke away and we went up in Peconic Bay; caught 18,400 fish, which we took to the Miamogue Works. *Thursday, 5th:* We went around Montauk, but it was very rough, and we came back and anchored off Tobacco Lot, Gardiner's Island. *Friday, 6th:* We looked off Fort Pond, east of Gardiner's Island, and through Gardiner's Bay; caught none; pleasant. *Saturday, 7th:* Did not fish. *Monday, 9th:* Went outside of Long Island and west as far as Napeague; caught 218,000 fish, which we took to the Miamogue Works; very pleasant day. *Tuesday, 10th:* We went outside of Long Island; saw no fish, so came back and went to Greenport; pleasant. *Wednesday, 11th:* We went up in Peconic Bay; caught a few fish, but not enough worth going to the works with, so we stopped into Greenport and let a farmer have them. *Thursday, 12th:* We hauled out the William Floyd on the railways and cleaned her bottom, ready for painting, and ripped out and tarred the seine; it rained a part of the day. *Friday, 13th:* We hung the seine, and the painters have painted the steamer, fixed the condenser, &c.; pleasant day. *Saturday, 14th:* We carted the seine down in a. m. and put it in the boats and salted it; in p. m. we launched the William Floyd, and I came home. *Monday, 16th:* We went in the sound; the wind was east and it was foggy; we went west as far as New Haven and went in for a harbor. *Tuesday, 17th:* We caught in the sound, off New Haven, 36,000 fish, and reached the Miamogue Works before sundown; weather continues pleasant. *Wednesday, 18th:* Went up sound as far as Bridgeport, but caught no fish until we got to the east of New Haven, when we caught 25,600 fish, and reached the Miamogue Works with them at 10 p. m.; pleasant. *Thursday, 19th:* We went to Greenport, reeled the seine, and, taking what help I wanted, went to New London to get the William Floyd's boiler fixed. *Friday, 20th:* We lay in New London, getting the work done as fast as possible; weather fine. *Saturday, 21st:* We got the work done and steam on about 1 o'clock; arrived in Greenport about 4 o'clock p. m.; weather fine. *Monday, 23d:* Went down to the Miamogue Works and coaled up; then looked through Gardiner's Bay, but caught no fish; weather pleasant. *Tuesday, 24th:* Went up sound and caught off Faulkland Island 109,600 fish, and arrived at the Miamogue Works at 9 o'clock p. m.; weather continues fine. *Wednesday, 25th:* Went in the sound and the wind came on to blow hard from the east, and stormed, so we went into New Haven for a harbor. *Thursday, 26th:* Went out in the sound, but the wind blew quite fresh SW. and made it rough, so we came into New Haven again; the English steamer Norman Monarch lay close by us, and we have had a good opportunity to look at her, as the officers were kind enough to take us through her and show us all that was of interest. *Friday, 27th:* We went out in the sound and made six sets; caught 84,800 fish, and arrived at the Miamogue Works at 9 o'clock p. m.; very pleasant day. *Saturday, 28th:* We went up to Greenport and mended seine; I went home in p. m.; pleasant day. *Monday, 30th:* We went to New London and had the new grates put in the William Floyd; then went up sound and caught a small set of fish off Faulkland Island; then anchored behind the light in the mouth of New Haven Harbor; weather fine.

July 1st, Tuesday: Made two sets off New Haven; then came down to the Miamogue Works; had 34,800 fish; pleasant. *Wednesday, 2d:* Went up sound; caught off New Haven 60,400 fish, and arrived at the Miamogue Works at 12 o'clock in the night; weather good. *Thursday, 3d:* We came to Greenport, as they want no more fish this week at the oil works; the men want to keep the Fourth; we went home on the cars. *Monday, 7th:* We went outside of Long Island; caught 13,400 fish off Easthampton; it was quite rough; some of my crew are troubled with seasickness; I never was bothered myself; we came back and took the fish we had to the Miamogue Works. *Tuesday, 8th:* It was a stormy, windy day; we came up to Greenport. *Wednesday, 9th:* We went around Montauk outside of Long Island; caught 55,200 fish, and took them to the Miamogue Works; it was very rough, but pleasant weather. *Thursday, 10th:* We went up sound, and off New Haven we caught 96,800 fish, and arrived at the Miamogue Works at midnight; it was a pleasant day, but we had a heavy thunder shower while on our way to the works. *Friday, 11th:* We went up sound and caught off New Haven and Faulkland Island 56,000 fish, and arrived at the Miamogue Works at 11 p. m.;

weather good, but before morning it rained and blew hard from the east. *Saturday, 12th:* We came up to Greenport in the wind and rain; in p. m. it cleared off and I went home. *Monday, 14th:* We went down in Gardiner's Bay and then up into Noyack Bay, where we found plenty of fish; we caught 187,200, and arrived at the Miamogue Works at 4 o'clock p. m.; pleasant. *Tuesday, 15th:* We went up bay again, and caught in Noyack Bay and Little Peconic Bay 232,000 fish, which was all we could put on, and reached the Miamogue Works at 6 o'clock p. m.; fine day. *Wednesday, 16th:* We went up in Little Peconic Bay; caught 87,200 fish, which we took to the Miamogue Works; pleasant day, but we had a hard thunder shower just at night, and it rained nearly all night. *Thursday, 17th:* Went up bay, but the wind was NW. and the fish would not show; one of the men was taken sick, and we took him to Greenport and looked up a man to take his place, and as the day was so far spent we concluded not to go out again. *Friday, 18th:* We went up bay and then down bay, and caught but 20,000 fish, which we took in to the Miamogue Works; weather pleasant. *Saturday, 19th:* Went out in Gardiner's Bay, but caught no fish; so went to Greenport and I went home; fine day. *Monday, 21st:* We went up sound as far as Luce's Landing; caught 52,000 fish, which we took to the Miamogue Works; weather continues fine. *Tuesday, 22d:* Went in the sound and went west as far as Cold Spring, where we stopped; pleasant; wind SW. *Wednesday, 23d:* Went out in the sound and east; we found some fish off Mattituck, and caught 59,600, which we took to the Miamogue Works; weather fine. *Thursday, 24th:* We went up sound as far as Faulkland Island; caught 126,400 fish, and arrived at the Miamogue Works at 9 o'clock p. m.; weather fine. *Friday, 25th:* Went up sound as far as New Haven; the wind breezed up from the east, so we went in and came to anchor behind the light in the mouth of New Haven Harbor. *Saturday, 26th:* Wind east and stormy; we came out and came to Greenport. *Monday, 28th:* Went up sound, and off Faulkland Island caught 129,600 fish, which we took to the Miamogue Works; very fine day. *Tuesday, 29th:* We went up sound; caught off Faulkland Island 9,600 fish; they did not appear to be very plenty to-day; we took them to the oil works; very warm. *Wednesday, 30th:* Went up sound; caught just east of Horton's Point 37,600 fish; arrived in to the Miamogue Works at 6 o'clock p. m.; a warm day. *Thursday, 31st:* Went up sound; caught 57,600 fish just west of Horton's Point, and took them to the Miamogue Works; pleasant day.

August 1st, Friday: It was foggy in the morning and we had to grope our way along through the gut and up sound, running slow so as not to run any vessels down; one of the steamers ran into a schooner just after going through the gut, but did not do much damage; the fog soon lit up and we caught 52,000 fish near Faulkland Island, which we took to the Miamogue Works; pleasant after the fog lifted. *Saturday, 2d:* Did not fish; a very, very warm day. *Monday, 4th:* We went up sound as far as New Haven; caught 102,400 fish, which we took down to the Miamogue Works; weather very fine. *Tuesday, 5th:* Went up sound as far as Charles Island; caught 60,000 fish, which we took to the works; fine. *Wednesday, 6th:* We went up to Greenport to fix the boiler. *Thursday, 7th:* Went out in the morning and the boiler commenced to leak, so we went to New London and had a soft patch put on. *Friday, 8th:* We came out in the morning and started west in the sound, but the wind was east and commenced to storm, so we came to Greenport. *Saturday, 9th:* Went out in the bay in a. m.; saw no fish, so went into the fish works and coaled up, and to Greenport; thus ends the week. *Monday, 11th:* Went up sound as far as Stratford Point; caught a few fish just at night and went into Black Rock and anchored; fine day. *Tuesday, 12th:* Fished off Stratford until noon, then started for the Miamogue Works; arrived just before sundown; had 129,600 fish; weather continues fine. *Wednesday, 13th:* We went up sound; the wind blew quite fresh SW.; we went in behind Norwalk Islands and came to anchor. *Thursday, 14th:* Went out in the sound; caught a few fish off South Port, and at night, as we did not have enough to come down with, we went into Bridgeport; fine. *Friday, 15th:* Went out in the sound and went east and saw some fish, and we set around them—four different bunches—on our way down, and caught not a single one; they went under the seine; divers we call them; we took to the works what we caught the day before, 16,800 fish; weather fine. *Saturday, 16th:* An east storm; we lay in Greenport. *Monday, 18th:* Went out in Gardiner's Bay and made one set, but caught none; it stormed hard nearly all day, and at night I went up to Greenport, and before we arrived at the wharf it was blowing a gale from the NE.; we made fast to the wharf, using all the lines we had, and oh! how it did blow; during the night there were about twenty fishing yachts and sloops dragged and went ashore, and two or three steamers had a pretty hard time; one little smack anchored off Bostwick, Gardiner's Island, foundered, and two men that were in her were drowned; the wind, some time in the night, shifted to NNW.; that was when it blew the hardest. *Tuesday, 19th:* Wind blew quite hard NW.; we did not go out; some of the steamers went down bay and towed up disabled yachts and sloops—some with bowsprit gone, some with boom or mast broken, &c. *Wednesday, 20th:* We went below Gardiner's Island; caught 169,200 fish, which we took to the Miamogue Works; fine. *Thursday, 21st:* We caught just east of Gardiner's Point 59,200 fish, which we took to the Miamogue Works; fine. *Friday, 22d:* We hauled out the William Floyd on the railways, to paint and fix the condenser, and we took the seine in the lot to put some new corks on the bunt; wind blew strong SW. *Saturday, 23d:* We saw the scull race in a. m.; I went home in p. m. *Monday, 25th:* We went down below Gardiner's Island and as far as Fort Pond; caught 41,600 fish, which we took to the Miamogue Works; wind east. *Tuesday, 26th:* The wind was east and it was storming; we lay in Greenport. *Wednesday, 27th:* The wind continued to blow east; did not fish. *Thursday, 28th:* We went up in Peconic Bay in a. m., but saw no fish, so we came back to Greenport. *Friday, 29th:* We went down in Gardiner's Bay; made four sets; caught 27,200 fish, which we took to the Miamogue Works; pleasant day. *Saturday, 30th:* We did not fish; I went home.

September 1st, Monday: We went up sound as far as Mattituck, where we succeeded in catching 141,200 fish, and arrived at the Miamogue Works at 8 o'clock p. m.; weather pleasant. *Tuesday, 2d:* Went up sound, and off Stratford we caught three small sets, and then went in to Bridgeport for the night; pleasant day. *Wednesday, 3d:* We went out in the sound in the morning and caught a good haul of fish off South Port; then the wind breezed up from the east and we started down sound; we arrived at the Miamogue Works at 4 o'clock p. m.; had 113,600 fish. *Thursday, 4th:* It was foggy in the morning, and we did not start out until 10 o'clock a. m.; then we went up in Little

Peconic Bay and down in Gardiner's Bay, where we caught 46,400 fish, which we took to the Miamogue Works; pleasant after fog lifted. *Friday, 5th:* We went down through Gardiner's Bay and below Gardiner's Island to Fort Pond; caught only 10,600 fish, which we took to the Miamogue Works; weather good. *Saturday, 6th:* Went out in Gardiner's Bay; caught 2,000 fish, and as there was not enough to pay for taking them to the works, we let a farmer in Greenport have them; weather continues fine. *Monday, 8th:* Wind blew hard; did not fish, but lay in Greenport. *Tuesday, 9th:* We went around Montauk, outside of Long Island, and west as far as Pond Quogue Light; caught 36,600 fish, which we took to the Miamogue Works; pleasant; wind north, and blew fresh in a. m. *Wednesday, 10th:* We went up sound as far as Luce's Landing; caught 90,000 fish, which we took to the Miamogue Works; pleasant day. *Thursday, 11th:* Went in the sound and caught near Faulkland Island 129,600 fish, which we took to the Miamogue Works; weather continues fine. *Friday, 12th:* Went in the sound and up as far as Faulkland Island; caught 72,000 fish, and arrived at the Miamogue Works at 8 o'clock p. m.; weather fine. *Saturday, 13th:* We went up to Faulkland Island, but the wind blew too hard for the fish to show, so we came to Greenport. *Monday, 15th:* We went in the sound and west as far as New Haven, where we caught 118,000 fish, and reached the Miamogue Works at 10 o'clock p. m.; fine. *Tuesday, 16th:* We went up sound, but the wind blew a good breeze from the east, and the fish did not show very well, so we went in to New Haven. *Wednesday, 17th:* The wind blew very hard from the west; we lay in New Haven. *Thursday, 18th:* We went out in the sound and west as far as Norwalk Islands, but the wind blew too hard for the fish to show; so we went in to Bridgeport and filled our tank with water. *Friday, 19th:* Went out in the sound and went east; the wind was blowing quite strong from the northeast, but when we had arrived off Faulkland Island the wind began to die out, and we saw a bunch of fish and went to work at them; made four sets and caught 95,200 fish, which we took to the Miamogue Works. *Saturday, 20th:* We went down below Gardiner's Island to Fort Pond, but saw no fish, so came to Greenport. *Monday, 22d:* An east storm; we lay in Greenport. *Tuesday, 23d:* We went up sound as far as Faulkland Island; caught 64,200 fish, which we took to the Miamogue Works; pleasant; wind southwest. *Wednesday, 24th:* Went up sound as far as Luce's Landing; made a set and caught 9,600 fish, and as the wind blew strong southwest we came down and took them to the Miamogue Works; then went to Greenport. *Thursday, 25th:* The wind blew quite strong from the northwest, so we concluded we would go up to Jamesport and rip out the old seine, as we want the corks and some of the lines to put in the new seine; on our way up we picked up two men, who were clinging to a capsized boat; they were nearly exhausted, and would not have been able to hold on much longer; they said they had been in the water since midnight; there were three in the boat when it capsized, but one left the boat and tried to swim ashore and was drowned; his body was found afterwards; we then proceeded to Jamesport and got the corks and lines; then went to Greenport and tarred the new seine. *Friday, 26th:* We went down as far as Fort Pond, but could see no fish, when we came back to Greenport and took out the old seine and went to work on the new one. *Saturday, 27th:* We finished hanging the new seine. *Monday, 29th:* Went below Gardiner's Island to Fort Pond, where we caught 24,800 fish, which we took to the Miamogue Works. *Tuesday, 30th:* We went around Montauk, outside of Long Island and abreast of Fort Pond; caught 93,600 and took them to the Miamogue Works; weather continues fine.

October 1st, Wednesday: Went outside of Long Island; caught 178,000 fish, which we took to the Miamogue Works; fine day. *Thursday, 2d:* Went outside of Long Island, and went west as far as Pond Quogue Light; saw no fish, so turned back; some of the gangs went on west farther and found fish. *Friday, 3d:* Windy; we went up to Greenport. *Saturday, 4th:* Did not fish. *Monday, 6th:* Went out in Gardiner's Bay; caught 15,200 fish, which we took to the Miamogue Works; wind east. *Tuesday, 7th:* Went below Gardiner's Island to Fort Pond and saw no fish; therefore we went in the sound and west as far as New Haven, where we made one set and then went in to New Haven; pleasant day. *Wednesday, 8th:* Went out in the sound; the wind blew so strong the fish did not show, so we went down and took our fish to the Miamogue Works; had 24,000; then coaled up and went to Greenport. *Thursday, 9th:* Went in the sound and west as far as Faulkland Island; made five sets and caught 138,400 fish, which we took to the Miamogue Works; fine day. *Friday, 10th:* We took a schooner out from the works in a. m.; then went down far as Gardiner's Point; but the wind blew from the E. and looked like a storm, so we came to Greenport. *Saturday, 11th:* Did not fish. *Monday, 13th:* Went up sound as far as Faulkland Island; caught 128,800 fish, and took to the Miamogue Works; fine day. *Tuesday, 14th:* Went up sound, but saw no fish, and at night went in to New Haven; pleasant. *Wednesday, 15th:* Went out in the sound; made two sets just east of New Haven; caught 54,400 fish, which we took to the Miamogue Works; weather fine. *Thursday, 16th:* We went in the sound and west far as New Haven; made two sets and went in to New Haven. *Friday, 17th:* Wind was E., so we came to the Miamogue Works with our fish; had 100,000; coaled up and went to Greenport. *Saturday, 18th:* We did not fish. *Monday, 20th:* The wind blew quite strong from the NW., so we did not go out until noon, when we went down to Pinm Gut, and saw some large bunches of fish working down Oyster Pond Point; we waited for them to get through the gut, as there are rocks on the sound side; at last a large bunch came through and we set for them, but caught our seine on a wreck and tore it, and lost nearly all the fish; then we came to Greenport and mended the seine. *Tuesday, 21st:* Went below Gardiner's Island to Fort Pond, and then in the sound nearly to Horton's Point; caught 124,800 fish, which we took to the Miamogue Works; fine day. *Wednesday, 22d:* Went up sound; found fish all the way from Horton's Point to Mattituck; caught 176,800 fish; pleasant. *Thursday, 23d:* Went up sound; caught off Mattituck 62,400 fish, which we took to the Miamogue Works; pleasant. *Friday, 24th:* The wind blew hard NW.; we lay in Greenport. *Saturday, 25th:* Did not fish. *Monday, 27th:* Went out in Gardiner's Bay; caught 4,800 fish, which we took to the Miamogue Works; fine day. *Tuesday, 28th:* Went out in the sound and west as far as Faulkland Island; caught 92,000 fish, which we took to the Miamogue Works; weather continues fine. *Wednesday, 29th:* The wind blew hard from the NW.; we came into Greenport. *Thursday, 30th:* We went out in Gardiner's Bay, but the wind came on to blow and we came into Greenport. *Friday, 31st:* Wind blew heavy; we lay in Greenport.

November 1st, Saturday: The wind continues to blow from the NW. *Monday, 3d:* Went out in Gardiner's Bay and found Cherry Harbor alive with fish; caught 140,000; and the wind blew up strong, so we came in to the Miamogue Works. *Tuesday, 4th:* We caught in Gardiner's Bay 84,400 fish, and took them to the Miamogue Works; we did not go up to election this year; pleasant. *Wednesday, 5th:* A very cold morning; the wind was N.; we caught in Gardiner's Bay 84,400 fish, which we took to the Miamogue Works; weather fine. *Thursday, 6th:* Went out in Gardiner's Bay; caught 12,000 fish, and went to the Miamogue Works about noon, when Captain Hawkins informed me that he was going to close the works, so we went to Greenport, then to Jamesport. *Friday, 7th:* We carted the seine out in the lot to dry in a. m., and took out what things we wanted to leave at Jamesport; we took the William Floyd to Greenport and laid her alongside of Tuthill's Wharf in p. m.; so ends the fishing season of 1879.

1880.

I have been transferred to the steamer E. S. Newins.

April 16th, Friday: I went to Greenport, and we brought the E. S. Newins up to Jamesport. *Saturday, 17th:* I went to New York to have my license renewed, and had to be examined to see if I was color blind. *Monday, 19th:* I went on board the E. S. Newins early in the morning, and started down the bay; went to the Miamogue Works to carry some men for Captain Hawkins; then to Greenport to get things in readiness for fishing; pleasant. *Tuesday, 20th:* We spent the day in fixing the fishing things; some of the gangs caught a few fish to-day in Gardiner's Bay; it was foggy and showery a part of the day. *Wednesday, 21st:* In the morning we went down to the fish works to coal up; then went out in Gardiner's Bay; caught 54,800 fish, which we took to the Miamogue Works; fine. *Tuesday, 22d:* We went out in Gardiner's Bay, but caught no fish; weather continues pleasant. *Friday, 23d:* We went below Gardiner's Island; caught 113,600 fish, which we took to the Miamogue Works; something gave out to the boiler, and the engineer was obliged to blow it off, and the steamer Peconic towed us from the Miamogue Works to Greenport; weather pleasant. *Saturday, 24th:* Wind east and stormed a part of the day; did not fish. *Monday, 26th:* Went out in Gardiner's Bay; it was foggy and we caught no fish. *Tuesday, 27th:* Went down to Fort Pond; saw a few fish, but caught none; then came up in Gardiner's Bay, and then to the Miamogue Works and coaled up; wind NW. *Wednesday, 28th:* Went down below Gardiner's Island to Fort Pond; caught 120,800 fish at one set, which we took to the Miamogue Works; after unloading the fish we went to Greenport to get water; weather pleasant, but blew strong southwest in p. m.; the barkentine Wandering Jew was launched to-day, and we helped pull her to the wharf as we came up from the oil works. *Thursday, 29th:* Went down to Fort Pond; saw no fish; then came to Greenport; wind blew hard SW. *Friday, 30th:* Went up in Peconic Bay, but saw no fish, and the wind blowing hard WNW. we came back to Greenport; the fishing steamer Narragansett is ashore off Easthampton.

May 1st, Saturday: Wind blew hard NW. and cold; did not fish; I went home. *Monday, 3d:* Went below Gardiner's Island; made one set off Tobacco Lot and one near Plum Gut, and went to the Miamogue Works with 117,800 fish; weather pleasant, but blew fresh SW. in p. m. *Tuesday, 4th:* Went out, but caught no fish; at night we anchored off Hicks's Island; wind blew hard SW. all day. *Wednesday, 5th:* We started out early; it was a calm and beautiful morning, and off Fort Pond we found plenty of fish; we made two sets and caught 193,800, and part of my men were taken very sick, and we had to come to Greenport and get a doctor to attend to them; then went to the Miamogue Works and unloaded the fish. *Thursday, 6th:* We did not fish, but lay in Greenport; fine. *Friday, 7th:* Went down to Gardiner's Point; caught 120,000 fish at two sets and took them to the Miamogue Works; weather continues pleasant. *Saturday, 8th:* Went below Gardiner's Island to Fort Pond, but caught no fish; then came back to Greenport; fine. *Monday, 10th:* We went around Montauk, and went west as far as Promised Land; found no fish; then came back and looked through the bay; saw a few fish, but caught none; a pleasant day, but the wind blew fresh SW. in p. m. *Tuesday, 11th:* Wind blew hard SW. in the morning, and we lay anchored off Hicks's Island until 9 o'clock a. m., when the wind slacked and we started out, and east of Gardiner's Island we caught 68,000 fish; then we helped a gang raise a large haul of fish; after which we went to the Miamogue Works; it was foggy part of the p. m. *Wednesday, 12th:* Wind NW.; we went around Montauk; outside of the island saw a good bunch of fish and lowered the boats, when the engineer called to us and said one of the socket bolts had given out; so we hoisted the boats up and made signals for help, when the steamer J. W. Hawkins took us in tow and carried us to New London to get it repaired; we arrived there about noon. *Thursday, 13th:* We lay in New London having the boiler fixed. *Friday, 14th:* We started out in the morning and went nearly to Montauk; and as the wind blew quite strong NE., and one of the bolts they put in at New London was leaking, we turned back and went to New London again to get it fixed. *Saturday, 15th:* We went out and around Montauk, outside of Long Island, and west as far as Pond Quogue Light; made two sets and caught 96,000 fish, and arrived at the Miamogue Works at 8 o'clock p. m.; very pleasant day. *Monday, 17th:* Went around Montauk, outside of Long Island, and west as far as Easthampton; caught 172,800 fish at one set, and were obliged to get help to raise them, as we could not get them up enough to scoop; but we had them scooped in about noon, and started east and arrived at the Miamogue Works at 5 o'clock p. m.; pleasant. *Tuesday, 18th:* Went around Montauk outside of Long Island; saw no fish; then went to New London and put soda in the boiler to clean it, and blew it off, as the tubes were leaking; wind light E. *Wednesday, 19th:* We lay in New London, and they are at work expanding the tubes to the boiler; wind light SE. and cloudy. *Thursday, 20th:* We lay in New London, and they are at work on the boiler; foggy in the morning, but cleared off about 9 o'clock a. m. *Friday, 21st:* We went around Montauk, outside of Long Island, but it was rough, so we came inside, and off Fort Pond we caught 7,400 fish, which we took to the Miamogue Works. *Saturday, 22d:* Went out in the morning, but saw no fish; so we came into Greenport and I went home; wind SW. *Monday, 24th:* We went around Montauk, but it was foggy outside, so we turned back, and caught east of Gardiner's Island 202,600 fish, which we took to the Miamogue Works; weather pleasant. *Tuesday, 25th:* Very

foggy; we went below Gardiner's Island; caught 141,600 fish, and arrived at the Miamogue Works before sundown; fog lit up before noon; p. m. fine. *Wednesday, 26th:* Went around Montauk, outside of Long Island, and west as far as Easthampton; we made three sets and caught 161,200 fish, which we took to the Miamogue Works; very warm, pleasant day, with light wind NW. in a. m. and SW. in p. m. *Thursday, 27th:* Went around Montauk, outside of Long Island, and west as far as Westhampton; caught 67,200 fish; arrived at the Miamogue Works at midnight; pleasant weather. *Friday, 28th:* Went outside again and west as far as Pond Quogue Light, but caught no fish; weather pleasant. *Saturday, 29th:* In Greenport; blew off boiler and fixed things in general. *Monday, 31st:* It rained in the morning, so we did not start out until 7 o'clock a. m., when we went down to Fort Pond and then up bay; caught 16,000 fish, which we took to the Miamogue Works; weather continues pleasant.

June 1, *Tuesday:* We went down to Montauk and met some of the steamers coming back, so we turned about and went up in the sound as far as Faulkland Island, where we caught 53,800 fish, which we took to the Miamogue Works; pleasant day. *Wednesday, 2d:* Wind east and stormy; we came to Greenport. *Thursday, 3d:* We went in the sound and west as far as Execution Light; made three sets, and at night anchored in Cow Bay; pleasant weather. *Friday, 4th:* We made two sets off Execution Light in a. m., and at noon we started down sound, reaching the Miamogue Works about 9 o'clock p. m.; had 87,200 fish; weather continues good. *Saturday, 5th:* In the morning we went up bay; caught 6,400 fish just east of Robin's Island, which we took to the Miamogue Works; then went to Greenport; very pleasant weather. *Monday, 7th:* We started a little before 4 o'clock a. m.; went in the sound and west to Execution Light; made two sets just at night, small ones; then anchored near City Island; fine. *Tuesday, 8th:* In the morning the wind blew quite fresh from the northeast; we went east and went into Cold Spring, then went to Bridgeport to make a harbor for the night, as the wind continued to blow from the east; there we heard that Garfield was nominated for President. *Wednesday, 9th:* Went out in the sound, and as the wind continued to blow NE., and no fish showing, we went to Geo. W. Miles' Works at Milford and sold our fish, 19,000, after which we started east, but before we arrived at Faulkland Island the wind died out, and in the p. m. we made six sets and caught 94,400 fish, which we took to the Miamogue Works. *Thursday, 10th:* Went in the sound and went west as far as Faulkland Island; caught 43,200 fish, which we took to the Miamogue Works; weather pleasant. *Friday, 11th:* Went in the sound and west as far as Faulkland Island; the fish were scarce, but we caught 18,000, which we took to the Miamogue Works; weather continues pleasant, but it came on thick and foggy in the night, and the steamer Narragansett was sunk on Cornfield Shoal and a number of people were drowned; I was up in the night and heard the whistles. *Saturday, 12th:* We lay in Greenport; did not fish. *Monday, 14th:* We went around Montauk and west as far as Napeague, but seeing no fish we turned back and went in the sound; we found no fish, but saw great quantities of drift stuff from the Narragansett; wind NW.; at night we went into New Haven. *Tuesday, 15th:* Went out in the sound; wind blew from the east and looked like a storm, so we came to Greenport; hauled the E. S. Newins on the railways and carted the seine in the lot. *Wednesday, 16th:* We ripped out and tarred the seine and partly hung it; the painters have been painting the steamer, and we are having the condenser fixed. *Thursday, 17th:* We finished hanging and carted the seine down and salted it in the boats; the steamer is painted, but we have not got the condenser on yet. *Friday, 18th:* We worked on the condenser; got it nearly on and were obliged to take it off and fix it over again. *Saturday, 19th:* In the morning we put the condenser on and launched the steamer; then I went home. *Monday, 21st:* The water-tank leaked, so we had to have that fixed in the a. m.; p. m. we went out in Gardiner's Bay; caught 4,800 fish, which we took to the Miamogue Works, and then coaled up. *Tuesday, 22d:* Went in the sound and west as far as Faulkland Island; made one set and caught 7,200 fish; but the condenser leaked, so we came down to the works, and then to Greenport to haul out again; the condenser is a regular bother. *Wednesday, 23d:* Hauled out on the railways at work on the condenser; we have had no rain for some time and the ground is getting very dry. *Thursday, 24th:* We succeeded in getting the condenser on, and launched off just before noon; p. m. we went down bay and south of Gardiner's Island and east of Block Island, and went to the wharf behind the breakwater; a very pleasant day. *Friday, 25th:* Started out from Block Island and went west, but found no fish until we reached the mouth of the Connecticut River, where we found a few small bunches, and caught 39,000, which we took to the Miamogue Works; pleasant day. *Saturday, 26th:* We did not fish. *Monday, 28th:* We went below Gardiner's Island to Fort Pond, where we caught 20,000 fish, which we took to the Miamogue Works; the fish were wild; weather good. *Tuesday, 29th:* Went down to Fort Pond, but the fish were so wild we could not catch them, so we went up sound as far as New Haven; made three sets just at night and caught about 15,000 fish, after which we went in behind the light and anchored; weather pleasant. *Wednesday, 30th:* Went out in the sound; made two sets and then started to the eastward, but the wind breezed up so that we caught no more; we arrived at the Miamogue Works about 3 o'clock p. m., and had 43,600 fish.

July 1*st*, *Thursday:* Went up sound and just at night made two small sets off New Haven, then we went into New Haven; weather continues good. *Friday, 2d:* We started out of New Haven in the morning and looked along to the eastward; made two sets off the mouth of Connecticut River and then went to the Miamogue Works; had 48,800 fish; weather continues pleasant and fish scarce. *Saturday, 3d:* We did not fish; carted the seine in the lot and shortened the cork line and had one of the seine-boats fixed. *Monday, 5th:* Did not fish; at home. *Tuesday, 6th:* It rained in a. m.; went out in Gardiner's Bay in p. m.; caught 47,200 fish, which we took to the Miamogue Works; pleasant in p. m. *Wednesday, 7th:* In the morning we went up in Peconic Bay; made four sets, but the bunches were very small; we went down in Gardiner's Bay in p. m.; made one set and then went in to the Miamogue Works; had 56,400 fish; weather fine. *Thursday, 8th:* Went in the Sound and went west as far as Old Man's Harbor; made five sets; caught 68,400 fish, and arrived at the Miamogue Works at 9 o'clock p. m.; very pleasant day. *Friday, 9th:* Windy; the fish did not show good and we caught only 8,800, which we took to the Miamogue Works; the steamer gave out in p. m. *Saturday, 10th:* We lay in Greenport in a. m.; I made out the fish commissioner record; I went home in p. m.; warm day, *Monday, 12th:* We went down to Fort Pond; saw no fish; then went up in Peconic Bay

and made one set; caught 9,200 fish, which we took to the Miamogue Works; fine. *Tuesday, 13th:* We went in the sound and went up to the head; caught a few fish just at night and anchored in Cow Bay; weather continues pleasant. *Wednesday, 14th:* We went out in the morning and worked at the fish until 3 o'clock p. m., when we started down sound, reaching the Miamogue Works about 12 o'clock in the night; we made six sets altogether and had 116,000 fish; weather good. *Thursday, 15th:* We went up sound and made two sets off Crane Neck; then went up to Execution Light where we made three more sets and came to anchor for the night in Glen Cove; weather good. *Friday, 16th:* Started out in the morning and made six sets; after which we started down sound and arrived at the Miamogue Works at 9 o'clock p. m.; had 155,600 fish; weather continues good. *Saturday, 17th:* Went up to Greenport and I went home. *Monday, 19th:* We went in the sound and to the west; reached Execution Light at 4 o'clock p. m., when we made a set and caught about 50,000 fish; then went up in Little Neck Bay and made another set about as good as the first, and by the time we were through with them it was dark, so we dropped the anchor where we were and salted the seine (we salt the seine every night after we get through fishing, since I have been in a steamer, instead of hanking it out as we used to do in a sailing gear); very pleasant day. *Tuesday, 20th:* Windy and stormy; fish did not show in the morning, so we started down sound, reaching the Miamogue Works about 4 o'clock p. m.; had 101,600 fish; pleasant in p. m. *Wednesday, 21st:* We went up to the head of the sound, arriving there about 4 o'clock p. m.; made two sets; caught about 15,000 fish, and anchored in Little Neck Bay; we saw a few small bunches on our way up, but did not think them large enough to bother with; a very pleasant day. *Thursday, 22d:* In the morning we started down sound, but we saw no bunches of fish large enough to set for until we arrived off Southport, where we made a set and caught about 15,000 fish; then we went on to the east, and when abreast of New Haven we saw a large bunch driven by porpoises; we made three quite fair sets and started for the Miamogue Works, where we arrived at 9.30 p. m., after having a stormy passage, for it rained and blew NE. and we were bothered to find our way through Plum Gut; we had 115,200 fish. *Friday, 23d:* We went over to New London to get a stay-bolt fixed; in the morning the wind was NE., afterward it came around SE.; some of the steamers found plenty of fish to-day east of Gardiner's Island. *Saturday, 24th:* We looked east of Gardiner's Island and through the bay, but could find no fish; they were not here to-day; so we came to Greenport and went home. *Monday, 26th:* We went out in Gardiner's Bay; caught 78,400 fish, which we took to the Miamogue Works; pleasant day. *Tuesday, 27th:* Went up sound and made two sets just east of Stratford Shoal Light; caught about 35,000 fish; had a heavy thunder squall; went into New Haven at night; it was a calm, warm day. *Wednesday, 28th:* We came out of New Haven in the morning and made one set; caught a few fish, but the wind blew quite strong from the north, so the fish would not show; so we came down sound and in Gardiner's Bay, where we made one set; then we came into the Miamogue Works; had 62,400 fish. *Thursday, 29th:* We fished in Gardiner's Bay; caught 53,600, which we took to the Miamogue Works; weather pleasant. *Friday, 30th:* We made three sets in Gardiner's Bay in a. m.; then went up in Peconic Bay and made two more sets and came to the Miamogue Works; had 30,400 fish; weather pleasant. *Saturday, 31st:* Did not fish; I went home.

August 2d, Monday: In the morning we went down in Gardiner's Bay; made one set; then went up in Noyack Bay where we made two more sets; the wind blew very hard SW., so we went down to the Miamogue Works; had 48,800 fish. *Tuesday, 3d:* Went up in Peconic Bay; saw a small bunch of fish that was not worth setting for; then we came down in Gardiner's Bay and made one set; caught 10,800 fish, which we took to the Miamogue Works; fine. *Wednesday, 4th:* It stormed in the morning, so we did not start out very early; then went in the sound and off Horton's Point; made one set, but did not catch them, as they went under the seine; then some part of the engine broke and we went to New Haven and had it fixed. *Thursday, 5th:* We went west as far as Southport; caught a few fish, but they were small; at night went into New Haven again; pleasant day. *Friday, 6th:* In the morning we came out of New Haven and went east; made a set off the mouth of the Connecticut River, then we went to the Miamogue Works; had 32,400 fish, and after getting them out and coaling up, we took a look up in Peconic Bay, but saw no more; so went to Greenport. *Saturday, 7th:* We went over to Cornfield Light Ship, then to Horton's Point; and as we saw no fish came to Greenport; pleasant weather. *Monday, 9th:* In the morning we went down to Fort Pond, then up sound to Smithtown Bay, then crossed the sound to Southport, where we saw some steamers at work; we saw a few fish, but it was so late we did not set for them, but went into Bridgeport; pleasant; wind SW. *Tuesday, 10th:* We went out in the morning; made nine sets, but the bunches were small; at night we anchored behind the light, east side of New Haven Harbor; pleasant day. *Wednesday, 11th:* In the morning it rained, but we started down sound very early, and arrived at the Miamogue Works at 8.30 o'clock, and had 81,200 fish; we coaled up and started back in the sound, as it had cleared off and bids fair to be a pleasant day; we made four sets, just east of Faulkland Island, and caught 57,200 fish, which we took to the Miamogue Works; pleasant in p. m. *Thursday, 12th:* We went to Fort Pond, then up sound in p. m; we caught about 50,000 fish, just east of New Haven, and stopped in New Haven through the night. *Friday, 13th:* Went out in the sound; made three sets, just east of New Haven, then made a small set off Faulkland Island; after which we hoisted our boats and started for Plum Gut; we had gone about 5 miles when we discovered a good bunch of fish, so we stopped, lowered the boats, and filled the seine full; I did not expect that we could catch them, for the water is deep out in the middle of the sound, and we were all surprised when we threw the big lead, for it struck bottom before half the line was out; I did not know there was a shoal like that so near the middle of the sound; the fish could not dive the seine and we saved about 75,000, the largest haul we have made in a long time; after scooping them in we hoisted our boats again, and started for the Miamogue Works, where we arrived about sundown; had 148,400 fish; fine day. *Saturday, 14th:* Did not fish; cleaned the boiler, and put a new piece in the bunt of the seine; weather continues good. *Monday, 16th:* Went in the sound and fished from Saybrook to Faulkland Island; made five sets and three "stabs;" caught 48,800 fish, which we took to the Miamogue Works; weather pleasant. *Tuesday, 17th:* In the morning we went up in Peconic Bay, but saw no fish that would pay us to stop for; so went up sound and fell in with fish just east of Faulkland Island; caught 46,800, which we took

to the Miamogue Works; weather continues fine. *Wednesday, 18th:* Went up sound, but caught no fish; went around a number of good bunches, but they *would* dive the seine every time; a very fine day. *Thursday, 19th:* We fished in Gardiner's Bay; caught only 12,000; the wind blew quite hard from the SW.; after we had been to the works and put the fish out we went up to Greenport and saw a three-masted schooner burn, which was loaded, in part, with benzine; it was a magnificent sight, but quite a loss to somebody. *Friday, 20th:* We fished in Gardiner's Bay; made six sets and caught 57,200 fish, which we took to the Miamogue Works; weather fine. *Saturday, 21st:* We went down near Gardiner's Point, and a hard shower came up; we waited awhile, and then came up to Greenport. *Monday, 23d:* Went out in Gardiner's Bay; caught 98,400 fish; but one of the tubes to the boiler gave out, so we went into the Miamogue Works about 2 o'clock p. m.; it was foggy in the morning, but pleasant the remainder of the day. *Tuesday, 24th:* Went out in Gardiner's Bay, and made two sets; then went below the island, off Fort Pond, and made two sets more; caught, in all, 41,600, which we took to the Miamogue Works; fine day. *Wednesday, 25th:* We made two sets in Gardiner's Bay in a. m., and in p. m. we had a squall, and the wind came out NE. and blew quite strong; so we caught no more; went into the works; had 8,800 fish. *Thursday, 26th:* Wind blew quite strong from NE.; we caught no fish. *Friday, 27th:* We caught in Gardiner's Bay 24,800 fish, which we took to the Miamogue Works; wind east. *Saturday, 28th:* Went up in Peconic Bay; caught 56,000 fish, which we took to the Miamogue Works; pleasant. *Monday, 30th:* A storm from the east; we lay in Greenport; I went to Jamesport and got a man to take the place of one of my crew who was sick. *Tuesday, 31st:* Went down to Gardiner's Point, but saw no fish, then up in Peconic Bay, where we made two sets; caught 31,200, and took them to the Miamogue Works; wind east.

September 1st, Wednesday: Went down below Gardiner's Island; made one set off Tobacco Lot; then came up in Gardiner's Bay, where we made another set, after which we came to the Miamogue Works with 16,800 fish; fine. *Thursday, 2d:* Went up sound as far as Mattituck Creek; caught 60,000 fish, which we took to the Miamogue Works; weather continues pleasant. *Friday, 3d:* We went down in Gardiner's Bay, but caught no fish; then went into the fish works and coaled up, and went to Greenport. *Saturday, 4th:* Did not fish; very warm day. *Monday, 6th:* Went down in Gardiner's Bay, and off Gardiner's Point we made three sets; caught 35,600 fish, which we took to the Miamogue Works; warm day. *Tuesday, 7th:* We caught in Gardiner's and Peconic Bays 35,600 fish, which we took to the Miamogue Works; cloudy and stormy, with wind east. *Wednesday, 8th:* Wind blew hard from the NE.; we went in Noyack Bay, made one set and caught 39,200 fish, and went down to the works with them; then we came to Greenport. *Thursday, 9th:* We went up in Noyack Bay and Peconic Bay in the morning; but the wind blew hard from the NE., so we came to Greenport and carted the seine in the lot and took a piece of bunt out of one seine and put it in the other; stormed hard in p. m. *Friday, 10th:* Wind NE. and storming; at 9 o'clock a. m. the wind shifted and blew from NNW.; we did not go out; I knit on the big net. *Saturday, 11th:* We went out and made one set in Gardiner's Bay, then went below Gardiner's Island and made one set, and came up south way and made a set off Payne's Works; caught in all 49,200 fish, which we took to the Miamogue Works, arriving there at 2 p. m., and Greenport at 4, and I went home; weather good. *Monday, 13th:* We went out in Gardiner's Bay, but saw no fish, so went up sound as far as Mattituck Creek, where we made five sets and caught 72,000 fish, which we took to the Miamogue Works; fine. *Tuesday, 14th:* We went out in Gardiner's Bay, but the wind blew hard and we saw no fish; so came into Greenport. *Wednesday, 15th:* We caught in Gardiner's Bay 9,200 fish, which we took to the Miamogue Works; wind blew hard. *Thursday, 16th:* We caught in Gardiner's Bay 14,000 fish, and took to the Miamogue Works; pleasant, but wind blew. *Friday, 17th:* Went in the sound, and west as far as Riverhead, where we made six sets; caught 106,400 fish, which we took to the Miamogue Works; very pleasant day. *Saturday, 18th:* In Greenport, cleaning boiler; I went home; very warm day. *Monday, 20th:* Went down in Gardiner's Bay; made three small sets, and just at night we found a large body of fish between Little Gull Island and Gardiner's Point, which we set into and caught about 50,000, then we went into the Miamogue Works; had 74,800 fish; it was foggy in the morning, but soon came off pleasant. *Tuesday, 21st:* Went out in Gardiner's Bay and below Gardiner's Island; caught only 2,400 fish and took them to the Miamogue Works; pleasant. *Wednesday, 22d:* Went up to the head of the sound, and as we did not see very many fish we went through the Gate and past New York and anchored just inside of Coney Island; wind NW. all day. *Thursday, 23d:* We fished off the Hook, and in Prince's Bay; made six sets, and went into Hawkins Brothers' Works at Barren Island; had 37,600 fish; pleasant. *Friday, 24th:* We started out from Barren Island as soon as we could see, and went over to Sandy Hook, but saw nothing worth stopping for; so we came through Hell Gate again into the head of the sound, and off Glen Cove we found fish and made two sets; then we went east as far as New Haven, where we stopped over night; wind blew fresh in p. m. *Saturday, 25th:* Started out of New Haven, and steered SSE. for Long Island; made one small set on our way down and caught 38,000, which we took to the Miamogue Works; weather good. *Monday, 27th:* Wind SW.; went up sound as far as Glen Cove, where we made two sets, and caught about 25,000 fish, and came to anchor off Glen Cove. *Tuesday, 28th:* We went out of Glen Cove, and as the wind blew too strong for the fish to show, we went through Hell Gate to Sandy Hook, where we made three sets and caught 94,500 fish, which we took to Barren Island to Hawkins' Works; the wind in a. m. was S. by E.; p. m. it was WNW. *Wednesday, 29th:* Went out early; went first to Sandy Hook, then east a few miles, then west as far as Coney Island, where we found some very good bunches of fish; we made three sets and caught 126,500 fish, which we took to the works; pleasant day. *Thursday, 30th:* Went out from Barren Island, and went over to the Hook; then went up by Coney Island, where we made five sets and caught 114,000 fish, which we took to the Hawkins, Barren Island; wind west, but pleasant.

October 1st, Friday: Went out in the morning and went through Prince's Bay, and then went east a few miles, then back, and by Coney Island and through Prince's Bay again; we saw plenty of small bunches of fish, but nothing that we thought would pay us for lowering the boats and washing the salt off the seine; then we went up to Jersey City and coaled up; a pleasant day. *Saturday, 2d:* We lay in Jersey City; cleaned boiler, &c.; I wrote up my record, &c.; weather good. *Monday, 4th:* Three of my crew were quite sick, so that it was impossible for me to fish, conse-

quently I started for Greenport; we had a strong breeze from the SW.; set the sail and arrived at Greenport at 4.30 p. m. *Tuesday, 5th:* A stormy day; we carted the seine in the lot; it cleared off and we tarred the new seine in p. m. *Wednesday, 6th:* We hauled the E. S. Newins out on the railways in a. m.; we worked on the seine in p. m. *Thursday, 7th:* A part of the crew went to the Suffolk County fair, but those of us that staid in Greenport worked on the seine and helped put on the condenser. *Friday, 8th:* We finished the new seine and carted it down, and stowed the old one away in a. m.; we launched the steamer and went down to the oil works and coaled up in p. m. *Saturday, 9th:* Did not fish. *Monday, 11th:* Went out in Gardiner's Bay and caught at three sets 54,400 fish, which we took to the Miamogue Works; weather good. *Tuesday, 12th:* We went up sound and off Mattituck Creek; made two sets; caught 18,400 fish, and a squall of wind and rain came up, so we started for the oil works, where we arrived just after sundown; wind blew hard from the N. *Wednesday, 13th:* We hauled out the steamer to fix the condenser again. *Thursday, 14th:* We went out and worked at the fish in the deep water off Gardiner's Point; set the seine six times and caught none; they dive the seine; a pleasant day. *Friday, 15th:* We went out, but could find no fish, except in the tide-way where the water was deep; we set the seine twice and caught none; weather good, but we were in bad humor. *Saturday, 16th:* Did not go out; I went home. *Monday, 18th:* The wind blew hard from the NW.; we made one set in Gardiner's Bay and caught 16,400 fish, which we took to the Miamogue Works; weather continues pleasant. *Tuesday, 19th:* We went down to Watch Hill and then through Fisher's Island Sound; made one set just west of the Dumplings, but the wind breezing up strong from the SW. we went into New London. *Wednesday, 20th:* Went into Gardiner's Bay; made three sets and one "stab;" caught 83,600 fish, which we took to the Miamogue Works; light wind from the E. *Thursday, 21st:* Went out in Gardiner's Bay; made one set, then went to Fort Pond, then up sound as far as Faulkland Island, then to the oil works; had 12,800 fish; wind SSE. and looks like a storm. *Friday, 22d:* We went out in Gardiner's Bay; wind E. and storming; made two sets and caught 30,200 fish, and went to the works with them early; got them out and arrived at Greenport about 3 p. m.; the wind blew and it stormed hard. *Saturday, 23d:* We went down as far as Fort Pond; wind blew quite hard from the W. *Monday, 25th:* Went down to Fort Pond, but saw no fish; then came up to the Miamogue Works and coaled up; wind blew quite strong from the NW. *Tuesday, 26th:* The fire-box to the steamer has cracked and they are putting a patch on it. *Wednesday, 27th:* In Greenport at work on the fire-box. *Thursday, 28th:* Went down to Fort Pond, then up sound to Horton's Point, then back in Gardiner's Bay; made one set, but caught none; pleasant day. *Friday, 29th:* Went out, but caught none. *Saturday, 30th:* I went home; it stormed in p. m.

November 1st, Monday: Went down around Gardiner's Island, then up to Plum Gut; made one set, but caught none; weather fine. *Tuesday, 2d:* Did not fish; attended election. *Wednesday, 3d:* Went out in Gardiner's Bay; made two sets and caught 42,400 fish, which we took to the Miamogue Works; a pleasant day. *Thursday, 4th:* Went down as far as Fort Pond, but saw no fish; then came to Jamesport; wind ESE. and cloudy. *Friday, 5th:* Wind east, and stormy; we lay in Greenport. *Saturday, 6th:* Foggy; we went down in Gardiner's Bay and caught, at three sets, 52,800 fish, which we took to the Miamogue Works. *Monday, 8th:* We went down in Gardiner's Bay; made one set and caught about 1,000 fish; then went to Fort Pond, but could find no more, so came to Greenport; the wind blew strong from the NW. *Tuesday, 9th:* Went out in Gardiner's Bay and then to Fort Pond, but could find no fish; so went to the Miamogue Works and decided to quit for the season; then went to Greenport and stripped sail and rigging from the steamer. *Wednesday, 10th:* We started very early in the morning for Jamesport, and left boats and seine, and most of the crew to cart the seine in the lot to dry; I went back to Greenport with the E. S. Newins and fixed her for the winter, and came home on the cars, and the fishing season of 1880 with us is ended; two or three gangs staid out about two weeks longer, and had a few days of good fishing about the middle of November, and caught some fat fish.

CATCH OF MENHADEN BY A LONG ISLAND FISHING CREW FROM 1852 TO 1880.

The following table shows the number of menhaden taken by Captain Conklin and his crew during each year from 1852 to 1880, as recorded in the preceding journal. It will be seen that in the early years of the fishery the season began later and ended earlier in the year than during recent years. *In 1878 and 1879 a few fish were taken in April, as follows: In 1878, April 22, 55,200 fish;* April 26, 153,600; April 27, 4,000; April 29, 182,000; April 30, 136,400. In 1879, April 21, 54,800 fish; April 23, 113,600; April 28, 120,800.

Date.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
May 23	.....	.....	.....	.....	.....	.....	.....	.....	7,200	.....	.....	.....	.....	.....	5,000
24	.....	.....	.....	.....	.....	.....	.....	.....	21,000	.....	.....	.....	.....	.....	24,000
25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12,000
26	.....	.....	.....	.....	.....	.....	.....	.....	5,000	.....	.....	.....	.....	.....	24,000
27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	.....	.....	.....	.....	.....	.....	.....	.....	12,700	.....	.....	.....	.....	.....	.....
30	.....	.....	28,000	.....	.....	.....	.....	.....	10,200	.....	.....	.....	.....	.....	22,400
31	.....	.....	.....	.....	.....	.....	.....	.....	18,000	6,000	.....	.....	40,000	12,800	44,800

Date.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
May 1														
2					4,000							141,500		
3														117,800
4										89,000				
5										20,500				193,800
6													16,800	120,000
7	60,000											184,800	130,800	
8												132,800		
9				100,000						38,500			92,000	
10	81,658			18,600	51,000								24,800	
11	12,000								3,000		16,000	40,800		68,000
12														
13	7,000					37,000							125,600	
14	22,400			11,000		47,000		54,500						
15						29,500		26,000	35,500				152,400	
16		26,224		44,100		36,300								
17						27,500			48,000			256,800	32,000	172,800
18				7,800	26,800	16,000			13,100					
19					32,000			30,500					36,400	
20								40,500		7,500			149,200	
21								27,000	46,275		45,000			7,400
22					10,000	59,300	9,000				24,000	51,000	68,800	
23				16,000	12,800	74,000	16,500			16,000	6,800	110,000		
24					5,800	44,540			5,225	19,000		212,000		202,800
25				4,800	13,000	34,800			28,000	6,000				141,000
26				2,000	42,200		52,000	20,000	9,250					161,200
27	3,000				11,500	49,541	58,000	30,500				164,000	92,800	67,200
28						30,222	21,500	132,000					36,800	
29	8,300				42,000	7,300		80,500		13,000	107,000		205,600	
30					29,500	23,900		34,000		18,000	18,000		208,800	
31					53,200	47,371			7,500	28,000				16,000

Date.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
June 1			21,000										33,000	24,000	65,200
2			21,000		10,000								32,800	80,000	21,800
3			7,000		24,000			3,000					64,000		
4				9,000	10,000	9,500			10,000	4,000			39,000		
5			6,500	21,000		15,000			5,000						51,000
6		10,000						9,000	19,600				56,000		5,600
7			10,000				25,000		10,000	9,000	3,000		12,500	27,100	18,800
8		14,000	18,000			7,500	6,000		24,000				43,000	6,500	11,000
9		4,500	10,000		12,000	17,000	25,500	24,000				6,500			
10		4,000			40,000			22,500		16,500	6,500				
11		20,000		9,500	13,000			16,000	8,000	32,700		28,000			
12	1,500		11,000	25,000	15,000					7,100	4,150	20,000		45,000	12,000
13		2,000	8,000	29,000	10,000	7,500				12,000	18,950		18,750	13,500	
14	10,000		12,000	15,000	20,000		22,000	21,200		14,000	22,500		41,000		
15			11,000	31,000		25,000		43,000				20,000	27,138		
16			15,000	8,400	26,000		10,000	14,000	20,000		18,050	18,000	62,144		
17	6,000				7,800		1,700	15,000		18,100	23,050	76,000			
18		5,000		24,600	10,000		93,000	15,400	5,000	16,175		7,000			
19			4,000	37,000	42,000		30,000		66,000	21,680				6,000	
20			1,000		34,000	15,000		50,000	8,000	29,100	27,500			17,000	
21							15,000	40,300	6,000	20,000				5,300	12,800
22						35,100	27,000	40,300	8,000	43,500		4,500		11,000	11,000
23		13,000			42,000		25,000	36,000			11,000		27,550	43,000	
24					31,000		25,500	38,000		32,600		2,000	22,100		
25						20,500	19,000		12,000	44,500	31,750		33,825		4,800
26						7,700					22,500	30,000			28,500
27				8,000	25,800			27,000		17,200		1,000	42,550	10,500	
28	8,000			9,400			35,000			52,000	44,000		56,100		23,400
29				2,000			37,000	35,000				14,000	10,100	7,000	
30					29,000		32,000	47,000			26,500				

Date.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
June 1	19,200	78,064			57,300			77,000	36,000	8,000	97,000			53,500
2		17,900						82,500						
3		16,531				22,600		30,560			88,000			
4	3,000	15,662											18,400	87,200
5	12,600	25,740			28,500		3,000	35,000	7,150	35,000	81,000	110,000		0,400
6	15,000	8,525			45,500	41,538		20,100			69,500	208,000		
7					18,500	60,979		66,000	5,550	29,500		38,000		
8		5,550			11,000				8,000		67,000			
9				1,000				82,000	7,000	11,000	42,000		218,000	
10		4,400				13,196		33,500	6,500					19,000
11			9,000			77,179			7,000		14,500			43,200
12		9,100				57,577			12,150		24,000	49,800		18,000
13						61,566	20,500				29,500			
14	40,000					36,043			8,000	48,000				
15		24,630	20,500					9,500	47,000	57,000	32,000			
16			2,000					11,500	35,500	51,500				
17		47,741				44,500			28,000				36,000	
18		10,100	22,800	63,200		44,500				4,500	24,500	134,400	25,600	
19	*18,800*	*15,843*			*59,000*	*105,918*				*6,500*	*34,500*	*73,600*		
20						77,656				23,500		18,000		
21	69,600		5,000			99,000	10,700		17,500	18,500				4,800
22	28,800							20,500	86,000	7,500				7,200
23			16,500			27,238		25,500	7,500	23,000				
24	9,600		39,500			74,000						28,000	100,600	
25			70,500	39,000		3,500	17,300							29,000
26					93,100	13,500	10,350	11,000		32,000		65,000		
27					4,400		24,300			17,000		17,500	84,800	
28					73,500				18,500	4,000		52,000		20,000
29	3,000	33,180	32,000		65,000			52,000		22,000	36,000	11,000		
30			21,000		64,000			44,000	48,000	10,500	17,500			43,600

Date.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
July 1	3,000				12,000		1,000	30,000		30,000	13,500	25,500	28,500		
2					15,500		35,000	16,000			21,700	20,000			
3												10,000			
4															
5													41,280	1,600	
6								35,000			12,000	20,000	20,400	9,400	
7								14,000			39,000	80,000	27,580		
8								36,000		8,000	35,000			10,500	
9	9,000							14,000			23,000	5,000	22,250		
10						10,000			53,000		22,000		24,160	8,200	
11						14,400		22,000	24,000		32,000		5,100		9,800
12									10,000		10,000		64,000	22,900	25,000
13												6,000		29,800	12,800
14		5,000				35,600					20,000	8,000	32,000	16,000	50,100
15		12,000									40,000	50,000			
16												4,000			65,000
17						5,000			1,200		18,000				
18															27,400
19		16,000											24,000		77,600
20		4,000				9,500							69,000		60,800
21	18,000	24,000												56,000	
22	7,000	8,500					26,800				38,000	19,410			
23	12,000						18,000				22,000	96,000			
24											8,000	21,000		10,500	80,875
25										17,000	20,500		12,000	59,380	51,500
26										69,000					
27												20,000	18,000	54,480	97,800
28		17,000									21,000	33,000	27,200	84,300	22,500
29		18,000											1,700		
30										66,500					80,000
31															72,500

Date.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
July 1	.....	64,380	15,500	.....	16,000	38,500	43,650	57,500	35,000	27,000	.....	130,800	34,800	.....
2	.....	53,680	.....	.....	.....	124,000	15,000	47,000	35,500	.....	.....	104,000	60,400	48,800
3	.....	.....	.....	.....	71,000	.....	.....	.....	.....	.....	6,000	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	.....	5,000	.....	.....	115,500	.....	.....	.....	.....	25,000	137,500	.....	.....	.....
6	.....	.....	.....	.....	29,500	.....	.....	.....	44,500	.....	.....	.....	.....	47,200
7	.....	.....	.....	.....	.....	.....	.....	10,000	41,000	77,500	48,000	.....	13,400	56,400
8	.....	.....	86,000	.....	.....	.....	29,000	.....	18,500	34,000	.....	.....	.....	68,400
9	73,160	.....	.....	.....	.....	.....	6,000	.....	12,500	.....	131,000	90,800	55,200	8,800
10	18,000	4,000	21,000	.....	.....	35,000	34,000	80,500	.....	17,500	29,000	94,400	.....	.....
11	18,300	.....	.....	.....	120,000	70,000	15,000	.....	.....	59,000	104,000	74,000	.....	.....
12	36,200	.....	.....	35,000	95,000	16,800	.....	.....	47,500	12,000	6,000	102,000	.....	9,200
13	.....	12,240	33,000	13,000	70,000	.....	.....	96,500	27,500	49,000	23,000	.....	.....	.....
14	.....	5,000	.....	.....	.....	.....	.....	35,000	30,500	35,500	.....	.....	187,200	110,000
15	30,100	.....	.....	50,000	.....	36,000	12,000	54,500	16,000	.....	.....	100,000	232,000	.....
16	78,300	.....	.....	.....	.....	18,300	51,500	24,000	27,000	.....	103,000	11,200	87,200	155,600
17	33,300	.....	2,500	.....	19,200	26,500	51,500	8,500	.....	.....	100,500	46,800	.....	.....
18	39,780	27,540	.....	24,500	23,500	42,400	24,500	.....	.....	24,000	109,000	92,000	20,000	.....
19	.....	.....	*29,000*	.....	.....	*21,000*	.....	.....	.....	*73,000*	*115,500*	*148,000*	.....	*50,000*
20	.....	31,000	7,700	11,500	.....	.....	.....	.....	.....	.....	.....	6,000	.....	101,000
21	.....	18,000	55,000	31,500	18,000	.....	53,000	.....	58,500	9,000	.....	.....	52,000	15,000
22	42,080	16,800	60,500	24,000	4,000	.....	54,000	24,000	17,000	.....	.....	.....	.....	130,200
23	33,000	10,180	31,500	.....	.....	37,500	73,000	26,000	73,000	.....	18,000	216,400	59,000	.....
24	90,880	.....	17,500	.....	24,000	27,500	41,000	92,500	31,500	62,000	70,500	102,800	126,400	.....
25	84,520	.....	.....	.....	28,500	15,500	67,000	3,000	.....	.....	38,500	109,000	.....	.....
26	40,000	.....	.....	.....	54,400	.....	.....	.....	71,500	.....	101,500	.....	.....	78,400
27	.....	79,000	60,500	18,000	51,500	.....	.....	.....	53,000	26,500	.....	.....	.....	35,000
28	.....	.....	.....	.....	83,200	.....	42,000	30,000	87,000	1,500	49,500	.....	129,600	62,400
29	.....	60,000	12,000	38,500	.....	16,200	25,000	28,000	.....	6,000	.....	128,000	9,600	53,000
30	.....	27,000	55,500	12,000	.....	50,000	22,000	.....	12,500	.....	80,500	.....	37,600	30,400
31	.....	.....	8,500	24,000	53,000	95,000	68,500	6,500	.....	.....	84,000	224,000	52,600	.....

Date.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
Aug. 1	.....	11,000	.....	.....	.....	.....	.....	.....	.....	67,000	.....	.....	30,950	33,000	16,000
2	.....	8,000	.....	.....	.....	.....	.....	.....	.....	*70,000*	.....	.....	*13,680*	*55,400*	.....
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29,000	32,000	32,000	.....
4	.....	.....	.....	.....	.....	.....	.....	.....	15,000	.....	.....	.....	.....	28,600	.....
5	.....	22,000	.....	.....	.....	.....	.....	.....	.....	.....	7,000	33,000	24,000	36,600	.....
6	.....	.....	.....	.....	.....	.....	.....	.....	45,000	45,000	24,000	.....	.....	.....	.....
7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12,000	.....	.....	25,200
8	.....	2,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	8,000	35,580	30,000	75,600
9	3,500	16,000	.....	.....	20,000	.....	32,000	.....	28,000	.....	.....	.....	44,700	37,600	.....
10	21,000	9,700	.....	.....	.....	.....	.....	15,000	.....	16,600	.....	59,000	10,950	53,600	17,200
11	.....	1,600	.....	.....	24,000	.....	7,000	.....	.....	.....	2,000	2,700	20,700	40,800	21,600
12	11,000	8,000	15,000	.....	31,000	.....	16,000	6,000	.....	.....	.....	43,000	17,200	.....	.....
13	12,000	26,000	.....	3,600	43,400	.....	.....	.....	.....	.....	33,000	9,314	.....	.....	*45,000*
14	.....	.....	.....	15,000	31,000	.....	.....	.....	.....	.....	18,000	.....	.....	.....	.....
15	.....	.....	4,000	8,000	26,000	.....	.....	.....	.....	35,000	.....	.....	.....	37,600	28,600
16	8,000	.....	22,000	13,000	.....	.....	6,000	.....	.....	45,000	.....	.....	.....	31,000	.....
17	17,000	.....	9,000	.....	.....	.....	4,000	.....	18,000	28,000	.....	20,000	4,200	21,200	48,000
18	8,000	.....	.....	.....	27,000	.....	5,000	28,000	.....	.....	.....	.....	40,000	72,500	52,600
19	18,000	.....	14,000	.....	.....	.....	10,000	.....	.....	36,000	29,200	46,000	44,000	.....	.....
20	11,200	8,000	.....	27,000	.....	.....	23,500	.....	.....	.....	26,500	.....	.....	.....	76,000
21	.....	.....	.....	16,000	.....	.....	22,400	.....	9,000	21,000	44,000	25,400	.....	36,800	57,200
22	.....	15,000	.....	8,000	23,000	.....	.....	.....	10,000	.....	30,000	.....	.....	58,700	17,200
23	.....	8,000	.....	4,000	20,000	.....	.....	19,400	20,000	.....	.....	.....	22,950	21,500	43,200
24	2,500	.....	18,000	6,000	.....	.....	34,000	.....	.....	77,000	.....	.....	25,411	53,600	*42,000*
25	.....	15,200	9,400	10,000	27,000	17,500	23,000	.....	27,000	.....	.....	25,000	17,650	42,200	.....
26	.....	.....	.....	.....	24,000	19,000	12,000	14,000	.....	12,000	17,000	43,400	.....	23,200	.....
27	11,000	.....	.....	.....	13,000	8,000	26,000	30,000	.....	28,000	20,000	21,145	.....	.....	7,400
28	.....	.....	.....	.....	7,400	.....	30,000	5,000	.....	.....	8,000	62,000	.....	16,500	12,800
29	.....	18,000	.....	12,000	.....	.....	.....	.....	7,000	29,000	.....	20,000	.....	51,100	40,200
30	.....	21,000	3,000	9,000	15,000	.....	29,000	25,000	19,000	16,000	.....	.....	28,850	11,400	.....
31	13,000	.....	10,000	12,000	.....	3,000	14,000	.....	.....	.....	.....	.....	37,000	12,400	30,200

Date.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Aug. 1				23,000	30,500	78,700	15,500			37,000		93,800	52,000	
2			22,500	35,500	28,400	98,800	14,000			47,500		102,800		48,800
3		3,500	24,000	44,500	38,000			42,000		6,500	42,500			10,800
4		15,800	46,000	54,800	10,500		9,500	73,000	77,000		19,500		102,400	
5	60,000		44,750	25,000		95,800		28,500	123,500				60,000	
6	33,300			85,000		76,800	13,000	23,000	57,500		95,000	30,400		32,400
7	29,500	46,000				44,300			86,000	32,000	44,000	77,600		
8	*19,840*			*17,000*	*16,800*	*52,000*				*32,000*	*27,000*	*12,000*		
9					40,500	83,500	9,000		94,500	6,500	32,000			
10		4,560		61,000	46,000			82,000	41,500		87,000			
11		63,000		28,000	38,000		24,500	12,000	12,500					138,400
12	38,660			48,000	15,000	92,000		3,000	26,000			90,000	129,600	
13		35,500				96,000					107,000	52,000		223,400
14	27,540	51,000				84,300		44,000	66,500	12,000	42,000			
15	66,700				45,000	77,000					56,000	180,800	16,800	
16				29,500	25,000		5,500		14,000		17,000	14,400		48,800
17		26,500		68,500	39,500			50,000	69,000	28,000	63,000			46,800
18		20,300	9,000	31,500				44,000	20,500	58,500				
19	*8,800*	*9,000*		*38,500*		*42,500*		*25,500*	*69,500*					*12,000*
20	8,700	87,000	30,500			96,700		15,000	52,000		121,000	55,200	169,200	57,200
21	52,800	76,280	16,000			71,000		78,000			56,000	87,600	59,200	
22	42,400										38,000			
23	60,000			22,500					112,000		79,500	48,400		96,400
24		89,700	62,000	12,000				20,000	88,500			29,600		41,600
25		31,600	25,000	3,000					17,000				41,600	8,800
26	20,000					74,300	63,500	86,500	28,000	56,500		66,000		
27		29,500	14,000				28,500	24,000	31,500		29,500	6,400		24,800
28	19,600					40,700	12,000	27,500	34,500	57,500	93,000	161,600		56,000
29	40,800				53,500					74,000	95,000	66,400	27,200	
30			9,000	62,000	73,200				24,000	54,000	110,000	36,800		
31		66,000		64,000	70,500				31,000	32,000	38,500	27,200		31,200

Date.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
Sept. 1						24,000	15,600	30,000						28,000	30,400
2	7,000					8,800	18,000						28,200		
3				22,000	18,000	11,500	5,000				15,000		21,335		42,100
4	10,000				14,500	3,300					30,000	23,300		34,000	
5		8,000						15,000			12,000			25,600	6,300
6					9,600			1,000	40,000					30,500	54,600
7				*10,000*			*20,000*	*11,000*	*13,000*			*26,000*		*47,200*	*18,800*
8			9,000		12,000		30,500	16,400				36,150	21,500	16,000	
9					6,000		22,000	33,000		44,000		64,000			
10							26,000	4,000		26,000		21,000			6,000
11												9,000		14,200	
12					20,000			3,000						33,400	
13							26,500	5,000		22,000				24,200	
14						29,000						4,000			
15						35,800					5,000	16,000	16,700	25,400	
16			4,000			13,000					15,000	8,200	48,725	50,600	
17										23,000	6,000	12,250	25,550		4,800
18															
19										20,000	10,500		42,740		
20													17,000	14,800	
21												14,000	43,000		
22												24,000		14,000	
23											30,000	20,000	9,000		
24		9,000						8,000		23,000		25,000	24,000		
25										22,500	2,000				
26											10,300	21,500		23,600	
27			5,000										12,000	9,000	
28												6,000			
29							7,500						15,550		
30										22,000	3,000	15,000			

Date.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Sept. 1	.....	29,000	.....	.....	45,500	.....	.....	25,500	42,500	40,500	.....	.....	141,200	16,800
2	9,000	27,540	.....	.....	50,200	.....	10,500	14,000	56,500	.....	.....	197,200	.....	60,000
3	38,000	.....	56,500	.....	.....	65,000	.....	21,500	38,000	.....	53,500	183,200	113,600	.....
4	33,600	23,500	.....	.....	76,300	57,500	47,500	.....	.....	56,000	8,000	.....	46,600	.....
5	24,000	.....	.....	.....	37,200	56,200	41,500	.....	.....	.....	86,300	.....	10,600	.....
6	35,200	.....	12,000	.....	55,200	56,800	20,500	38,500	101,000	23,500	18,700	95,000	2,000	35,600
7	25,600	.....	14,000	.....	48,750	.....	.....	.....	59,000	49,500	.....	.....	.....	.....
8	.....	22,600	.....	.....	25,800	.....	14,000	8,500	80,500	.....	.....	.....	.....	39,200
9	52,400	.....	.....	86,500	.....	.....	34,000	41,500	47,500	.....	.....	253,600	36,600	.....
10	65,000	97,600	25,200	.....	.....	34,000	17,500	.....	.....	.....	47,500	66,400	99,000	.....
11	33,200	59,580	.....	.....	.....	90,500	50,500	21,000	.....	66,000	48,000	76,800	129,600	49,200
12	40,000	.....	.....	.....	.....	60,300	21,500	.....	.....	78,500	42,500	.....	72,000	.....
13	.....	.....	.....	.....	.....	6,000	23,000	.....	76,500	7,500	29,000	.....	.....	72,000
14	.....	.....	31,400	14,000	.....	.....	.....	8,500	60,000	116,500	.....	61,600	.....	.....
15	.....	.....	11,000	.....	.....	.....	32,500	.....	74,000	92,000	.....	.....	118,000	9,200
16	25,600	6,520	34,500	.....	.....	.....	19,000	.....	77,500	.....	.....	236,000	.....	14,000
17	57,000	.....	.....	.....	23,300	50,500	31,000	.....	.....	.....	5,000	98,000	.....	106,400
18	32,000	.....	.....	.....	39,800	.....	.....	.....	.....	.....	92,500	57,600	.....	.....
19	12,800	.....	.....	84,000	48,300	.....	.....	.....	.....	20,000	94,400	114,800	95,200	.....
20	.....	.....	49,400	.....	.....	.....	.....	.....	41,000	98,000	51,500	158,400	.....	124,800
21	.....	.....	53,500	38,000	30,000	.....	.....	15,500	50,500	.....	.....	.....	.....	2,400
22	.....	.....	18,400	.....	.....	.....	30,000	27,500	.....	40,500	.....	.....	.....	.....
23	31,200	.....	28,000	51,000	.....	36,800	8,500	36,500	52,000	.....	.....	23,200	64,200	37,600
24	2,400	.....	25,600	40,500	.....	35,800	10,500	28,000	.....	.....	44,500	25,600	9,600	.....
25	12,000	.....	37,800	82,000	.....	75,500	21,000	16,000	.....	.....	16,500	103,400	.....	38,000
26	.....	.....	.....	.....	.....	.....	.....	.....	.....	56,500	20,600	.....	.....	.....
27	.....	.....	.....	36,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	25,000
28	.....	.....	21,200	21,000	.....	.....	.....	23,500	50,500	.....	52,500	.....	.....	94,500
29	.....	.....	53,200	6,000	.....	.....	.....	12,500	.....	75,500	.....	.....	24,500	126,500
30	.....	.....	54,500	.....	39,600	29,150	.....	.....	16,500	.....	.....	127,000	93,500	114,000

Date.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
Oct. 1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14,400	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	30,000	.....	.....	.....	18,000	.....
3	.....	.....	.....	.....	8,000	.....	.....	.....	.....	10,000	17,500	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	11,000	.....	.....	.....	.....	.....
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	9,000	.....	.....	11,200	.....	.....
6	.....	.....	.....	.....	.....	4,000	.....	.....	.....	20,000	.....	.....	28,800	.....	.....
7	.....	.....	.....	.....	.....	.....	.....	9,000	.....	40,000	.....	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	30,000	.....	7,000	.....	.....	.....
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	25,000	.....	.....	.....	.....	.....
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17,500	.....	.....	.....
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	82,000	.....	.....
12	.....	.....	.....	.....	.....	.....	.....	32,000	.....	.....	.....	15,200	.....	.....	.....
13	.....	.....	.....	.....	7,000	2,000	.....	6,000	.....	.....	.....	27,000	.....	.....	.....
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17,500	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	46,600	.....	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24,000	.....	.....	.....	.....
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32,000	.....	.....	3,000	24,000
18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	157,875	.....	41,600
19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12,800	54,650	.....	45,000
20	.....	.....	20,000	.....	.....	.....	.....	.....	.....	.....	.....	90,000	38,500	.....	24,000
21	.....	.....	26,000	.....	.....	.....	.....	.....	.....	.....	63,000	84,000	40,000	.....	.....
22	.....	.....	3,000	.....	.....	.....	.....	.....	.....	.....	.....	32,000	91,600	.....	8,400
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	80,000	.....	22,000	16,800
24	.....	.....	.....	.....	.....	.....	.....	20,000	.....	.....	51,000	53,600	103,000	4,500	11,800
25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	60,000	.....	.....	8,000	.....
26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	56,600	2,000	.....
27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	85,000	.....	75,200
28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35,600	.....	.....	.....
30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40,500	.....	.....	6,000	.....
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	71,500	3,200	14,700

Date.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Oct. 1			26,000			17,500	12,000		11,000		49,500	152,000	178,000	
2	39,200		2,500							30,500	46,500	88,800		
3	30,600									34,500		111,200		
4									11,000			155,600		
5				15,000					43,500	32,000				
6							6,000						15,200	
7						32,000						119,000		
8	9,800					6,500			11,500				24,000	
9		39,000				20,700				19,500			138,400	
10	24,000					7,000				55,000	33,500			
11							33,000				29,500			54,400
12		14,000	24,300								46,000			18,400
13		29,000					82,000	52,000	12,500					
14		34,000	5,800	54,150		12,000		17,500				42,400		
15	49,100		17,600			23,700	58,500	44,000			48,500		54,400	
16		26,000					2,000	102,500			35,500			10,400
17		16,500		31,800		41,300	37,500	18,000			32,000			
18	3,200		22,500			12,200	8,500		50,500		53,000	16,800		
19		39,500							38,500	21,500	56,500			
20			15,500					20,000	28,000	98,000				83,600
21	25,600		27,000			21,800		15,500		29,000			124,800	12,800
22	16,300		32,200					12,000	26,500				176,800	
23		69,500	37,500			10,000			22,000	37,000	28,500		62,000	
24	52,800		59,500				8,500			19,000	27,500			
25	25,000						12,000			13,500	43,000	160,800		
26	20,600	2,500							23,000	5,000		78,000		
27				48,200									4,800	
28		33,500	10,300				76,000	57,000		25,000			92,000	
29			33,500					36,000			51,400	66,400		
30							42,000	39,500			79,500			
31	77,600									10,500	22,000			

Date.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
Nov. 1													39,000	12,800	41,500
2												59,370	79,000		
3												10,600	73,000		12,800
4												30,250			
5												53,900			
6															
7															
8															
9															
10															
11															

Date.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Nov. 1										43,500	73,500	35,600		
2								24,500		39,500				
3			48,400						53,500				146,000	42,400
4		30,500	75,400				3,500						84,400	
5							82,500	23,000			196,000		84,400	
6			34,500				28,500			11,500			12,000	52,800
7	83,200										79,000	97,800		
8										18,500	90,000			
9		23,500												
10														
11	21,800											150,000		

Blank page retained for pagination

PART VI.

THE HERRING FISHERY AND THE SARDINE INDUSTRY.

By R. EDWARD EARLL.

1.—THE HERRING-FISHERY OF THE UNITED STATES.

1. The fishing grounds.
2. The vessels and their crews.
3. The lay and share.
4. Methods of capture.
5. Disposition of the catch.
6. Statistics of the herring fishery.

2.—THE FROZEN-HERRING INDUSTRY.

1. Origin of the trade.
2. The fishing grounds.
3. The vessels and their crews.
4. The fishermen of Newfoundland and New Brunswick.
5. Methods of capture.
6. Preserving the fish.
7. Markets.
8. Extent of the trade.

3.—THE PICKLED-HERRING TRADE WITH THE MAGDALEN ISLANDS, ANTICOSTI, NEWFOUNDLAND, AND LABRADOR.

1. History of the fishery.
2. The fishing grounds.
3. The vessels and their crews.
4. Apparatus and methods of capture.
5. Lay of the fishermen.
6. Methods of preserving the fish.
7. Extent of the fisheries and the export trade.

4.—THE SMOKED-HERRING INDUSTRY.

a. Hard herring.

1. Origin of the smoked herring.
2. Location of the industry.
3. The fishermen and curers.
4. Methods of the fishery.
5. The smoke-houses.
6. Methods of smoking and packing.
7. Markets and prices.
8. Further preparations of smoked herring.
9. Statistics of the business.

b. Bloater herring.

10. The origin, methods of preparation, and statistics of the bloater-herring industry.

c. Statistics of the industry.

11. Statistics of the smoked-herring industry of Maine in 1880.

5.—THE SARDINE INDUSTRY.

1. Origin and development of the business.
2. Location of the fisheries.
3. Apparatus and methods of capture.
4. Preparation of the fish.
5. Extent of the business.

Blank page retained for pagination

PART VI.

THE HERRING FISHERY AND THE SARDINE INDUSTRY.

By R. Edward Earll.

1.—THE HERRING FISHERY OF THE UNITED STATES.

1. THE FISHING GROUNDS.

General movements of herring.—The natural history of the herring has, perhaps, been less thoroughly understood than that of any other of our important food-fishes.

Pennant was the first to construct a theory with reference to the movements of the herring. His theory, which was based largely upon the traditional ideas of the fishermen, was that the herring lived in the Arctic seas during the greater part of the year. Here he claimed they found an abundance of suitable food, and were entirely free from the ravages of the numerous enemies which preyed upon them in the more southern latitudes. He stated that at certain seasons of the year large schools gathered from the surrounding waters and soon started on their annual migrations to the shores of Europe and America. The division of the army that was to populate the European seas was supposed to be so extensive as to occupy a surface greater than that of Great Britain and Ireland combined. It was further claimed that as the schools proceeded southward they naturally subdivided into smaller schools or battalions five or six miles long by three or four broad. The particular schools that were to visit the waters of Great Britain in summer arrived at Iceland in March, and next appeared at the Shetland Islands, where they divided, one portion passing directly southward, between Scotland and the Continent, while the other was turned to the westward, and after passing Cape Wrath followed the western shore of the island. It was thought that each school was led by herring of "unusual size and sagacity," claimed by some to be the *alice* or *twaite* shad. This theory, though now amusing on account of its absurdity, was generally accepted for many years, and it was not until 1854 that it was overthrown by a more rational one. At this time Mr. Cleghorn, of Wick, Scotland, published his ideas of the movements of the herring. These were so wholly opposed to those of Pennant as to attract universal attention, and to call forth considerable discussion, which has resulted in the addition of much information regarding the movements of the fish.

Mr. Cleghorn's theory, briefly stated, was as follows: First, that the herring is a permanent resident of the waters which it inhabits, and that it never migrates to any distance from a given locality; second, that distinct races exist on different portions of the coast; third, that although the quantity of netting now in use is much greater than that formerly employed, yet the catch is, generally speaking, much smaller; fourth, that the yield of the fisheries gradually increased up to a certain point, after which it began to fluctuate, and soon decreased rapidly, so that many stations that were once prosperous have been abandoned; fifth, that the fisheries were soonest exhausted in the vicinity of the larger cities, and among the smaller bays and islands, where the fishery could be extensively prosecuted, and that the supply was least affected in the open sea.

From these premises he reached the conclusions that the former fluctuations and recent decrease in the yield is due to overfishing.

Numerous other ichthyologists have written extensively of the movements of the herring in later years, and others have devoted considerable attention to the classification of the genus *Clupea;* but even now the whole subject is in confusion. Many of the leading European authorities claim that there are a number of distinct species inhabiting the European seas, and some of them have gone so far as to assign special names to the different schools. Mr. J. M. Mitchell says that different schools of herring have a different look, and that such peculiarities are noticeable that practical men can distinguish between them. Mr. Bertram, in his Harvest of the Sea, says:

"It has been deduced, from a consideration of the figures of the annual takes of many years, that the herring exists in distinct races, which arrive at maturity month after month; and it is well known that the herring taken at Wick, in July, are quite different from those taken at Dunbar in August or September; indeed, I would go further and say that even at Wick each month has its changing shoal, and that as one race ripens for capture another disappears, having fulfilled its mission of procreation." *

Most American writers, on the other hand, recognize but one species of herring, this being the *Clupea harengus*, the common herring of both Europe and America. Some of the American fishermen, however, claim that though the large fish are all undoubtedly of the same species, the small herring, which are in some localities called "brit," and in others "spurling," are quite different, and that they never grow to any considerable size. Others, on the contrary, insist that these small fish are but the young of the common herring, and that there is no more difference between them than is noticeable between the young and adult of any other species.

In America, the herring occur from the coast of Labrador on the north to Cape Cod, and occasionally even to New Jersey on the south, and there are extensive spawning and feeding grounds for the species along various portions of the coast; while immense schools of them are often seen by the fishermen at different seasons of the year on many of the outer fishing banks. It is claimed, however, that they invariably resort to the inshore grounds for the purpose of spawning, though the fact is not yet fully established.

THE SPAWNING SEASON.—In America, as in Europe, there is considerable uncertainty as to the time of spawning. The Fish Commissioners of Scotland, after having collected a large amount of valuable information, arrived at the conclusion that "herrings spawn at two seasons of the year, viz, in spring and autumn. They have no evidence of spawning during the solstitial months, viz, June and December, but in nearly all the other months gravid herring are found, and the Commissioners assert that the spring spawning certainly occurs in the latter part of January, as also in the three following months, and the autumn spawning in the latter end of July, and likewise in the following months up to November. 'Taking all parts of the British coast together, February and March are the great months for spring spawning, and August and September for the autumn spawning.'" In America, also, the herring spawn at various seasons of the year. On the south coast of Newfoundland they spawn between the middle of May and the first of July. They usually approach the shores of the Magdalen Islands, in the Gulf of Saint Lawrence, during the last week in April. They visit this locality wholly for the purpose of spawning, and leave as soon as the eggs have been deposited, which usually requires from three to five weeks.

About the time of their departure from the Magdalens, schools of spawning fish make their appearance at the western end of Cape Breton Island. They are first seen in the vicinity of Port

* Harvest of the Sea, page 164.

Hood, and from this point they gradually work toward the Strait of Canso. These remain but a short time, frequently leaving in less than two weeks from the time they are first seen.

At Grand Manan Island, New Brunswick, the herring strike in, in June, and the spawning season continues from the first of July to the middle of September.

At Boisbubert, Castine, and Crabtree Point, in the eastern part of Maine, the spawning-time is from the latter part of July till the first of September.

At Wood Island, Maine, and at Cape Ann, Massachusetts, they usually arrive about the 20th of September, and the spawning is at its height from that time till the middle of October. According to Professor Baird, the spawning season occurs even later as we proceed southward.

It is claimed, however, and is doubtless true, that the spawning season for the winter schools in the vicinity of Eastport is in March and April, and that they frequently spawn in St. Andrews Bay as late as the middle of May.

From these facts it will be seen that it is difficult to construct a theory as to the laws that regulate the spawning conditions of the fish.

HERRING ON THE NEW ENGLAND COAST.—But it is not our purpose to go into any general discussion of the herring fisheries as they exist on the coasts of Europe and America, nor even to treat of the fisheries of the British Provinces of North America, any further than is necessary to show the extent of the business in the United States. Confining ourselves, then, for the present, to the coast of New England, we find that although there are numerous spawning-grounds where the fish are taken in considerable quantities, yet the herring occur in greater or less numbers in almost every harbor and cove between Cape Cod and Eastport, and that they are frequently observed at a considerable distance from the land. In the spring they usually make their appearance along the southern shores of this district during the latter part of April, and are taken a few weeks later along the coast of Maine. Great schools of them are also seen on George's and other outer fishing-banks as early as February, though with the exception of the school visiting Eastport they are not known to occur in the shoal waters along the coast during the winter months.

The young and the old usually go in schools by themselves, remaining separate from each other during the entire year. Some localities are visited only by young fish, others only by those that are fully mature; while others still are frequented by both young and old at different seasons, or the two may occasionally be seen in the same region at the same time, though even then they seldom mingle to any considerable extent.

FISHING-GROUNDS IN THE VICINITY OF EASTPORT.—The principal fishing ground for small herring is in the vicinity of Eastport. These immature fish appear in the early spring, and are abundant among the numerous islands and ledges throughout the summer, often remaining as late as the middle of December. The fishing ground extends from Beaver Harbor, New Brunswick, to Cutler, Me., a distance of thirty-two miles. Along this stretch of coast the herring are chiefly taken in brush weirs, and are used for smoking and canning, any surplus being frequently made into pomace and oil. This region is also the center of the winter herring fisheries of New Brunswick, and is much resorted to for bait by American fishermen in the spring.

Most of the fish taken in the early spring are locally known as "brit," being but three or four inches long. A little later larger individuals appear, and by midsummer those taken average five to seven inches in length. Later still even larger herring are taken, the bulk of them at this season being smoked and shipped to Boston for distribution to the consumers.

Formerly large numbers of herring visited Cobscook Bay, where they remained during a greater part of the season, but when brush weirs came into general use the passage between Campobello Island and Lubec was almost completely closed by the building of particularly large

weirs, which often extended well out into the channel, frequently nearly meeting from the opposite shores. The bulk of the fish having been turned from their usual passage, they seemed to move a few miles to the eastward, and the center of the fishery is now at the eastern end of Campobello and in the vicinity of Deer Island, New Brunswick, though considerable numbers of small fish are still taken at Lubec, and even as far west as Cutler and Cross Island.

The fisheries of this region, though extensive, are not yet fully developed, for the small fish, prior to the establishment of sardine canneries in 1875, were of little use, and fishing for them was not considered profitable. On account of the small size and the supposed worthlessness of the fish, little or no attention was paid to their capture, and until recently many fishermen have been wholly unaware of the immense quantity of herring in the region.

The catch being sold almost exclusively to the sardine canneries, the subject will be treated more fully in the chapter on the sardine fisheries.

THE FISHING-GROUNDS OF JONESPORT AND BOISBUBERT.—The next important herring ground as we proceed westward is that in the vicinity of Jonesport, or in and about Moos-a-bec Reach. According to Mr. M. P. Chandler, of Jonesport, large schools of herring have visited these waters regularly since 1830, and probably for a much longer period. He claims that schools of small fish arrive about the last of April and remain till the middle of June, when they are driven farther out to sea by schools of full-grown herring that visit the waters along the shore. Vessels from the surrounding fishing ports resorted to this locality with gill-nets as early as 1840, and the fishery continued until 1872, when, owing to a depreciation in the value of the fish, the business was wholly discontinued, and no vessels have visited the region since that date. During the height of the fishery a fleet of twenty-five sail often anchored in Head Harbor, and the fisheries were prosecuted from small boats in the surrounding waters Though the vessel fishery ceased some time since, the herring are reported as abundant as formerly, and considerable numbers of them are taken in nets and weirs by the local fishermen, the greater part being used for bait, while the remainder are employed as a dressing for the land, or sold to the sardine canneries established at Jonesport in 1880.

Lying to the southward of the towns of Millbridge and Steuben, between the mainland and Petit Manan light, is the small rocky island of Boisbubert. This island is about two miles long by half a mile wide, and the waters lying off its southern head are a favorite resort for the herring during the spawning season, which extends from the middle of July to September. The spawning-grounds are located within a radius of two or three miles of the southern head of the island, and include a number of small rocky islands and ledges, the principal ones being Egg Rock and Jordan's Delight. The bottom of the ocean in this region is covered with large stones and bowlders, to which large quantities of algæ are attached. During the spawning season the entire bottom is often covered to a depth of several inches with the eggs of the herring.

This has been a favorite spawning-ground for the species from the earliest recollections of the oldest inhabitants, and, according to Mr. Sanborn, of Millbridge, a brush weir was built in the mouth of the Naraguagus River, near the village of Millbridge, as early as 1820. Though herring were taken in considerable numbers, the weir fisheries increased very slowly, owing to a limited demand for the fish, the supply being used only for bait by the few local fishermen and for fertilizing the land. About 1850 parties from Lubec came to the region and built large weirs on Boisbubert Island and other places along the mainland, and then, for the first time, the herring fisheries became important. The business continued to increase, and each of the weir-owners built large smoke-houses and presses for utilizing the catch. The fishery was at its height between 1858 and 1863, when twelve to fifteen weirs were fished regularly and 75,000 to 100,000 boxes of herring were

smoked annually, the greater part being shipped to Boston for a market. Large quantities of fish were also pressed for the oil, the pomace being used locally as a fertilizer. The pressing of fish was discontinued fully ten years ago, and, owing to the low price of smoked herring, the weir fisheries have constantly decreased, so that in 1880 only 500 boxes of fish were cured in Millbridge and the fishermen of Steuben had entirely discontinued their work. Eight small weirs were occasionally fished during the season of 1880, and it is estimated that considerably over 2,000 hogsheads of fish were taken; but the greater part of them were turned out for want of a market, a few being sold to the lobster and boat fishermen for bait, and others were carted upon the land.

About 1868 the vessel fishermen of the surrounding islands, on learning of the abundance of the herring on the spawning-grounds of Boisbubert, began to resort to the region in small vessels to engage in the fishery. A larger number came each season, until, in 1875, there were from twenty to twenty-five sail, averaging five men each, anchored in the harbor at the southern end of the island. These vessels arrived about the last of July and remained till September, some of them securing only one and others two trips before the fish had left the grounds.

From that time the business declined until during the summer of 1880 there were but nine vessels engaged in this fishery, the total catch being from 700 to 800 barrels. The fish were salted in barrels and carried to Portland and Boston for a market.

MOUNT DESERT AND VICINITY.—The waters in the vicinity of Mount Desert and Blue Hill Bay are favorite feeding grounds for the herring from May to October. Different schools visit this region, and the fish are usually very abundant about the smaller islands in the vicinity. They are of medium size, and, with the exception of those at Cranberry Islands, are taken exclusively in weirs. Those visiting the shores of Cranberry Islands are quite large, and are taken by the local fishermen in gill-nets, the catch being salted or smoked for the different markets. At other points, especially at the various islands in Blue Hill Bay, there are numerous smoke-houses for curing a portion of the fish, but the bulk of the catch is sold to the vessels from Cape Ann and other places that resort to the locality for the purchase of bait. A number of weir-owners have built large ice-houses, and do an extensive business in supplying ice and bait to the New England fishing fleet. This trade is of recent origin, being the result of the absence of the menhaden from the coast of Maine. Formerly the fishermen used menhaden almost exclusively in the summer, but within the last few years these fish have entirely deserted the region, and herring have been substituted for them. The result is, that a considerable number of large weirs have been built, and the inhabitants are just coming to know the value of the herring fisheries in their own waters. The principal islands where the fisheries are prosecuted are Stave Island, off the western shore of Gouldsborough; Bar Island, on the northeast coast of Mount Desert; Cranberry and Gott's Islands, two small groups lying to the south of Mount Desert, and Long Island, Tinker's Island, and Flye's Island, in Blue Hill Bay.

The catch is very often extensive, several of the larger weirs stocking upwards of $2,000 during the short season.

PENOBSCOT BAY, ISLE AU HAUT, AND CASTINE.—Different portions of Penobscot Bay are, also, frequented by schools of herring at different seasons. Though the fish are fairly abundant in almost any part of the outer bay, the fishery is extensive at only a few points. The principal fisheries are located at Isle au Haut, at the eastern entrance of the bay; Castine Harbor, about 30 miles farther north; Crabtree Point, at the western entrance of Fox Island Thoroughfare; and about Matinicus Island, lying 15 miles to the southward in the mouth of the bay.

According to Capt. J. W. Collins, small herring are abundant about the shores of Isle au Haut from May to October, and a school of larger fish makes its appearance along the southern

portion of the island about the middle of July, remaining from three to four weeks. A little later another school arrives, and remains about the same length of time. Formerly, a considerable number of herring were taken in nets by the local fishermen, and vessels have occasionally visited the region, securing full fares. For the past few years, however, the business has not been prosecuted to any extent, and the fishing has been confined to the capture of bait by the local fishermen.

Though herring have been taken in small numbers in the vicinity of Castine for many years, little seems to have been known of their abundance prior to 1874, when the bait fishermen engaged in their capture with gill-nets. Spawning herring were found to be quite plenty, and two years later the first vessels from the surrounding islands resorted to the region, securing full fares, which were carried to Boston. From this date a fleet of four or five vessels have visited the locality yearly, and they have invariably found fish fairly abundant. In 1880, according to Mr. George Morey, of Castine, there were six vessels engaged in the fishery at that place. The fish are of large size, averaging from twelve to thirteen inches in length. They arrive about the middle of July and pass up the harbor for a distance of one to two miles above the village, where they remain until the middle of August for the purpose of depositing their spawn. They are sometimes so abundant that the water is literally filled with them as far down as the village; and instances are on record where nets set just abreast of the wharves have been sunk by the weight of the fish taken in them.

Mr. Morey states that as soon as the school of spawning herring has disappeared, a large number of smaller or "sardine" herring are noticed in the harbor, where they remain till late in the fall.

According to Mr. S. T. Meeker, of North Haven, the first herring fishing of any note at Crabtree Point was in 1870, but even then the fishery was of little importance, and for several years it was carried on only by the local fishermen. In 1873 the fish were unusually plenty, and during the height of the season they were taken in such numbers that many of the nets were sunk as fast as they were put overboard. During this year one small vessel engaged in the fishery, and met with such success as to warrant others in visiting the region the following season. By 1875 the fleet had increased to twenty or twenty-five sail; but in 1878 the herring arrived in such small numbers that the fishermen lost heavily, and no vessels have visited the region since that time. The absence of the fish in 1878 was exceptional, as shown by the catch of the local fishermen during the subsequent years.

MATINICUS ISLAND AND EBENCOOK HARBOR.—Capt. J. W. Collins, who visited Matinicus Island in the fall of 1879, says that the waters about its shores are among the best in the State for the summer herring fisheries, and that vessels from various fishing towns between Cape Cod and Mount Desert resort to the locality to obtain their supply of bait, which they buy from the local fishermen, and from the small vessels that make a specialty of this fishery during the height of the season. Herring were formerly peculiarly abundant, but for the past ten years the catch has been considerably below the average. The fishery is prosecuted wholly by means of nets about the smaller islands in the locality, and a considerable number of the resident fishermen spend a greater part of the summer in netting the fish. Captain Collins estimates that in the summer of 1879 about 2,000 barrels of herring, in addition to a quantity of small mackerel, were taken in the region.

Ebencook Harbor, situated in the northwestern part of the island of Southport, is said by Mr. William T. Maddocks to be a favorite feeding-ground for small herring from August to December. According to the same authority, the fishery began at this point as early as 1806, when a number of local fishermen made large catches by the use of torches and gill-nets. The fishery gradually

increased in importance, and most of the residents built smoke-houses for curing their catch. A little later small vessels began to engage in the fishery, and soon twenty-five or thirty sail, including several of the larger crafts, were often anchored in the harbor at the same time.

The development of the Magdalen herring fisheries had a depressing effect upon the fisheries of this region, and as the supply from that region increased the local fishermen were obliged to turn their attention to other branches of the business. From 1850 the decline of the local fishery was quite rapid, and for a number of years no vessels have visited the harbor, though a few of the boat-fishermen still net a small quantity of herring, which are reported as still abundant in these waters.

CASCO BAY AND SOUTHWARD.—Though considerable numbers of herring are taken about the numerous islands in the mouth of Casco Bay, and at Richmond Island near Cape Elizabeth, the principal herring fisheries of the western coast of Maine are confined to the waters in the vicinity of Wood Island, lying near the mouth of Saco River, 12 miles to the southwest of the city of Portland. This is one of the principal spawning grounds for the herring within the limits of the United States, and the fishery is more extensively prosecuted in this vicinity than at any other point, except Eastport, where not only large but immature fish are taken.

Wood Island is the largest of a group of small rocky islands and ledges lying just off the cape which forms the southern boundary of Casco Bay. It is about half a mile long by less than a quarter of a mile wide. Inside of the island is a harbor, which, though it offers fair anchorage, is exposed to easterly gales, while farther in is a shoal-water cove affording excellent shelter for the fishing fleet.

The herring visit this region solely for the purpose of spawning. They arrive in small numbers about the 20th of September and gradually become more abundant until, a week later, the water is literally filled with them. The great bulk of the fish remain but a few days, after which they disappear.

The accounts of some of the early voyagers mention the fact that herring were very abundant in this region, and it is probable that the fishery has been more or less extensively prosecuted from the earliest settlement of the country. For the last twenty years the locality has been the favorite resort of many of the smaller vessels of the various fishing towns between Cape Cod and Penobscot Bay, and, though the fleet has varied considerably from year to year, it has gradually increased, until in the fall of 1879 there were, according to the statements of the leading Portland packers, fully one hundred and fifty sail, with from two to seven men each, engaged in the fishery, the catch amounting to nearly 20,000 barrels. The greater part of the vessels are owned at Gloucester, Mass., and at Portland, Booth Bay, Bristol, and Friendship, Me.

About the time the herring leave Wood Island a large school makes its appearance among the numerous rocky ledges just south of Cape Ann. On their arrival the principal fishing is at Norman's Woe, at the entrance of Gloucester Harbor, but a little later the herring are more abundant off Marblehead, and later still near Boston Light, at the entrance of Boston Harbor.

Many of the vessels that have been fishing at Wood Island proceed to Cape Ann, and other vessels and boats from the region join in the work, so that the water is soon well filled with nets, and the catch sometimes reaches upwards of 12,000 barrels during the two or three weeks that the fishing continues.

It is claimed by some that the herring taken here belong to the school that visited Wood Island earlier in the season, and that they could readily be followed from one place to the other, a distance of over 50 miles. Others insist that the schools are wholly distinct, and that those leaving Wood Island have thrown all of their eggs and milt, while the school that visits Cape Ann is "*full-roed*"

on its arrival. No careful study has been made of this subject, as the opportunity has not yet presented itself; but it seems more than probable that the whole coast from Seguin Island, at the eastern entrance of Casco Bay, to Boston will prove to be one continuous spawning ground for enormous schools that remain at a considerable distance from the shore, and approach it only in the fall for the purpose of depositing their spawn, after which they return to the deeper water outside, and that there are particular relations between currents and temperature and the movements of the fish that cause them to visit the northern portion of the ground nearly two months earlier than they do the waters about Boston.

The theory advanced recently that the herring, unlike the shad and alewife, spawn on a falling temperature is very naturally suggested by the habits of the fish in this locality, but when we remember that the herring spawn in April and May at Magdalen Islands, in midsummer at Grand Manan, and probably in March at Eastport, Me., there is abundant reason why this theory should be rejected.

South of Boston there are no extensive herring fisheries, and there is no particular locality where the fish are known to be abundant. According to Mr. F. W. True, a few are taken in the weirs along the shores of Cape Cod, and Mr. W. A. Wilcox reports an occasional catch in the weirs of Narragansett Bay. Both of these gentlemen, however, state that no one makes a business of catching the herring, and that most of those taken while fishing for other species are used for bait by the local line-fishermen or sold to the Cape Ann vessels that resort to the region in spring to purchase menhaden and alewives to be used in the George's Bank cod fisheries.

2. VESSELS AND CREWS.

THE VESSELS AND OUTFIT.—As has already been stated, there is not a single vessel belonging to the United States that is engaged regularly in the herring fisheries throughout the year, since they are not considered sufficiently remunerative to warrant the fishermen in devoting any considerable portion of their time to them. During the spawning season, however, a large number of small vessels of an inferior grade, that have been engaged in shore trawling, or to a limited extent in the coasting trade, are fitted out for this work. These proceed carefully along the shore from harbor to harbor until they reach the fishing grounds. Some are considered nearly unfit for the other fisheries and lie idle during the greater part of the year, their trip for herring in the fall being their principal work. The poorer class of vessels, though scarcely seaworthy, can be employed to advantage in the herring fisheries, as they remain constantly in or near the harbor, where they can be securely anchored during stormy weather, while the fisheries are prosecuted from small boats that go daily to the fishing grounds. The vessels serve principally as a home for the fishermen and as a storehouse for receiving their catch; and they are also used for carrying the fish to market at the close of the season.

These vessels range from 5 to 40 tons, the larger ones going a distance of more than a hundred miles from home either for the purpose of catching or marketing their fish. Even the smaller vessels frequently go from 50 to 75 miles away, though their captains are very careful to wait for a favorable opportunity, often anchoring in a convenient harbor a number of times on the passage. The value of these vessels depends upon their size and condition, the price varying from $150 to $1,000.

In preparing for this fishery the vessels lay aside their trawls and other fishing gear and supply themselves with gill-nets, after which they proceed to some of the principal fishing ports, where they are supplied with barrels and a sufficient quantity of salt for preserving the catch.

The herring-nets are 15 to 20 fathoms long, 2 to 3 fathoms deep, and have a mesh varying from 2¼ to 2¾ inches. Each vessel usually carries from 8 to 15 of these nets, which, together with the anchors and hangings, are worth $10 to $15 apiece. The webbing is usually purchased from the various factories in the larger cities, and, after being hung by the fishermen, the nets are tanned with catechu or dipped in tar for the purpose of preserving them.

Each vessel is also provided with small open boats, varying from 14 to 18 feet in length, one of these being carried for every two members of the crew, with the exception of the cook, who usually remains on board to care for the vessel while the others are tending the nets.

THE FISHERMEN.—The greater part of the men engaged in the herring fisheries are those who have been employed in some branch of the shore fisheries during the summer months. With few exceptions, they are native-born Americans, though a considerable percentage of the Boston fishermen are of foreign birth, the majority of these being Irish. The crews vary in number, according to the size of the vessel. The smallest vessels usually carry two men and a boy, while the larger ones carry as high as seven or eight men. Taking the entire herring fleet, a fair average would be four or five men to the vessel.

3. THE LAY AND SHARE.

SCOTCH METHODS.—It might be interesting, under this head, to give an idea of the relations between the fishermen and dealers in Scotland, where the fisheries are very important. Mr. James G. Bertram says:

Commerce in herring is entirely different from commerce in any other article, particularly in Scotland. In fact, the fishery, as at present conducted, is just another way of gambling. The home "curers" and foreign buyers are the persons who at present keep the herring fishery from stagnation; and the goods (*i. e.*, the fish) are generally all bought and sold long before they are captured. The way of dealing in herring is pretty much as follows: Owners of boats are engaged to fish by curers, the bargains being usually that the curer will take two hundred crans of herring—and a cran, it may be stated, is forty-five gallons of ungutted fish; for these two hundred crans a certain sum per cran is paid, according to arrangement, the bargain including as well a definite sum of ready money by way of bounty, perhaps also an allowance of spirits, and the use of ground for the drying of the nets. On the other hand, the boat-owner provides a boat, nets, buoys, and all the apparatus of the fishery, and engages a crew to fish; his crew may, perhaps, be relatives and part owners, sharing the venture with him, but usually the crew consists of hired men, who get so much wages at the end of the season and have no risk or profit. This is the plan followed by free and independent fishermen who are really owners of their own boats and apparatus. It will thus be seen that the curer is bargaining for two hundred crans of fish months before he knows that a single herring will be captured; for the bargain of next season is always made at the close of the present one, and he has to pay out at once a large sum by way of bounty, and provide barrels, salt, and other necessaries for the cure before he knows even if the catch of the season just expiring will all be sold, or how the markets will pulsate next year. On the other hand, the fisherman has received his pay for his season's fish, and very likely pocketed a sum of from ten to thirty pounds as earnest money for next year's work. Then, again, a certain number of curers, who are men of capital, will advance money to young fishermen in order that they may purchase a boat and the necessary quantity of netting to enable them to engage in the fishery, thus thirling the boat to their service, very probably fixing an advantageous price per cran for the herrings to be fished and supplied. Curers, again, who are not capitalists, have to borrow from the buyers, because to compete with their fellows they must be able to lend money for the purchase of boats and nets, or to advance sums by way of bounty to the free boats; and thus a rotten, unwholesome system goes the round—fishermen, boat-builders, curers, and merchants all hanging on each other, and evidencing that there is as much gambling in herring fishing as in horse-racing. The whole system of commerce connected with this trade is decidedly unhealthy, and ought at once to be checked *and reconstructed if there be any logical method of doing it.* At a port of three hundred boats a sum of £145 was paid by the curers for "arles" and spent in the public houses! More than £4,000 was spent in bounties, and an advance of nearly £7,000 made on the various contracts, and all this money was paid eight months before the fishing began. When the season is a favorable one and plenty of fish are taken, then all goes well, and the evil day is postponed; but if, as in one or two recent seasons, the take is poor, then there comes a crash. One falls, and, like a row of bricks, the others all follow. At the large fishing stations there are comparatively few of the boats that are thoroughly free; they are tied up in some way between the buyers and curers, or they are in pawn to some merchant, who "backs" the nominal owner. The principal, or at least the immediate sufferers, by these arrangements are the hired men.

This "bounty," as it is called, is a most reprehensible feature of herring commerce, and, although still the prevalent mode of doing business, has been loudly declaimed against by all who have the real good of the fishermen at

heart. Often enough men who have obtained boats and nets on credit and hired persons to assist them during the fishery are so unfortunate as not to catch enough of herrings to pay their expenses—the curers for whom they engaged to fish having retained most of the bounty money on account of boats and nets; consequently the hired servants have frequently to go home, sometimes to a great distance, penniless. It would be much better if the old system of a share were reintroduced. In that case the hired men would at least participate to the extent of the fishing, whether it were good or bad. Boat-owners try of course to get as good terms as possible, as well in the shape of price for herrings as in bounty and perquisites. My idea is that there ought to be no engagements, no bounty, and no perquisites. As each fishing comes round let the boats catch and the curers buy day by day as the fish arrive at the quay. This plan has already been adopted at some fishing towns, and is an obvious improvement on the prevailing plan of gambling by means of "engagements" in advance."*

AMERICAN METHODS.—In New England the relation of vessel owners and dealers to the fishermen is very different from that already described. The vessels are usually owned by the captain, who selects his crew from among his friends on account of their supposed fitness for and experience in the fishery. The owner furnishes the vessel in a condition ready for sea, and receives in return from one-fifth to one-seventh of the first value of the catch. The crew, on the other hand, provide all the apparatus for the fishery, including boats, nets, and other fishing-gear. They are also expected to provide themselves with provisions, and to arrange with one of their number to act as cook. The cook is, in most cases, the son of the captain, or of some member of the crew, whose services are obtained for a small compensation. He is expected to remain constantly on board to care for the vessel while the men are tending their nets, and, in addition to preparing the food, must assist in salting and packing the fish.

The vessel is generally taken to one of the larger ports in the vicinity of the fishing-grounds, where an arrangement is made with a fish-dealer to supply barrels and salt for packing and curing the catch. The dealer usually supplies the provisions necessary for food, and in some instances furnishes a portion of the fishing-gear, it being understood that he shall receive the fish at a stated price. The fishermen seldom pay for the outfit when it is received, but on the contrary run an account with the dealer, who depends largely upon their catch for his money; and it often happens, when the fisheries are poor, that he loses heavily. There is a disposition among certain crews to avoid the payment of their obligations, and it frequently occurs that, unless carefully watched, they will carry the greater part of their catch to other places for a market, selling for cash and pocketing the money. The dealers have lost so heavily in this way that they are now very cautious as to whom they will trust, and the skippers who for any reason are not considered responsible, experience considerable difficulty in finding a dealer who is willing to advance them the necessary outfit. Many of them are thus placed at a disadvantage, as they seldom have sufficient funds to pay for their goods until they have disposed of their catch.

After the catch has been marketed the vessel's portion of the money is set aside. All bills, including the cook's wages and the cost of salt, barrels, provisions, &c., are then paid out of the general stock, after which the money is divided equally among the different members of the crew, the captain sharing equally with the others. The amount of money realized by the men engaged in the herring fisheries varies exceedingly; some vessels are very successful and secure large trips, while others may fish the entire season with only moderate success. The average share to the fishermen would be, perhaps, $30 to $50 per month.

4. METHODS OF CAPTURE.

TORCHING.—There are three principal methods of catching the herring on the coast of the United States. The oldest, and in early years the most common method, was that known as "torching." Later, brush weirs were introduced, and these are now extensively employed in

* Harvest of the Sea, pp. 183–185.

the capture of small herring along the eastern part of the coast of Maine. The spawning herring are usually taken in gill-nets, a method which has been employed for many years on different portions of the coast.

The well-known instinct of herring to follow a light was observed by the Indians prior to the settlement of the country by the whites. The discovery was doubtless the result of their extensive camp-fires, which were built along the shores in the principal fishing districts. The method of torching is also said to be in use by the fishermen of other countries. Torching is a very simple method. For this purpose the fishermen usually select a medium-sized boat, which can be propelled rapidly through the water by means of oars. The boat is provided with a small iron frame called a "dragon," which projects from the bow. In this dragon a fire of birch bark and other highly combustible materials is kept constantly burning while the fish are being taken. The fishermen usually go to the shore late in the afternoon and time their departure so as to reach the fishing grounds shortly after sunset. As soon as it becomes sufficiently dark the fire is lighted, one man takes his position in the stern to steer the boat and another stations himself in the bow, armed with a dip-net for securing the fish as they gather in little bunches just in front of the light. The remaining members of the crew row the boat rapidly through the water, while the man in the bow is busily engaged in throwing the fish into the boat by means of his dip-net. Great numbers of herring are attracted by the light and it is not uncommon for fifteen or twenty barrels to be taken in a few hours.

Where the current is strong it is often customary to row out into the channel, and then gradually work in toward the shore, thus bringing the fish into shoaler and stiller water where they can be more easily secured.

Torching is the method commonly employed at Ipswich Bay, Massachusetts; it is also practiced to a considerable extent at Eastport, Me., these being the only points where it has been generally adopted; but the method is occasionally employed on a smaller scale by the fishermen of other portions of the New England coast.

POUNDS, TRAPS, AND WEIRS.—Pounds, traps, and weirs are also used for the capture of herring. These are all built upon the same general plan, having a "leader" or "wings," which direct the fish to one or more "pockets" or "pounds," which retain them until they can be secured. They vary greatly in size and shape, according to locality and the peculiar character and shape of the shore and adjoining ocean bed. The material of which they are constructed also differs. In one region netting will be exclusively employed, in another the traps will be built largely of lath and boards, while in another still the entire weir will be built of brush and poles. At Cape Small Point, near Portland, Me., and at Bristol, the pounds, which are quite large, are composed chiefly of netting; and, owing to the rocky character of the bottom, the poles, instead of being driven into the ground, are secured by means of large flat stones, in which they are inserted, or poles are entirely dispensed with and the pounds are held in position by means of anchors and ropes. In this case the bottom of the netting is weighted with lead or stones and the top is supplied with large floats to keep it at the surface. Some of these floating traps are very successful in the capture of large quantities of fish.

About Cape Cod, according to Mr. F. W. True, the traps usually have leaders of netting and pockets of board or lath. Though fished for other species, they often take considerable numbers of herring at certain seasons.

The brush weir is extensively used in the herring fisheries of the coast of Maine. It is peculiarly adapted to the capture of small herring, which are used in the preparation of sardines at Eastport and other places along the eastern shores of the State. Being the principal method by

which the "sardine-herring" are secured, it will be described in detail in the chapter on the sardine industry.

FISHING WITH GILL-NETS.—The gill-nets used in the herring fishery are from 15 to 20 fathoms long, 2 to 3 fathoms deep, and have a mesh varying from 2¼ to 2¾ inches. They are usually made of cotton twine, the weight varying considerably in different localities. Hemp nets were formerly extensively used, but cotton is found to answer the purpose equally well, and is much cheaper. The nets to be used on the principal spawning grounds, where the fish are known to occur in immense schools, are usually made of strong and comparatively coarse twine, as they are liable to be so heavily loaded with fish that those of light weight would be ruined in a single night. Along other portions of the coast, where the fish are less abundant, nets of finer material are often employed.

In former years the webbing was usually knit by the wives and children of the fishermen, and this is done to a limited extent at the present time, though most of the fishermen have come to use machine-knit webbing, which they buy from the net factories of the principal cities.

When the webbing is ready it is hung to small double lines of opposite lays, about one-third of the length of the net being taken up in hanging, so that a piece of webbing 30 fathoms long will make a net of 20 fathoms when hung. After the net has been properly tanned or tarred and hung to these double lines a heavier cork-rope, supplied with egg-shaped wooden floats or with corks, is made fast to the upper margin. The floats are placed at distances varying from 2½ to 4 feet, according to their size and the strength of the current in which the nets are to be used. Small leaden sinkers are sometimes attached to the bottom, but more frequently oblong stones are used, these being more readily obtained and as easily fastened by means of small loop-lines. In the vicinity of Eastport iron anchors varying from 20 to 50 pounds are generally employed. On some parts of the coast the fishermen use stone killicks. These as a rule must be considerably heavier to answer the same purpose.

Several nets are usually fastened together and set in one string, though in some instances they are set separately. Where the current is strong they are usually anchored at only one end, the other being allowed to swing with the tide, but in still water an anchor is ordinarily placed at either end of the string. Large buoys are attached to either end of each net to assist in holding it up and to mark its position in the water. In addition to these, larger watch-buoys are attached to either end of the string, to provide against the loss of the nets in case they should be carried to the bottom by the weight of the fish. The watch-buoys have lines of sufficient length, so that if the nets should be sunk the buoy will still float on the surface and enable the fishermen to secure them. The buoys in general use are made of spruce or other light wood, and, on account of their shape, are known as "spar-buoys." Those to be placed at the end of each net are usually 3½ to 5 feet in length and from 6 to 8 inches in diameter, while the watch-buoys are proportionately larger. Where the current is weak and a large catch is expected pine kegs are frequently employed.

Toward the close of the afternoon a busy scene is presented at Wood Island. The men are now engaged in transferring the nets to the small boats, and soon after they may be seen making their way out of the harbor, some sailing and others pulling vigorously at the oars. After reaching the fishing ground, which is some 2 or 3 miles distant, the fishermen select their berth and begin setting their nets. One man rows the boat in the desired direction, which may be either with or across the tide, while the other throws out the nets. There is frequently a lively competition among the fishermen as to who shall secure the best berth, and it is not uncommonly the case that they will row about for a considerable time in search of "signs of fish" before deciding exactly where to locate for the night.

The nets are set at varying depths; they are at times placed on the surface, and at others sunk to a depth of 1 or 2 fathoms, in which case heavier sinkers are attached to the bottom of the net, and the "tail ropes" of the buoys are increased to the desired length. As soon as the nets have been properly set the fishermen return to the vessel.

If a large catch is expected the nets are visited about midnight for the purpose of "underrunning." By this method the net is not removed from its moorings. The fishermen proceed to one end of the string, raising the net, passing it over the top of the boat, and returning it to the water on the opposite side as fast as the fish are removed. In this way only a few feet of the net are out of the water at a time, while the balance is fishing as usual. The fish are either shaken or picked out of the nets, as is most convenient. The time required for underrunning depends wholly upon the size of the catch and the number of nets that are out.

One object in underrunning the nets at midnight is to secure an additional quantity of herring; another is to remove a portion of the catch, and thus prevent the nets from being so heavily loaded as to injure them by the weight of the fish.

When there is no indication of a large catch the nets are not visited till morning. At the approach of dawn the work of the fishermen begins, and soon the glimmer of lights may be seen in all directions, as they move to and fro about the decks of the vessels making their preparations for "a start." A little later they enter their boats and are off for the fishing grounds. The nets are usually reached by daybreak, when they are at once loosed from their moorings and hauled into the boat with the fish still hanging in the meshes. If the berth is a good one, the moorings are left in the water to mark the position and to retain it for another set. The boat, with its load, at once returns to the vessel. The nets are then taken on deck, where the fish are removed. They are then carefully examined and mended, if need be, after which they are placed in the rigging of the vessel or carried to the adjoining shore to be thoroughly dried.

GILL-NET FISHING FOR BAIT.—For many years prior to the introduction of frozen herring into the American markets the vessels engaged in the cod fisheries of George's and Brown's Banks and other fishing grounds in the Gulf of Maine usually carried from three to six herring nets, to be used in the capture of herring for bait. These were sometimes set from the vessel's stern as she lay at anchor on the fishing grounds, but quite as frequently the vessel proceeded to the deep water off the edge of the bank, where she was hove to under her mainsail and foresail in such a manner that she might drift in a direction at right angles to that in which she was headed. The nets were then put out, their inner end being attached to the mainmast by means of a long rope called a net-string. As a rule, the vessel was hove to in the evening and allowed to drift during the greater part of the night.

When the nets were to be taken in all hands were called to assist in the work. The nets were at once hauled on deck, after which the fish were removed. When the catch was small the fish were usually placed in barrels or tubs, to be used during the day's fishing; but when a large quantity were secured, the greater part were transferred to the hold of the vessel, where they were iced or lightly salted, to be used later in the fishing. After the fish had been stowed away, the nets were washed and hung upon the stern to dry.

It frequently happened that enough fish were taken at a single set to last until a fare was secured. At times when the fish were large and fat the surplus was often sorted and carried to market. Occasionally, however, herring were found very scarce, and vessels had great difficulty in securing a supply, a longer time being required in catching the bait than in using it. It was largely due to this fact that the frozen herring met with such general favor when they were first introduced.

Another method, known as "sweeping," was frequently employed. By this method ordinary gill-nets were used in the daytime. When the fish were seen schooling at the surface they were at once surrounded by a wall of netting, and driven into the meshes by means of rocks or oars, which were thrown or darted into the water. This method was extensively used by the vessel fishermen in former times, and is still employed to a greater or less extent by the shore fishermen in various localities along the coasts of Maine and Massachusetts.

SEINES.— Seines, though extensively employed in the herring fisheries of Newfoundland and other places, are seldom used in the capture of these fish on the coast of the United States, as traps and weirs are found to be less expensive and answer the purpose equally well.

Large catches of herring are often made in the purse-seines of the mackerel fishermen. These are used at a considerable distance from the shore in the capture of mackerel, and it occasionally happens that schools of herring are taken by mistake, or that both herring and mackerel are taken at the same set. The fishermen claim that the two species seldom mingle freely in the same school, and they explain the fact of their being taken together by saying that the herring have a habit of following the mackerel and of swimming beneath them in the water. There seems no sufficient evidence to substantiate or to disprove this theory. Captain Collins, who has been extensively engaged in the mackerel fisheries, gives it as his opinion that the purse-seine can be used to great advantage in the herring fisheries off the American coast whenever the price of the fish will warrant the fishermen in engaging in their capture. At the present time, however, the demand for them is so light and the price is so low that no attention is given to the capture of herring by the mackerel fishermen, and when a school is accidentally taken it is at once turned out, the men not considering the herring worth the time and trouble required in curing them.

5. DISPOSITION OF THE CATCH.

STATISTICAL SUMMARY.—The total catch of herring by the fishermen of Maine in 1880 was 34,695,192 pounds, which entered into consumption as follows: 4,300,000 pounds used fresh for food, 8,819,875 pounds used for pickling or brine salting, 6,138,942 pounds used for smoking, 6,496,375 pounds used for canning, 7,000,000 pounds used for bait, and 1,940,000 pounds used for fertilizer.

In New Hampshire the catch was 108,750 pounds of herring, about 60,000 pounds being used for food and the remainder for bait and fertilizer.

In Massachusetts the catch in 1879 was 7,794,780 pounds, of which quantity 3,827,124 pounds were consumed fresh (2,610,514 pounds for bait and 1,216,610 pounds for food) and 3,967,656 pounds were used for pickling.

CARE OF THE FISH ON THE VESSELS.—As shown above, very many of the herring taken by the American fishermen are used for bait in the shore and bank cod fisheries and in the fresh-halibut fishery. Many more were salted for the market in former years than at the present time. The greater part of those now prepared by American fishermen are salted without splitting, and are known in the market as "round herring," in distinction from those that have the gills and viscera removed, which are known as "split herring."

In the vessel fisheries the greater part of the herring are salted in barrels before being landed. After being taken from the net they are heaped upon the deck and water is thrown upon them for the purpose of washing off the loose scales and the blood that has collected. A quantity of salt is then sprinkled over them and thoroughly mixed among the fish. They are then placed in barrels, when a little more salt is added, and they are rolled aside, where they are allowed to settle, and are again filled up with fish. As soon as the fish have become properly "struck" the barrels are

headed up and stowed in the hold until such time as the vessel shall arrive at the market where they are to be sold. The fish in this condition are known as "sea-packed" herring, and bring about two-thirds of the price of herring that are properly packed.

HERRING-CURING ON SHORE.—On reaching the market the fish are sold to some of the principal dealers, who at once dump them out of the barrels and thoroughly wash them. They are then weighed in lots of two hundred pounds, each lot being carefully packed in a barrel by itself, care being taken that the herring may be placed in such a position as to show to the best advantage. A quantity of salt is sprinkled among them as they are packed. When the barrel is full it is headed up and a hole is bored in one side, through which a quantity of strong brine is poured upon the fish. After being allowed to settle for a number of hours, more brine is added, care being taken that the barrel shall be completely filled. The hole is then plugged up and the fish are ready for market.

In many cases the fishermen in the vicinity of the larger fishing ports dispose of their herring before they have been salted. As soon as the nets have been hauled they set sail and proceed to the harbor, where, unless some contract has been previously made, the catch is sold to the highest bidder. The fish are at once thrown upon the wharf and salt is sprinkled upon them. They are then shoveled into boats or hogsheads, and strong brine is added until they are completely covered. Here they are allowed to remain for a number of days or weeks, until they are thoroughly cured, when they are packed as above described.

Another brand known as "split" or "gibbed" herring is frequently put up. The split fish differ from the round herring in that the gills and entrails have been removed. The gibbing is usually done by the fishermen before the herring are salted. A rough method of gibbing, which is occasionally employed, is to tear the gills from the fish by means of the thumb and fore-finger, and to remove the entrails through the opening thus made. The more common practice, however, is to split the fish down the belly with a knife, in order that the viscera and gills may be more easily removed. The blood is also scraped from the backbone, and the fish are thrown into a tub of water to be soaked before salting. When the blood has been sufficiently removed to give the herring a light color they are carefully packed in barrels, with enough salt to preserve them. The roe-bags of spawning herring are usually left in the fish, as these are considered a great luxury by the Irish. Most of the gibbed herring are among the best quality of fat fish taken on the coast, and fish of inferior quality are generally salted without splitting. The market price of split herring is usually from one to two dollars more than that of fish prepared in the ordinary way.

It is claimed by many that the American methods of curing are very inferior to those employed in other countries, as the fish are often allowed to remain a considerable time before they are salted, and they are also washed and new pickle is used for repacking them. By changing the pickle, or by soaking the fish, they are thought by many to lose much of the rich and delicate flavor for which the herring are so highly prized by the herring-eating nations of Europe. In Holland and other countries where herring are regarded with great favor the fishermen aim to salt the catch as soon as possible after the fish have been taken, and the herring are seldom allowed to stand more than two or three hours before they are cared for.

HERRING-CURING IN SCOTLAND.—The method of curing in Scotland is described by Mr. Bertram in the following manner:

"At stations about Wick the quantity of herrings disposed of fresh is comparatively small, so that by far the larger portion of the daily catch has to be salted. This process during a good season employs a very large number of persons, chiefly as coopers and gutters; and as the barrels have to be branded, by way of certificate of the quality of their contents, it is necessary that the

salting should be carefully done. As soon as the boats reach the harbor—and as the fishing is appointed to be carried on after sunset they arrive very early in the morning—the various crews commence to carry their fish to the reception-troughs of the curers by whom they have been engaged. A person in the interest of the curer checks the number of crans brought in, and sprinkles the fish from time to time with considerable quantities of salt. As soon as a score or two of baskets have been emptied, the gutters set earnestly to do their portion of the work, which is dirty and disagreeable in the extreme. The gutters usually work in companies of about five—one or two gutting, one or two carrying, and another packing. Basketfuls of the fish, as soon as they are gutted, are carried to the back of the yard and plunged into a large tub, there to be roused and mixed up with salt; then the adroit and active packer seizes a handful and arranges them with the greatest precision in a barrel, a handful of salt being thrown over each layer as it is put in, so that in the short space of a few minutes the large barrel is crammed full with many hundred fish, all gutted, roused, and packed, in a period of not more than ten minutes. As the fish settle down in the barrel, more are added from day to day till it is thoroughly full and ready for the brand. On the proper performance of these parts of the business the quality of the cured fish very much depends."

LAWS REGULATING HERRING CURE.—Many of the European countries have laws describing in detail the exact manner in which the herring shall be prepared, and great care is taken that the fish shall be properly cured in every particular. In America, on the contrary, little care is taken in the preparation of the fish, and though there are laws relating to the subject they refer more to the quantity of fish which a package of a given size shall contain, and to the amount of salt used in packing the fish, than to the quality of the fish. At one time the laws of all the States having extensive herring fisheries required that all of the pickled herring should be inspected before they were sent to market. A law to this effect is still in force in the States of Maine and New Hampshire. According to section 7, chapter II, of the Laws of Maine for 1875:

"Every inspector who inspects pickled alewives or herring, packed whole or round, shall see that they are struck with salt or pickle, and then put in good casks of the size and material aforesaid, packed closely therein and well salted, and the casks filled with fish and salt, putting no more salt with the fish than is necessary for their preservation; and the inspector shall brand all such casks with the name of the inspected fish as aforesaid, but in no case shall the inspector brand the casks unless the fish contained therein shall have been packed and prepared under his immediate supervision."

Section 8 of chapter XI of the Revised Statutes of Maine for 1871 gives the following description of the barrels in which fish are to be packed:

"All tierces, barrels, or casks, used for the purpose of packing pickled fish, shall be made of sound, well seasoned white oak, white ash, spruce, pine, or chestnut staves of rift timber, with headings of either of such kinds of wood, sound, well planed, and seasoned, and the heads, if of pine, free from sap; the same to be well hooped with at least three strong hoops on each bilge, and three also on each chime; the barrel staves to be 28 inches in length, and the heads to be 17 inches between the chimes, and made in a workmanlike manner to hold pickle, and branded on the side near the bung with the name of the maker or owner thereof. The tierces shall contain not less than 45 nor more than 46 gallons each, the barrels from 29 to 30 gallons each, and the aliquot parts of a barrel in the same proportion."

The laws of the State of Maine, as recently amended, do away with an inspector-general, but require the secretary of state to appoint deputy inspectors in the various fishing towns, these to receive their commission from him and to be obliged to report to him the quantity of fish inspected

by them each season. The law is practically of little value, as many of the inspectors fail to report on their work, and a considerable quantity of herring salted at Eastport and elsewhere are never inspected.

In Massachusetts the inspection of herring intended for pickling is not required by law, though the fish are often properly packed and branded before being placed upon the market. Section 36 of chapter XLIX, of the General Statutes of Massachusetts for 1859, says:

"Under the supervision of the inspector-general and his deputies, respectively, all kinds of split pickled fish and fish for barreling, except herring, and all codfish tongues and sounds, halibut fins and napes, and swordfish, whenever said articles are intended for exportation, shall be struck with salt or pickle," &c.

THE MARKETS.—The principal markets for salt herring along the New England coast are Portland, Boston, Gloucester, and Eastport. Portland probably takes the lead in this trade, receiving the bulk of the herring taken about Wood Island, as well as those caught in Penobscot Bay, and on the spawning grounds off Boisbubert. This port also secures a considerable portion of the fish caught off Cape Ann. Boston is more of a distributing center for the fish, and many of those bought and packed by the Portland dealers are shipped there for distribution to the trade. Gloucester affords a fair market for the catch taken about Cape Ann by the local fishermen; and when the export trade will warrant it sometimes buys largely from the herring dealers of other cities.

Eastport, being situated in the center of the principal herring fisheries of the United States, necessarily handles a large quantity of these fish. The fisheries are prosecuted chiefly in winter, when the herring can be frozen, and the merchants have come to make a specialty of this trade, and they now, in connection with several Boston companies, control the frozen-herring trade of New England. During the spring and fall, and at such times during the winter as the weather will not admit of freezing the fish, a limited quantity are pickled and sold to the Eastport dealers for shipment to Boston and New York.

Prior to the rebellion the bulk of the pickled herring were consumed by the negroes of the Southern States, but the liberation of the slaves had a decided influence on the trade, which has since come to be of little importance. At the present time a majority of the herring are shipped to the mining districts of Pennsylvania, though considerable quantities find their way to the West, where they are consumed largely by the poorer classes, noticeably by the Germans, the Scotch, and other foreigners.

HERRING FOR BAIT.—Mention has already been made of the extensive herring fisheries in different localities for the purpose of supplying bait for the New England fishing fleet. Those vessels engaged in the various branches of the codfishing, as well as some of those employed in the fresh halibut and winter haddock fisheries, are dependent almost entirely upon herring for their bait. The whole question of the use of frozen herring as bait will be found in the chapter on frozen herring, but the bait used by the vessels in summer will more properly be considered in this connection.

For the last twenty years few vessels, with the exception of those employed in the shore fisheries, have carried nets for the purpose of securing their own bait, as they have found it more desirable to purchase their supply from the weir, net, or seine fishermen at different points along the shore. A portion of the fleet depended largely on the catch of menhaden in the Gulf of Maine, and these in a measure took the place of herring. Since 1879, however, the menhaden have been almost wholly absent from these waters, and the fishermen have been seriously inconvenienced

on this account, as the shore herring fisheries have not been sufficiently developed to furnish them with an abundance of fish.

A portion of the fleet engaged in the George's cod fishery visit the southern shores of Cape Cod, or even go as far as Long Island Sound, to secure a supply of menhaden and alewives, rather than run the risk of finding herring on the coast of Maine. In the winter, when frozen fish can be obtained, there is usually an abundant supply in Gloucester; but when these are no longer to be had the George's-men must depend wholly on fish bait and must secure their supply before starting for the fishing banks. For this purpose they usually proceed to the nearer herring grounds on the coast of Maine; but if fish cannot be obtained in these localities they work eastward, stopping at the various bait-stations until a supply has been secured. It frequently happens that from ten to twenty-five vessels may be seen in the same harbor waiting their turns to secure a supply, and those coming last are often obliged to wait four or five days or even a week before a sufficient quantity can be obtained.

The vessels engaged in the George's cod fisheries range from 50 to 75 tons, the average being a trifle over 60 tons. These carry from nine to twelve men, and are fitted for an absence of four or five weeks, though the average trip does not exceed twenty days. A fair catch is 25,000 pounds of split fish, or 50,000 pounds as they come from the water. In the hope of securing a full fare a "George's-man" usually carries as much bait as will be needed under ordinary circumstances. An average quantity is from 25 to 30 barrels for a trip. The price of the herring varies according to supply and demand, the average being from 75 cents to $1 per barrel.

When the fish have been caught they are brought at once to the vessel, where they are carefully packed in ice in one of the bait-pens located in the forward part of the ice-house. The method of packing is similar to that employed in "stowing the bait" in the vessels engaged in the Grand Bank cod-fisheries, a description of which will be given farther on.

Herring as ordinarily packed will keep in good condition for two or three weeks, after which they become so soft that they will not remain on the hook for any length of time, and are therefore of little value.

The greater part of the bait used by the George's fishermen during the summer months is purchased from the various weir and net fishermen of the coast of Maine and Massachusetts, though in the spring and fall a few vessels visit the fishing grounds of New Brunswick to secure their supply, and in seasons of peculiar scarcity vessels have gone as far east as Pubnico, Nova Scotia.

In the Western and Grand Bank cod-fisheries most of the vessels measure between 60 and 100 tons, the average being about 75 tons. A few of larger size are also employed, some of them measuring upward of 120 tons.

The vessels frequenting the Western Bank are gone from five to ten weeks, while those visiting the Grand Bank are absent from three to five months. The number of men carried by these vessels depends largely upon the method of fishing. Those using trawls average from twelve to fourteen men each, while the largest of those engaged in "hand-lining from dories" carry twenty or more men. The last-named vessels are provided with salt clams, and seldom use any herring in the fishery. Most of the trawlers, on the contrary, depend almost wholly upon fresh herring, with the exception of the summer months, when capelin (*Mallotus villosus*) and squid (*Ommastrephes illecebrosa*) are used. The entire supply, with few exceptions, is obtained along the coast of the British Provinces, the greater part being secured at Newfoundland and Nova Scotia, though considerable quantities are purchased from the fishermen of New Brunswick. The vessels fishing in the Gulf of Saint Lawrence usually obtained their supply in that region.

As soon as the vessel is fitted out for the fishery she proceeds to one of the "baiting stations,"

where a supply of 40 to 60 barrels is purchased. Capt. D. E. Collins, in his manuscript journal of a fishing trip to the Western Bank, in the spring of 1879, gives the following account of the method of icing the bait on a vessel engaged in the Bank fisheries: "Our bait-pen is built forward of the cabin bulk-head, between it and the after-hatch. It is 9 or 10 feet wide by 10 or 12 feet long, and holds about 60 barrels of bait in addition to the ice necessary for preserving it. The bottom of the pen is raised a foot or more above the keelson. There is a partition in the middle, dividing the pen into two parts, so that all the fish of one may be used before the others are disturbed. This arrangement is important, as the fish do not keep well after they have been once disturbed. The pen is built of double boards, having a door on either side at the forward end. The lower part of the door is raised about 2 feet above the bottom. When bait is being iced boards are shipped into grooves in the opening as fast as they are needed to prevent the fish from falling out, and, when full, the door is put up on the outside and held in place by means of a horizontal bar. When the bait has been secured the ice is at once removed from the pens and taken on deck. As the work proceeds one cake after another is placed in a large tub, and four or five men, armed with fish-forks, are engaged in 'picking it up fine' until the necessary quantity has been broken. Others of the crew are engaged in passing the baskets of herring and fine ice to those who are stowing the bait. There are generally two men in the hold, one in the bait-pen and another at the hatchway. A layer of ice is first put upon the floor of the pen, after which a thin layer of herring is added, then another layer of ice, and so on until the pen is nearly full. The whole is covered by a quantity of ice varying from 6 inches to 1 foot in thickness, according to the season, the pen to be opened last having the largest quantity."

Bait iced in this manner will keep about three or four weeks, after which the vessel must return for a fresh supply. The fishermen of Long Island Sound have a practice of "gutting" a portion of the fish, and claim that in this way they are enabled to keep them for a much longer period.

When bait is scarce the vessel frequently sails without having secured a full supply, as it is desirable to reach the fishing ground as soon as possible.

The vessels fishing on Western Bank use herring almost exclusively, and make from one to three trips to the land to purchase a fresh supply while securing their load of codfish. The vessels engaged in the Grand Bank fisheries frequently make five or six "baitings" during the season; but they depend largely upon capelin for four or five weeks, beginning with June 15, and on squid from the middle of July to the 1st of September, as these are abundant during their respective seasons, and the cod are thought to prefer them.

Captain Collins states that there is often considerable competition between the captains of the vessels that are in search of bait. When a number of them reach a harbor at the same time, being anxious to secure their bait at the earliest possible moment, underhand methods are sometimes resorted to, and the price is often carried far beyond what the fish are actually worth. On April 23, 1879, he was obliged to pay $2.25 a barrel for herring, and three days later it sold as high as $3.25 at Ketch Harbor, Nova Scotia. The Provincial fishermen are fully aware of the dependence of the Americans upon them for their supply, and they frequently take an undue advantage of it. They are certainly greatly benefited by the trade, and those engaged in the capture of bait are reported as more successful than those engaged in any other branch of the Provincial fisheries.

6. STATISTICS OF THE HERRING FISHERY.

The following table shows the number of vessels and other details of the herring fleet from New England ports in 1880. It does not include the hundreds of small boats employed in the fishery, but only decked vessels over 5 tons burden.

Herring fleet of New England for the year 1880.

Towns.	Number of herring vessels.	Tonnage.	Value.	Number of men.
MAINE.				
Eastport	10	194.35	$6,375	51
Pembroke	2	42.12	2,500	16
Lubec	6	81.42	1,900	26
Machiasport	2	54.37	1,700	14
Jonesport	1	18.42	600	5
Steuben	1	11.33	400	3
Gouldsborough	1	26.94	350	5
Sullivan	1	7.65	150	3
Mount Desert	2	48.32	1,000	8
Tremont	6	93.77	1,425	25
Cranberry Islands	6	94.97	2,300	24
Blue Hill	1	6.86	150	2
Brooklin	3	60.41	1,300	14
Deer Isle	18	390.79	4,985	80
Sedgwick	1	17.27	500	2
Bucksport	1	43.20	500	6
Swan's Island	9	184.08	4,150	41
Isle au Haut	1	25.85	500	6
Total for Eastern Maine	72	1,402.14	36,785	331
Belfast	1	7.76	100	2
Camden	1	20.92	6,250	3
North Haven	1	8.32	250	2
Vinal Haven	2	30.86	550	7
Bear Island	1	6.82	500	3
Rockland	1	31.00	700	5
Saint George	2	20.26	550	7
MAINE—continued.				
Cushing	6	101.20	$1,800	25
Friendship	22	429.63	13,375	76
Matinicus Island	2	19.06	850	6
Waldoborough	3	65.96	1,053	14
Bremen	4	52.95	1,075	14
Bristol	9	202.38	4,375	42
Monhegan Island	1	18.93	200	4
Booth Bay	2	15.93	300	5
Portland	14	186.84	7,750	52
Biddeford	6	48.63	3,050	23
Kennebunk Port	8	103.57	6,150	35
York	1	30.64	2,000	9
Kittery	2	15.09	550	6
Total for Western Maine	89	1,416.15	48,925	340
Total for Maine	161	2,818.29	79,710	671
NEW HAMPSHIRE.				
Portsmouth	1	18.14	400	6
MASSACHUSETTS.				
Gloucester	22	308.75	19,820	103
Boston	2	71.26	1,200	18
Hull	5	66.44	1,300	15
Total for Massachusetts	29	447.45	22,320	135
Grand total	191	3,283.88	102,430	812

The following tables show the yield of the herring fisheries of New England and of the Dominion of Canada in 1880, and include the catch of vessels, boats, and weirs:

Table showing the quantity and value of herring taken in New England in 1880.

	Maine.	New Hampshire.	Massachusetts.	Total.
Fresh herring.				
Pounds used for food	4,390,000	18,750	1,216,610	5,625,360
Pounds used for bait	7,000,000	30,000	2,610,514	9,640,514
Pounds used for fertilizer	1,940,000			1,940,000
Pickled herring.				
Pounds of fresh herring used for pickling	8,819,875	60,000	3,967,656	12,847,531
Barrels of pickled herring produced	32,830	200	15,870	48,900
Value when pickled	$102,472	$600	$47,612	$150,685
Smoked herring.				
Pounds of fresh herring used for smoking	6,138,942			6,138,942
Boxes of smoked herring produced	370,615			370,615
Value when smoked	$99,973			$99,973
Canned herring (sardines).				
Pounds of fresh herring used for canning	6,496,375			6,496,375
Pounds of canned herring produced	2,377,152			2,377,152
Value when canned	$772,176			$772,176
Total number of pounds caught	34,695,192	108,750	7,794,780	42,598,722
Total value as sold	$1,043,722	$1,200	$85,812	$1,130,734

Table showing the quantity and value of the herring taken in the Province of Quebec in 1880.

Divisions.*	Fresh or pickled herring.			Smoked herring.			Page of Report of Canadian Minister of Marine and Fisheries.
	Barrels.	Price per barrel.	Value.	Boxes.	Price per box.	Value.	
South shore of Saint Lawrence (Cape Chatte to Restigouche)	†10,743	$5 00	$53,715	552	$0 25	$138 00	53
North shore of Saint Lawrence (Manacouagan to Blanes Sablons)	†4,021	5 00	20,105				76
Magdalen Islands	17,644	5 00	88,220				100
Anticosti	†1,472	5 00	7,360	10	25	2 50	106
South shore of Saint Lawrence (Point Lévis to Cape Chatte)	21,218	4 00	84,872				118
Total	55,098	4 61½	254,272	562	0 25	140 50	

* The divisions of the Province of Quebec—*from the city of Quebec to Bersimis* and *the Saint Lawrence above Quebec* (see pp. 119 and 123, Report of Minister of Marine and Fisheries)—are omitted, having no mackerel or herring.

† *Pickled.*

Table showing the quantity and value of the herring taken in the Dominion of Canada in 1880.

Province.*	*Pickled herring.*			*Smoked herring.*			Page of Report of Canadian Minister of Marine and Fisheries.
	Barrels.	Price per barrel.	Value.	Boxes.	Price per box.	Value.	
Ontario	7,066	$4 00	$28,264				292
Quebec	55,098	4 61½	254,272	562	$0 25	$140 50	53, 76, 100, 106, 118
Nova Scotia	136,543	4 00	546,172	60,020	25	15,005 00	185
New Brunswick	125,552	4 00	502,208	477,349	25	119,335 00	215
Prince Edward Island	18,020	†4 00	72,080				249
British Columbia	‡10	†4 00	40			1,750 00	269
Total	342,289		1,403,036	537,922		136,230 50	

* The inland Province of Manitoba, which of course has no mackerel or herring, is omitted. † Not given in official report. ‡ Pickled.

2.—THE FROZEN-HERRING INDUSTRY.

1. ORIGIN OF THE TRADE.

NEWFOUNDLAND FROZEN-HERRING TRADE.—The island of Newfoundland has, from its earliest discovery, been a very important locality for the herring. Different schools have appeared upon different portions of the coast at various seasons of the year. For any particular locality, however, the time of arrival and departure of the different schools has been quite constant, and, in some places, the herring have remained but a few weeks. On other portions of the coast, and particularly along the southern shores of the island, they remain during the greater part of the year, and at Fortune Bay can be taken in considerable numbers for fully eight months.

As early as 1837 a Gloucester fishing vessel visited the island for a trip of salt herring, and other vessels from the same port went occasionally a few years later. The salt-herring fisheries, however, did not become important for many years.

In those early days the fresh-fish trade of the United States was of little importance, and the present methods of icing, freezing, and shipping were little known. The present trade in fresh fish is of recent growth and is the result of a series of experiments in different methods of icing and refrigeration. In those days, when ice was not used, the fresh-fish trade was confined largely to the locality where the fish were taken, and if any shipping was done it was confined to a radius of a few miles at the most. The idea of engaging in an extensive traffic in fresh fish did not, there-

fore, present itself in the early history of our fisheries, and it was only through the experiment of a Cape Ann fisherman that the trade in frozen herring originated.

The Cape Ann Advertiser of February 23, 1877, gives the following account of the origin and growth of this trade on the coast of Newfoundland:

The frozen herring trade of Gloucester, the foundation of the prosperity of our extensive Bank fisheries, like many another important feature of our leading industry, had its origin in that spirit of adventure which is ever a characteristic of the men who man our fishing fleets and shrink at no hazard which promises profit to self and prosperity to the business community.

Previous to 1854 fresh herring found no place in the fishing industry of this port. Newburyport and other fishing towns were engaged on a small scale in the Magdalen Islands herring-fishery to supply the demand for smoked herring, but in this branch of the business the Gloucester fleet did not participate. Though an occasional trip of pickled herring was brought from Newfoundland before 1850, the idea of bringing fresh herring from that locality, "for baiting purposes and family use," was not thought of until the winter of 1854–'55.

In the fall of 1854, from representations of Newfoundland fishermen that large quantities of halibut caught on the shores of that island were annually cut up and barreled, Capt. Henry O. Smith, now a veteran skipper, conceived the idea that it would be a profitable venture to make a trip to Newfoundland and bring home a cargo of frozen halibut. Accordingly he sailed from this port in the schooner Flying Cloud some time in December, but after arriving in Newfoundland and lying in port about a fortnight, during which time he secured only about 2,000 pounds of halibut, he found that his venture would be a losing one unless he turned his attention to some other cargo than that of which he was in quest. Codfish being plenty, he concluded to obtain a quantity, and soon succeeded. The catch of herring was also large that season, and it occurred to Captain Smith that on one of his trips to George's he had brought in some herring left over from his bait, which, on account of the extreme cold weather, had become frozen stiff, and remaining in that condition had proved serviceable on the next trip to the Banks. At that time the George's fleet were obliged to rely upon the schools of herring found on the Banks for their supply of bait, first catching the bait, sometimes requiring two or three days, either on the Banks or by drifting into deeper water, before commencing to fish. The advantage of starting out with a good supply of bait suggested itself to Captain Smith, and he felt that now was the opportunity to test an experiment which might prove of inestimable importance to the fisheries of Gloucester. Accordingly he took on board about 80,000 frozen herring of prime quality, and with his assorted cargo of cod, halibut, and herring, sailed for home.

On arriving in Gloucester, in February, 1855, about 20,000 herring were sold to Mr. George W. Floyd, who took them on sleds for distribution around the Cape to bait the shore fishermen, then pursuing a profitable industry. Captain Theo. Parsons was the first to see the advantage of frozen herring for George's bait, and took 1,000 fish, while another skipper was willing to try the experiment and took 500 more. The balance of the cargo, not finding sale for bait, was taken to Boston for a market. * * * Captain Parsons sold one-half of his lot to another skipper, so that out of the herring brought by Captain Smith, three George's-men were baited, each taking 500 herring, which proved sufficient bait in those days. * * * The three vessels made speedy trips, and after eight or nine days arrived home again, one with 90,000 and the others with over 80,000 pounds each of codfish—the crack voyages of the season. The anticipations of Captain Smith were more than realized, and had there been a cargo of frozen herring then in port there would have been no need for seeking another market for the bulk of the stock.

Later, the same season, Captain McKinnon arrived from a halibut trip, bringing about 40 barrels of fresh herring on a venture; but the herring had spoiled before reaching port and were not marketed.

Gratified with the success of this venture, and unmindful of the peril attending the enterprise, Captain Smith resolved to make a second trip the same season, and sailed for Newfoundland in March, 1855, but was caught in an icefield, where his vessel was confined for a period of nineteen days, with no clear water in sight from the masthead. She was finally released, with a broken rudder, and arriving at Newfoundland took on board a cargo of oil, and returned home in safety.

The experiment having proved a success, Captain Smith determined to prosecute the business on an extensive scale the following winter. Accordingly, in copartnership with George Garland, four vessels were fitted out for trading trips to Newfoundland, Captain Smith going down in the schooner John to take charge of the business, accompanied by Captains James Ayer in schooner Mary Hart, Stephen Smith in the Flying Cloud, and John Welch in the Diadem. A Marblehead schooner was also chartered by the firm, but threw up the charter before proceeding on the voyage. The same season Capt. Andrew Leighton embarked in the business in the schooner Queen of Clippers. The Mary Hart was first laden with about 20,000 pounds frozen codfish and some 350 barrels frozen herring, and arrived home in due season, being the first to arrive, and Captain Ayer the first skipper to land a cargo of frozen herring at this port. Her arrival was hailed with joy by the George's fleet, who saw in her cargo the hopes of a repetition of the big trips of 1855. As she rounded Eastern Point she was recognized by Capt. Jesse Lewis, who was bound out on a George's trip, and who at once returned and was the first to take bait from the new stock. Before the Mary Hart's cargo was fully disposed of Captain Leighton arrived with a full cargo, and after disposing of some 30,000 herring for bait sold the rest of the cargo to Messrs. Garland and Smith, who marketed it in Boston. The Flying Cloud's fare was disposed of here. The Diadem brought a cargo of salt herring and frozen fish, which were sold in New York, and the John came home in April with cargo of fish oil, &c.

From this humble beginning may be traced the success of the herring business, which was developed into a leading business industry, and employs many of the finest vessels of the fleet. For the first dozen years the business was con-

fined to Newfoundland voyages, but of late years an extensive herring business has grown up with Grand Manan, and a few cargoes are brought annually from Nova Scotia. This herring industry enables our vessels to prosecute the Bank fisheries in February and March, when immense schools of fish resort thither, and the largest fares are brought in. It furnishes a valuable article of nourishing food for the New York, Boston, and other markets at low price.

NEW BRUNSWICK FROZEN-HERRING TRADE.—From the beginning of the present century Grand Manan is known to have been a favorite resort for the herring, and the waters off its southern head have been one of the principal spawning grounds on the entire coast. Mr. M. H. Perley, in his report of the fisheries of New Brunswick for 1850, describes these grounds as of peculiar importance, and speaks of the herring as "striking in" in such vast quantities as to completely cover the sandy spots, while immense numbers were compelled to drop their spawn on the rough, rocky bottom beyond these limits. It seems that the fisheries of this region early became important, and, according to the same authority, there were in 1849 one hundred and twenty vessels engaged in the herring fisheries of the region. A part of this fleet came from Nova Scotia, while the remainder belonged to the various fishing ports of Maine and Massachusetts.

The fisheries soon became so extensive that laws were passed to protect the spawning fish, and vessels were limited to the use of nets of 30 fathoms each, while the boats were not to have them more than 15 fathoms in length. These laws were soon changed so as to entirely do away with the fishing in the vicinity of the spawning grounds between the 15th of July and the 15th of September.

Though the fish were peculiarly abundant about Grand Manan, and also appeared in considerable numbers along the shore at different seasons, they were not known to frequent the shore grounds in any considerable numbers during the winter months prior to 1850. Mr. Perley speaks of their appearance at this time as something extraordinary. He says:

"In November last fine cod, averaging about thirty to a quintal, were taken by the hand-line fishermen between Musquash and Le Preau. At that time fine herring made their appearance, requiring nets with 2¼-inch mesh. These continued to increase in numbers until January. While this report is being written (February, 1851,) they are taken daily in considerable quantities. The appearance of large bodies of herring so close to the shore during the depth of winter is an unusual circumstance. In general they do not approach the coast until the latter part of winter or in early spring, and then in only moderate quantities."

Notwithstanding these statements, it does not seem improbable that the fish might have been abundant in these waters during the winter months for many years, and that the fishermen failed to learn of their presence on account of the lack of a market and the cold, stormy weather, which interfered to a great extent with the prosecution of the fishery. However this may be, little was done in the capture of herring in this locality prior to 1866, and even then the business was so small as to attract no attention, the greater part of the catch being used for bait by the local fishermen. Gradually, however, as the Newfoundland fisheries developed and the value of frozen herring became more generally known, the fishermen engaged to a limited extent in their capture, freezing the fish and selling them to Eastport dealers, who distributed them by wagons to the towns in the vicinity, and shipped them by steamer to the principal fishing ports, to be used for bait and food.

The shipping began in a small way as early as 1864, and in 1866 the first Gloucester vessel visited the region to engage in the fishery. Up to this time the fishery had been so unimportant that little was known of the abundance of the fish and of the extent to which the business might be prosecuted. It soon became apparent, however, that immense numbers of fish could readily be taken, and that the business could be made a very profitable one. Some vessels from Portsmouth,

Portland, and other towns began to come regularly to the region, though the Gloucester fishermen engaged in the frozen-herring trade hesitated to visit this region on account of a prejudice against the net herring, the higher price demanded by the fishermen, and the smaller size of the fish when compared with those taken in Newfoundland.

The extensive fleet engaged in the frozen herring trade soon found it more profitable to make short trips to the Bay of Fundy than to visit the more distant grounds at the island of Newfoundland, and in a few years the New Brunswick fisheries had grown to be more extensive than those of Newfoundland. The expense of a long trip to Newfoundland, together with the additional risks and exposures of the voyage, more than counterbalanced the difference in the price paid for the fish. In addition to this, there was some uncertainty as to the supply of fish in Newfoundland, as vessels had occasionally failed to secure full cargoes, while, at Grand Manan, no such scarcity of fish had occurred, and, besides, trips from Grand Manan would reach the market nearly a month earlier.

About 1868 the business may be said to have been properly inaugurated, and, from this date, it grew with surprising rapidity until in the winter of 1879–'80 it had quite supplanted the trade with Newfoundland; 8 cargoes being brought from Newfoundland, while 102 cargoes, in addition to the large quantity shipped by steamer, were brought from Grand Manan.

2. FISHING GROUNDS.

NEWFOUNDLAND.—The principal localities for frozen herring, as has already been intimated, are the island of Newfoundland and the southern coast of New Brunswick.

This fishery for Newfoundland is confined almost exclusively to the southern shore of the island, which is of peculiar formation, being exceedingly high and rocky and indented by numerous long and deep arms of the sea, which are frequented by immense schools of herring during the winter and spring months.

The first trip of frozen herring taken to the United States was obtained at Rose Blanche, a small harbor about 20 miles east of Cape Ray, the southwestern point of the island. Cargoes have frequently been secured at other points along the shore; the principal fishing ground, however, is at Fortune Bay, a large bay 65 miles in length, situated about midway of the southern shore of the island. This bay is irregular in shape, having a width of 35 miles at its mouth and gradually narrowing toward the center, where it varies from 10 to 20 miles in breadth. It is separated from Placentia Bay by a long peninsula, which forms its southeastern shore. This shore, though high, is comparatively regular, and, in various portions of its length has low and sloping banks. The northern shore of the bay, however, is peculiarly rough, rugged, and barren, being composed of a series of steep, rocky peninsulas intersected by deep and narrow bays, which are the favorite feeding and spawning grounds for the herring. Long Bay, or "Long Harbor," as it is locally called, has for several years been the principal fishing point of the region. This bay is about 16 miles long by a mile and a quarter wide, and during the winter months is usually covered with ice through a greater part of its length. The lower portion, however, is open, and affords an opportunity for seining and netting the fish.

Other harbors, including Saint Jacques, Bay the North, and Rencontre, were formerly important points in connection with this fishery, and vessels occasionally visit them at the present day.

NEW BRUNSWICK.—When the frozen-herring trade of New Brunswick began, the principal fishing was at Grand Manan.

This is a small rocky island, 13 miles long by 7 wide, lying about 6 miles southeast of West Quoddy Head, which is the nearest land. Vessels have regularly visited this island and obtained

full fares, and, at certain times, the principal fisheries of the region have been prosecuted from the various harbors and coves along its eastern shore.

Gradually, however, the fisheries of the main shore have become more important, and the bulk of the catch is taken there, few, if any, of the vessels going to Grand Manan for their cargoes.

The fish arrive off the southern head of Grand Manan during the month of July, where they remain until the middle of September. Late in October other schools gradually approach the shore of the main land, in the vicinity of Campobello Island, just opposite Eastport; as the season advances the numbers increase, until, in midwinter, the waters between Eastport and Le Preau are literally filled with herring, great numbers of them entering and remaining in Saint Andrews Bay until late in the spring.

The fishing begins in a small way as soon as the fish arrive, but it does not become extensive until the weather is sufficiently cool to freeze the catch. During the first of the season the bulk of the herring are usually taken in the vicinity of Deer Island and Campobello; later they are more abundant about Beaver Harbor and Point Le Preau, while in the spring the fishing is often extensive in Saint Andrews Bay. This rule is not constant, however, as the fisheries of the different localities vary greatly from time to time, one particular section being much less important in one season than another.

Herring also occur in considerable numbers along other portions of the coast, and trips have been taken at various points along the shores of Nova Scotia and Cape Breton, but there is no extensive fishery in these places.

3. THE VESSELS AND THEIR CREWS.

The vessels engaged in the frozen-herring trade are those that have been employed in the cod and mackerel fisheries during the summer months; many of these are among the largest, strongest, and swiftest of the fleet. In visiting Newfoundland vessels are obliged to encounter the roughest weather, and to be exposed to the strongest winter gales. In addition to this they often encounter vast fields of ice, and are frequently detained for weeks at a time. For this reason only the largest and most able vessels have been engaged in the Newfoundland fisheries, the average of these ranging from 80 to 100 tons.

In preparing a vessel to engage in this fishery it is usually brought to the wharf, after which the fishing gear and salt are removed and the hold is thoroughly cleaned. After this is done, from 20 to 50 tons of dirt or stone are usually placed in the hold for ballast and properly secured. Those vessels which have been engaged in the mackerel fisheries, however, retain their summer ballast, but usually put in a few tons additional.

After the vessels are ballasted the owners purchase a large amount of provisions, including flour, beef, and pork. In addition to this they usually carry a considerable quantity of kerosene oil, oil clothing, rubber boots, and other articles worn by the fishermen. These goods are exchanged with the natives for herring, the bulk, or even all of the cargo, often being paid for in this way. After the goods are properly stowed, it frequently occurs that the vessel takes a considerable quantity of fruits or vegetables to be sold along the coast of Nova Scotia and Cape Breton.

THE NEWFOUNDLAND FLEET.—Vessels visiting Newfoundland usually start by or before the middle of December. Those sailing first secure their cargoes and return home during the latter part of January, while those sailing later are sometimes detained until the middle or last of March.

The crews are usually hired at $20 to $25 per month to sail the vessel. The captain is sometimes hired outright, but more frequently he has an interest in the trip. Only enough men are taken to manage the vessel on the voyage, six to eight able-bodied seamen being a fair average. These

are usually men who have been engaged in other branches of the fisheries during the summer season.

On account of the rough weather and dangerous passage it is customary for vessels to "hug the shore" on the outward passage, so that they can "make a harbor" in case of bad weather, and also to obtain a market for their cargo of fruits and vegetables. They usually make several stops on the coast of Nova Scotia, and later enter the harbor of Louisburg to wait for a favorable chance for crossing the gulf between Cape Breton and Newfoundland. They usually touch at St. Pierre if the weather is unfavorable for continuing their passage up the bay. The most dangerous part of the entire trip is the passage in or out of Fortune Bay. The water is so deep that anchorage cannot be found at any distance from the land, and good anchorage can only be secured in a few of the smaller harbors. The weather is also very changeable, and vessels are frequently overtaken by snow-storms, accompanied by severe gales, in which case it is next to impossible to make the land.

Formerly, after securing their cargoes, the captains came cautiously from harbor to harbor, watching for a good opportunity to leave the bay; but, as the competition increased, the first fish arriving in market came to bring a much higher price than the later arrivals; the result has been a peculiar rivalry between the different vessels, and many of them have run great risks in order to be first at the market. Many of the more reckless captains have attempted to leave the bay when the weather was unsuitable, and many have narrowly escaped destruction, while a number have been lost in this way. Other vessels are lost on the homeward passage by coming in contact with the ice while under a heavy press of sail.

From the origin of this trade until the spring of 1877, according to the Cape Ann Advertiser, twenty-three vessels, valued at $214,500, and fifty-seven lives were sacrificed.

THE NEW BRUNSWICK FLEET.—Owing to the nearness of the fishing grounds the vessels engaged in the frozen-herring trade of New Brunswick are usually smaller and inferior in size and build to those employed in the Newfoundland trade. Many shoal-draught swift-sailing vessels employed in the summer mackerel fisheries, though unsuitable for the Newfoundland trade, are well adapted for this business; while vessels of 30 to 40 tons, from various fishing ports along the shore, are regularly engaged in it during the winter months.

The vessels going to New Brunswick seldom carry any goods to exchange with the fishermen, but buy the fish outright, paying cash on delivery.

The first of the fleet reach the ground about the middle of November, or as soon as the weather becomes cold enough to freeze the catch. From this time until the following March vessels are constantly arriving and leaving with their cargoes. Those engaging in the New Brunswick fisheries usually proceed at once to Eastport, where they obtain full information of the abundance of the fish and their market value. Some of them then proceed to the smaller harbors in the vicinity of the fishing grounds and buy their catch directly from the small boats; while others remain at Eastport and take such fish as are brought to them by the small vessels engaged in the fishery.

The first arrivals from this region in the principal markets occur during the first week in December, and the business reaches its height by the 1st of January, and continues as long as the weather will warrant.

As in the Newfoundland fishery, the captain usually hires only a sufficient number of men to handle the vessel on the voyage and to receive and stow the cargo, buying the fish directly from the local fishermen. Occasionally, however, the crews of some of the smaller vessels catch their own herring, and after properly freezing and stowing them set sail for Boston or Gloucester to market them. The crew is usually hired at from $20 to $30 a month, while the captains, with few

exceptions, have a direct interest in the voyage, either from their share in the vessel, or by special arrangements with the owners.

4. THE FISHERMEN OF NEWFOUNDLAND AND NEW BRUNSWICK.

NEWFOUNDLAND FISHERMEN.—The island of Newfoundland is settled only along the coast line, the interior being a rough and rocky region, wholly incapable of cultivation. At occasional points along the shore there is a small amount of arable land, which is cultivated to a certain extent; the bulk of the produce consumed on the island, however, being imported from Prince Edward Island and other points in the Dominion. With their limited resources these people are almost wholly dependent upon the fisheries for a livelihood, and many of them are living in the most abject poverty.

The principal fisheries of the island are for seal, cod, and herring; while considerable money is obtained from the sale of capelin and squid for bait in the summer season. In the section visited by the American vessels, however, the fishery is confined largely to the capture of cod and herring, and when these fisheries fail there is often a vast amount of suffering.

The Cape Ann Advertiser of January 24, 1862, gives the following with reference to the suffering caused by the scarcity of fish at that time:

"Recent news from Newfoundland reports a sad case of destitution among the inhabitants, especially in the vicinity of Placentia Bay. The unsuccessful summer fishing is the principal cause of this state of things, but it is much aggravated by the want of that winter employment which the herring fishery in Fortune Bay has afforded for some years past. The civil war in the United States, in its mischievous influences, has for the present almost if not entirely put an end to the traffic which this business produced. The Government is making every provision possible for the relief of these destitute people."

A few of the more energetic fishermen, by incessant labor and careful economy, have succeeded in accumulating a small amount of money, and some of them have been enabled to buy vessels and to build themselves suitable homes. The ones who have been most successful are those who have catered most largely to the American trade, spending the summer in the cod fisheries and the winter and spring in supplying the American and French vessels with herring and capelin for bait. Many, however, have only the rudest houses, and are deprived of even the ordinary comforts of life. Mr. Augustus Dower, who visited the island in the winter of 1879–'80, on one of the vessels engaged in the frozen-herring trade, writes in his log-book, under date of January 11: "I went into a fisherman's house to-day for the first time this winter. It was full of half-naked children, and had every indication of poverty in the extreme." This is no exceptional case, but, as we are assured by those familiar with the region, is a common occurrence in different portions of the island.

When we consider the illiteracy of these people and their extreme poverty, together with the fact that many of them are almost wholly dependent upon the fisheries for a livelihood, it is natural to suppose that there would be a peculiar prejudice against any participation in their fisheries by the people of other countries; as the capture of fish by the crews of foreign vessels at anchor in the Newfoundland harbors means simply the depriving the natives of the chance of obtaining money from the capture and sale of the fish which these vessels require. On account of this feeling the American fishermen have usually abstained from the capture of herring, and have bought their supplies largely from the native fishermen; but, as the apparatus and methods of capture employed by the Newfoundlanders have been very crude, our fishermen have been greatly inconvenienced both by the unnecessary expense and the additional time required in securing their

cargoes. For these reasons the Americans have for some time been interested in the introduction of better methods among these people. Many of the New England fishermen have recently carried purse-seines on their trips to the island in order that the herring could be readily taken in any depth of water and at any distance from the shore. They have usually placed them in the hands of the natives, hiring them to catch the fish and paying them a liberal amount for their labor. They did this, not because they could not catch their own fish, but because they did not care to antagonize these people; in fact the Newfoundlanders had threatened violence in a number of cases provided any attempt should be made by the crews of the American vessels to fish their own seines.

INTERNATIONAL DIFFICULTIES AT FORTUNE BAY.

THE FORTUNE BAY DIFFICULTY.—Such a condition of affairs existed for a number of years, and the feeling between the fishermen of the two countries became stronger with each succeeding season. The Americans, accustomed to prosecute the fisheries by means of the more modern and expeditious methods, were greatly annoyed at the inconveniences to which they were subjected in Newfoundland. Learning that the commissioners, who had been in consultation at Halifax, had just decided that the United States should pay the sum of $5,500,000 to the British Government for the privileges granted them under the treaty of Washington, they decided that they had a right to free themselves from these restraints and to enjoy the privileges for which their Government was to pay so large a sum. An attempt to carry these ideas into practice during the winter led to the serious disturbance at Fortune Bay, Newfoundland, known as "the Fortune Bay outrage," which has caused so much trouble between the two Governments.

As the difficulty occurred in connection with the herring fishery, and most seriously affects the trade in frozen herring, a brief review of it and the steps that led to its final settlement may not be out of place in this connection, though an extended discussion of the matter in all its important bearings would lead us too far from our subject.*

It seems that in the fall of 1877 twenty-six American vessels were sent to Newfoundland for the purpose of securing cargoes of frozen herring to supply the principal New England markets. Extensive preparations were made for this trade, and after the vessels had been put in order and properly ballasted many of them took on board a quantity of merchandise to exchange with the natives for herring. Most of them were also provided with purse-seines for use in catching the fish. By the middle of November many of them were under way, and three weeks later the last one had taken its departure. This entire fleet proceeded to the southern shores of Newfoundland, and one after another of them reached Fortune Bay and proceeded to Long Harbor, the principal fishing ground of the region. A number arrived early in December, and others came a little later, but as the herring had not yet put in an appearance in any quantities, the captains were obliged to anchor and await their arrival.

A few of the captains had succeeded in purchasing small quantities of herring from the native fishermen who lived in the region or who came hither in small "jacks" to engage in the fishing with nets and haul-seines; others had, as formerly, hired some of the Newfoundland fishermen to take charge of and fish their seines, paying them a definite sum for their labor. By January 5 no less than twenty-two American vessels were lying at anchor waiting for herring, and as no vessel had succeeded in getting more than a few barrels, the outlook was not very encouraging.

On Sunday, January 6, bubbles could be seen rising to the surface of the water, an unmis-

*All of the correspondence on the subject between the two Governments, together with the affidavits of the fishermen on both sides, appear in the Foreign Relations of the United States for 1879, 1880, and 1881.

takable sign that the fish had arrived. Later in the day they became more abundant, and the captains of some of the American vessels decided to "man their own seines" and thus secure their cargoes immediately. Accordingly four vessels sent their boats to lay out their seines, and others were preparing to follow, when the enraged Newfoundlanders (some of whom it is said had on the same day been fishing with nets and seines in the vicinity), seeing that all of the American vessels were likely to secure full cargoes before dark, and knowing that this would destroy their chance of finding a market for their catch, gathered on the beach and demanded that the seines be taken up, giving as a pretext that it was unlawful to fish on the Sabbath. At the same time the Americans were assured that if they did not comply with the demands that their nets would not only be opened and the fish turned out but that the seines would be destroyed.

The captain of the schooner Frank A. Smith, after a vigorous protest, decided to accede to their demands, and at once took up his seine and returned with it to his vessel. John Hickey, an Englishman, living near Fortune Bay, who had set his seine and was threatened in a similar way, followed the example of the Smith. The other American captains, however, continued their fishing and refused to desist. Captain Jacobs, of the schooner Moses Adams, had made a haul and had emptied his catch into the seine of one Thomas Farrell, a Provincial fisherman then in his employ, when the mob, for such it had come to be, attempted to liberate the fish and to tear up the seines, but Captain Jacobs, armed with a revolver, determined to protect his property. The natives, seeing his firmness, turned their attention to the two remaining seines belonging to the schooners New England and Ontario, respectively. These had been joined, and an enormous school of herring, containing upwards of 2,000 barrels, an ample quantity to load both vessels, had been surrounded, and the fishermen were fully determined to secure their fish. Finding that threats would not avail, the infuriated mob seized the seines and, after liberating the fish, tore them to pieces and divided them up among themselves as trophies of their victory. No less than sixty men were engaged in the onslaught, while fully one hundred and forty more stood by and urged them on with shouts and cheers.

This attack very naturally put an end to the seining, as no one dared to jeopardize his life and property by longer opposing the frenzied crowd. Finding that they had carried the day, the Newfoundlanders returned to their own vessels or gathered in crowds upon the shore and gave themselves over to general rejoicing. In describing the scene Captain McAulay, of the schooner Ontario, says they "made a jubilant demonstration, firing guns, blowing horns, and shouting, as if celebrating a victory, to impress upon the masters of the American vessels present that they were prepared to stand by and justify what they had done, and that the Americans might expect to be treated in future in the same manner should they attempt to catch herring in the Newfoundland waters."

On the following morning the herring had disappeared and most of the vessels were obliged to go home in ballast or with the few fish that they had already purchased. It is said, however, that several remained for a time in the hope of buying fish from the natives with which to fill up their vessels, but in this they were disappointed, for herring continued scarce and they too were compelled to return home with only partial fares.

It was not pleasant to the Americans to submit to such abusive treatment and to be deprived of the privileges for which our Government had paid the enormous sum of $5,500,000, and, though it was doubtless the proper course, yet our knowledge of these men leads us to believe that had they not been so hopelessly in the minority they would have insisted upon their rights. As it was they decided to give up the voyage as a losing one and to return home and lay the

matter before their Government, and ask that steps be taken, not only to make good their loss, but to secure to them the enjoyment of their rights under existing treaties.

The testimony of many of the fishermen was taken by the proper authorities, and the owners on whom the loss came most heavily, on account of the expense incurred in fitting the vessels, made up their claims for damages and loss amounting in the aggregate to $105,305.02. These were at once forwarded to the Secretary of State, who, after examining into the evidence, promptly instructed our minister at London to lay the matter before the British Government. An extended correspondence ensued between the two Governments and the subject was under discussion for several years.

It was at first maintained by Her Britannic Majesty's Government that the complainants had violated the provisions of local laws in three particulars: (1) The use of seines at a forbidden time; (2) fishing on Sunday; (3) "barring fish." Sections 1 and 2 of chapter 102 of Title XXVII of the Consolidated Statutes of Newfoundland, passed in 1872, on the ground of which the first and third charges were made, are in the following language:

"SEC. 1. No person shall haul, catch, or take herrings by or in a seine or other such contrivance on or near any part of the coast of this colony or of its dependencies, or in any of the bays, harbours, or other places therein, at any time between the 20th day of October and the 12th day of April in any year, or at any time use a seine or other contrivance for the catching and taking of herrings except by way of shooting and forthwith hauling the seine: *Provided*, That nothing herein contained shall prevent the taking of herrings by nets set in the usual and customary manner, and not used for in-barring or inclosing herrings in a cove, inlet, or other place.

"SEC. 2. No person shall, at any time between the 20th day of December and the 1st day of April in any year, use any net to haul, catch, or take herrings on or near the coasts of this colony or of its dependencies, or in any bays, harbours, or other places therein, having the mokes, meshes, or scales of such net less than two inches and three-eighths of an inch at least, or having any false or double bottom of any description; nor shall any person put any net, though of legal-size mesh, upon or behind any other net not of such size mesh, for the purpose of catching or taking such herring or herring fry passing a single net of legal-size mesh."

The assertion of the illegality of Sunday fishing was based upon section 4 of chapter 7 of an act passed April 26, 1876, entitled "An act to amend the law relating to the coast fisheries," which provided that—

"No person shall, between the hours of 12 o'clock on Saturday night and 12 o'clock on Sunday night, haul or take any herring, capelin, or squid with net, seines, bunts, or any such contrivance for the purpose of such hauling or taking."

Secretary Evarts, in his instructions of August 1, 1879, to Mr. Welsh, the American minister at London, claimed that, by virtue of the provisions of Articles XVIII and XXXII of the treaty of 1871, the fishermen of the United States had an unlimited and unlimitable right to prosecute the fisheries in the waters of Newfoundland and other North American British provinces during the period therein specified; that such was the intent of the two Governments at the time of its promulgation, and that it was for this privilege, which Great Britain had asserted to be more valuable than the equivalent offered in the treaty, that the immense sum of $5,500,000 had been paid by the United States under the Halifax award. To substantiate her position our Government brought forward extracts from the statement of Her Majesty's case presented to the Halifax Commission, and from the arguments of British counsel before that body, which showed their interpretation of the terms of the treaty to be substantially identical with that now maintained by the United States. He claimed that the American fishermen had not interfered in any way with the rights of British

subjects or gone beyond their treaty privileges, and refused to admit the competency of municipal legislation to nullify or diminish aught from the privileges granted by the Imperial Government. He held, moreover, that, even if the local laws could in any case have such an effect, they certainly were not so intended in the present instance, and, in support of this position, cited section 18 of the Newfoundland law alleged to have been infringed, which is as follows:

"Nothing in this chapter shall affect the rights and privileges granted by treaty to the subjects of any state or power in amity with Her Majesty."

Regarding the amount of the claim against Great Britain, Mr. Evarts said:

"The evidence in this case shows that the catch which the United States fishing fleet had on this occasion actually realized was exceptionally large, and would have supplied profitable cargoes for all of them. When to this is added the fact that the whole winter was lost and these vessels compelled to return home in ballast; that this violence had such an effect on this special fishery that in the winter of 1878–'79 it has been almost entirely abandoned, and the former fleet of twenty-six vessels has been reduced to eight, none of which went provided with seines, but were compelled to purchase their fish of the inhabitants of Newfoundland, the United States Government is of opinion that $105,305.02 may be presented as an estimate of the loss as claimed, and you will consider that amount as being what this Government will consider as adequate compensation for loss and damage."

The British Government finally acknowledged that local legislation passed after the ratification of the treaty of Washington ought not to affect the American fishermen in any of their rights, but it claimed that any laws existing prior to 1871 should be considered as binding upon our fishermen. Lord Salisbury, therefore, in his letter of April 3, 1880, omits the question of "Sunday fishing," but bases the case of his Government on an act passed by the colonial legislature of Newfoundland on March 27, 1862. He shows that section 1 of that act forbids the taking of herring with a seine between the 20th of October and the 12th of April, and further prohibits the use of seines at any season for the purpose of barring herring. In this letter he claimed that the fishermen of the United States had no right to use the shores of Newfoundland for purposes of actual fishing, and (2) that they had no right to use a seine for herring at that particular season of the year, and, indeed, that they could not use one for barring herring at any time. He states that the evidence in the case shows that "on the day in question a large number of the crews of the United States fishing vessels came on shore and from the beach barred the herring, the ends of their seines being secured to the shore." This fact alone, he thinks, would warrant his Government in refusing to pay the claims for losses sustained by our citizens.

In commenting upon the language of the treaty, he said:

"Thus, while absolute freedom in the matter of fishing in territorial waters is granted, the right to use the shore for four specified purposes alone is mentioned in the treaty articles from which United States fishermen derive their privileges, namely, to purchase wood, to obtain water, to dry nets, and cure fish.

"The citizens of the United States are thus, by clear implication, absolutely precluded from the use of the shore in the direct act of catching fish. This view was maintained in the strongest manner before the Halifax Commission by the United States agent," &c.

The American vessel-owners in their claims for damages had included not only the actual expenses of the voyage, but also the profits that might have accrued to them from the sale of the fish, these last being figured on the basis of profits in former years of vessels engaged in the same business.

Finally, in the spring of 1881, a compromise was suggested by which each Government should make certain concessions. By the terms of this compromise the British Government were to pay the actual losses incurred by the various vessels, which amounted to $52,977.26, the vessel-owners, in turn, agreeing to withdraw their claims for the additional $50,000 representing the probable profits of the business. A settlement was made on this basis, and during the following summer the money was received by our Government and paid over to the proper parties.*

NEW BRUNSWICK FISHERMEN.—The New Brunswick fishermen are, as a class, far superior to those of Newfoundland. They are very much less dependent upon the fisheries than the people of Newfoundland, and many of them only engage in the business during the winter months, when there is a scarcity of employment at their various trades, or when little can be done about the small farms of the region. They manifest a disposition of friendliness toward the American fleet, and do not seriously object to Americans engaging regularly in the work of catching the herring. The bulk of the catch is taken by the various islanders and people living along the shore, but perhaps a quarter of the entire catch is secured by the American fishermen living in the vicinity of Eastport or by those coming in small vessels from the fishing towns in the eastern part of Maine.

5. METHODS OF CAPTURE.

METHODS AT NEWFOUNDLAND.—The vessels on reaching Fortune Bay usually proceed to Long Harbor, where they are securely moored, head and stern, and, in addition, two lines are put out and made fast to objects on the shore. Owing to the lack of a market the fishing does not begin until the American vessels arrive, though the natives from other portions of the coast often come to the harbor and make full preparation before the vessels arrive.

When the fishing began gill-nets were almost exclusively used, but, as the work became extensive, some of the more provident of the Newfoundland fishermen provided themselves with large haul-seines. The seine-owners are usually the masters of small vessels locally known as "jacks." The first vessels owned were quite small and of an inferior model and rig. These, however, have gradually been replaced by those of larger size, until the fleet, at the present time, average from 20 to 40 tons. These vessels are employed in summer for running the catch of herring and capelin to the island of St. Pierre, where it is sold to the French fleet engaged in the cod-fisheries. These vessels are also a great convenience in the winter herring fishery, as they enable the men to follow the herring from harbor to harbor and transport the fish to other localities in case no market offers where the fish are taken.

* The following quotation includes those articles of the treaty of Washington which bear upon the points under discussion:

"XVIII. It is agreed by the high contracting parties that, in addition to the liberties secured to the United States fishermen by the convention between the United States and Great Britain, signed at London on the 20th day of October, 1818, of taking, curing, and drying fish on certain coasts of the British North American colonies therein defined, the inhabitants of the United States shall have, in common with the subjects of Her Britannic Majesty, the liberty for the term of years mentioned in Article XXXIII of this treaty, to take fish of every kind, except shell-fish, on the sea-coast and shores, and in the bays, harbors, and creeks of the provinces of Quebec, Nova Scotia, and New Brunswick, and the colony of Prince Edward Island, and of the several islands thereto adjacent, without being restricted to any distance from the shore, with permission to land upon the said coasts and shores and islands, and also upon the Magdalen Islands, for the purpose of drying their nets and curing their fish: *Provided*, That in so doing they do not interfere with the rights of private property, or with British fishermen, in the peaceable use of any part of the said coasts in their occupancy for the same purpose.

It is understood that the above-mentioned liberty applies solely to the sea-fishery, and that the salmon and shad fisheries, and all other fisheries in rivers and the mouths of rivers, are reserved exclusively for British fishermen.

XXXII. It is further agreed that the provisions and stipulations of Articles XVIII to XXV of this treaty, inclusive, shall extend to the colony of Newfoundland, so far as they are applicable. * * *

XXXIII. * * * The said articles shall remain in force for the period of ten years from the date at which they may come into operation, &c.

In seining the fish the captain usually takes his position in the bow of the seine-boat while the crew are employed in rowing the boat along within a few rods of the shore. The herring are detected by means of small bubbles rising to the surface. As soon as these are seen, one end of the seine is made fast to the shore, after which it is "shot" around the fish and the other end is again brought to the land. The net is often hauled across the mouth of a small cove and the fish are readily confined until such time as the market offers or until the weather becomes cool enough for freezing them. Again, after the ends of the seine are brought to the shore it is frequently anchored and the fish confined within its walls for several days, until they can be satisfactorily disposed of. The fish are seldom if ever hauled upon the beach, but the seine is hauled in until the fish are confined in a small space, after which they are dipped out and boated to the vessels or to the shore, as the case may be.

The catch is often very large, sometimes reaching upwards of a thousand barrels at a single haul.

The fish "strike in" in great numbers at certain seasons, and, unless taken at once, are apt to pass up under the ice out of reach of the nets, and many are thus frequently lost.

Many of the poorer fishermen who do not own seines, and who are not hired by the seiners to engage in the fishery, provide themselves with gill-nets, setting them at night in the ordinary way and visiting them early in the morning, sometimes securing a large catch in this way.

The fish taken are sometimes mixed, several sizes being found in the same school. Such fish are seldom bought by the American vessels if large fish of uniform size can be obtained—the difficulty being in finding a market for the smaller fish—and a vessel bringing a cargo of mixed fish to the United States finds it difficult to dispose of them except at reduced rates.

METHODS AT NEW BRUNSWICK.—In the New Brunswick fisheries the herring are taken exclusively in gill-nets, no seines of any kind being used. The fishermen gather from different places along the coast of New Brunswick and from the nearer fishing towns on the coast of Maine, remaining in the locality until the close of the season. Most of them have small vessels, which serve as a home and on which they dry and mend their nets. These are usually anchored in some cove convenient to the fishing grounds or in the lee of some island, where they remain until enough fish have been taken to be carried to Eastport or elsewhere for a market. The vessels engaged in this fishery vary in size from 5 to 40 tons. They are among the poorest vessels engaged in the fisheries of the American coast, a portion of them being only partially decked, with small cuddies forward for eating and sleeping. Others are the old-style sharp and square sterned vessels that have practically become worthless for the other fisheries.

Many of the New Brunswick fishermen live on the shores in the immediate locality, and use only small boats for engaging in the work.

The vessels are provided with the ordinary reach-boats, 15 to 20 feet in length. These are locally known as net-boats, and are worth about $40 each. The number varies from one to five, according to the size of the crew. The crews of the vessels average only four or five men, though they vary from two to ten. In the larger vessels one man remains on board to keep things in order and to do the cooking, while the remainder are engaged in catching the fish. In the smaller vessels all are engaged in fishing, and each takes his turn in cooking the food. Two men go in the same boat to set, tend, and haul their nets.

They usually leave the vessel about three in the afternoon for the purpose of setting, and on reaching the grounds set their nets in 8 to 25 fathoms of water, sinking them to a depth of several feet below the surface. The nets are allowed to remain until the following morning, when they are visited, hauled, and carried to the vessel, where they are picked and dried. Formerly several nets

were usually set in a string, but with the strong tides it has been found more desirable to set them separately. The depth to which they are sunk is regulated by straps, attached to a wooden float, which are placed at short intervals along their entire length and vary from a few feet to 6 fathoms. These floats hold the net in proper position, and, by shortening or lengthening the strings, *it can be set at any required depth. Anchors are also attached to each end to hold the* net in position, and, in addition, each is provided with a watch-buoy having a long line attached, so that if the net should be carried to the bottom by the weight of the fish this will still float at the surface and enable the fishermen to haul it up.

Each fisherman usually supplies himself with two nets. These are usually 2¾-inch mesh, 30 fathoms long, and 150 meshes deep. The webbing costs about $9, but when properly tanned, hung, and provided with buoys and buoy-lines a net costs little short of $20. The man is then said to be properly "geared," and is ready to ship in one of the vessels for the fishery.

The catch is very irregular, and no estimate could be given of a day's catch, for at times *almost no fish are secured, while at others the nets are so heavily loaded that they sink to the* bottom and are not strong enough to hold the weight of the fish in bringing them to the surface. Men have been known to catch nothing for weeks together, while a crew of five men have made $500 in a single night. The average season's work for two men is said to be from 120,000 to 250,000 fish to the boat, selling at 25 cents per hundred, which would be a fair average for several consecutive years. The best fishermen can make $250, while the average, after taking out the *vessel's one-seventh loss of nets and material for mending, is said to be only $150. The nets* usually last two and, with care, three seasons; but a large catch of fish injures them greatly, and they are often lost altogether, so that one must allow $25 each season for replacing them.

6. PRESERVING THE FISH.

METHODS OF FREEZING AND PACKING THE FISH.—As soon as the vessel has been properly moored in one of the many coves convenient to the fishing grounds, part of the ballast is thrown overboard, the remainder being retained until it becomes certain that a full cargo can be secured. The hold is then sheathed up around the sides to prevent the frozen fish from being injured by coming in contact with the salt plank which forms the ceiling of the vessel; or, occasionally, it is thoroughly dried by the use of lime. A platform is built in the bottom of the hold, being raised from a few inches to a foot above the keelson, so that the fish may be out of the way of injury from any water that may be in the hold. Two bulkheads or partitions are placed across the forward part of the hold to separate it from the forecastle. These are about five or six inches apart, and the space between them is carefully packed with sawdust or straw to prevent the heat of the stove from entering the hold and injuring the fish. If the fish are to be frozen on the vessel, which is frequently the case at Newfoundland, a large scaffold of rough boards is built for the purpose.*

---

*Capt. D. E. Collins, in an unpublished letter, describes the erection of the scaffold used in freezing herring on shipboard in the following language:

"*In the first place the tacks of the foresail* and mainsail are come up with, and the *leech-lines on the boom are* unreeved and the sails furled to the gaffs. They are then hoisted so as to be above the scaffold, when it is built, about six feet. The scaffold is placed six feet or more above the deck. To build the scaffold a piece of scantling or joist is lashed from the fore to the main rigging on each side, and another extends on each side from the main rigging to the end of the davits. These are blocked up forward, if necessary. This being done, the fore and main booms are raised so as to form a middle support. From these side pieces small joists, generally two by four inches thick and about twenty feet in length, are laid to the booms, overlapping them about five feet. These pieces are placed all along, with about two and one-half feet space between them—the whole width of a scaffold, on a large-sized vessel, being about thirty feet—and the ends of the joists projecting over the vessel's side about three feet. These being

The lumber is usually purchased in some convenient harbor along the coast on the outward passage, and as soon as the vessel reaches the harbor the work of building begins, and as the crew are usually unskilled mechanics it is generally three or four days before the scaffold is ready for use. The journal of Mr. Augustus Dower, of the schooner Victor, of Gloucester, gives the following description of its construction:

"Strong scantling are selected, and, after being carefully spliced together, are propped up and securely lashed to the shrouds of the vessel about seven feet above the deck. These scantling extend from bow to stern on either side of the vessel. Shorter scantling are now laid across these stringers, on which the boards are nailed. After the platform has been made, boards are put up along either side to prevent the fish from sliding off, and, after being thoroughly propped from beneath, the scaffold is complete."

The scaffolds vary considerably, according to the size of the vessel, the average dimensions being ninety to one hundred feet long and twenty-five feet wide. As soon as the trip has been secured, the platform is taken down and the lumber is sold to the islanders, who usually contract for it as soon as the vessel arrives. The quantity of fish to be placed on the scaffold varies considerably, according to the weather. When the temperature is little below the freezing-point the fish must be spread very thin in order that those underneath may be thoroughly frozen; but, with a lower temperature, the fish can be heaped together to a depth of a foot or more, though in such cases it is necessary to turn them every few hours.

When the scaffold has been filled the remainder of the catch is often spread upon the deck of the vessel, where it remains until frozen. The greatest care is necessary in this work, and parties must be constantly watching the weather, day and night, to guard against loss from a sudden rise of temperature or a storm of rain or snow. The watch usually turns the fish with shovels or stirs them with his feet every few hours, and during storms of snow it becomes necessary to work constantly among them to keep them from being covered up and injured. This process is called "picking."

When the weather becomes warm, so that the fish would be thawed by exposure, it becomes necessary to "heap" them or shovel them into piles and carefully cover them with canvas or other material that will protect them from the weather. When the change comes suddenly all hands are sometimes kept busy for several hours in placing those below that are thoroughly frozen and in carefully covering the others on the scaffold or on deck.

It frequently happens that fish that have not been thoroughly frozen are placed in the hold for protection against continued warm weather. In such cases they must be again taken out and refrozen as soon as the weather is suitable for the purpose. The fish treated in this manner are considered inferior to those frozen during the first exposure.

The usual method of ascertaining whether a fish is sufficiently frozen is by breaking. If the herring bends at all in the hand it is not frozen sufficiently; but if it breaks short, like a dry stick, it is considered ready to be packed in the hold.

In New Brunswick and, to a certain extent, in Newfoundland the fish are frozen by the fishermen who catch them. After being taken from the nets they are brought to the shore in baskets

down, boards are laid over them, fore and aft, openings being left over the hatchways through which to shove the herring into the hold. Indentations are also formed in the sides of the platform abreast of the hatchways to allow the herring to be hoisted up from the boats. For additional support to the scaffold, tackles are attached to the main boom topping-lift and jib-stay. During gales or heavy storms the sails are lowered down, so that they rest on the scaffold, thus preventing it from being blown away. The fore gaff and sail, when hoisted up, are secured to the main rigging by a guy from the after end of the gaff. As many as one hundred and twenty barrels of herring have been frozen at one time on the schooner Centennial's scaffold."

and are spread out upon the land to the depth of a few inches to a foot, and occasionally stirred or kicked about by the fisherman who may chance to be on watch for the purpose of noting the weather and calling all hands in case it becomes necessary to take in the fish. The place selected for freezing is usually a clean gravelly beach above high-water mark, or a surface of crusted snow and ice, or, in case no such spot can be found, clean grassy land is occasionally used. If the day is cold they can be frozen at once, but if warm they must be kept on the vessel till night before spreading, or, in case of a continued thaw, they must be salted or thrown away. Herring kept over three or four days before they are frozen are not considered equal to those frozen immediately, as the scales of the former are apt to come off, which very much injures their appearance, while the latter remain constantly fresh and bright.

There is often a lively competition between the trading vessels as to which shall secure the largest amount of fish in the shortest time. This generally results in a rise in the price, as one vessel will frequently outbid another, and it sometimes occurs that much more is paid for the bait than it is actually worth. Another method adopted by the captains is that of winning the favor of the fishermen. This is especially noticeable by the vessels visiting the Newfoundland coast. In this region the captain who is kindest is the one who will have the preference of the fish taken by them. The Newfoundlanders are not slow to improve the opportunity of asking and accepting favors, and in the bait as well as the herring fishery many of them often board the vessel as soon as she reaches the harbor. Capt. D. E. Collins, in speaking of a visit to Newfoundland in the summer of 1879, says: "It is customary in most of the baiting-places of Newfoundland for the fishermen to flock aboard of an American vessel as soon as she anchors, and it is not unusual to see a dozen or twenty on deck at once, all eager to gather and retail the fishing news and to make arrangements for baiting the vessel. If near meal-time they may also be attracted by the hope of getting an invitation to eat, and thereby a 'square meal,' for there is a great difference between the food of American fishermen and that of the average Newfoundlander." In another place, while speaking of the competition between the vessels in securing a supply of bait, Captain Collins adds: "There being twenty-five sail of bankers here (Carboniere, Concepcion Bay), and all wild to get it with as little delay as possible, it follows, as a matter of course, that every possible effort is put forth by each. The price having reached 40 cents per hundred none of them felt like going beyond it, but every other artifice has been resorted to, and the Newfoundland fisherman, who was fortunate enough to have a good catch of squid, has been the subject of more attentions than were ever lavished upon a belle of society, and, for the time being, the bait-fisherman is master of the situation. The cook, too, with a full appreciation of the influence of a good dinner upon a hungry fisherman, keeps a well-spread table below always ready, and takes care to invite the fishermen below for a 'bite.' It is scarcely necessary to add that generally they are in no way loath to accept the invitation, and they rarely fail to do justice to the occasion."

This same fact is noticeable to an equal or even greater extent in the frozen-herring fisheries during the winter months, and we learn of instances where twenty to twenty-five natives have been fed at one time, the cook being kept constantly busy preparing food for them during the stay at the island.

In return for this kindness some of the fishermen improve the opportunity of their visit to steal certain articles belonging to the vessel, and, unless they are carefully watched, a good many things are lost in this way.

Mr. Augustus Dower, who visited Fortune Bay in the winter of 1879–'80, says in his journal of January 9: "We bought sixty-nine barrels of frozen herring from a Bay-the-North schooner, the crew of which stole two shovels, a bucket, and a pair of oars. We searched their vessel

thoroughly and found one of the shovels, the remainder of the goods having probably been thrown overboard while we were below."

The herring are carefully packed loose in the vessel, the hold, and even the cabin, being completely filled, the crew usually living in the forecastle on the homeward passage. Formerly the fish were packed in frozen snow, or a considerable quantity of snow was placed around the sides of the hold and the fish heaped together in the middle; but, for many years, this practice has been wholly abandoned, as it is found that the fish will keep equally well without the use of snow. A quantity of straw, however, is sometimes placed around the sides of the hold, and is scattered among the fish to a limited extent.

The quantity carried by the vessels engaged in the trade varies considerably. The largest schooners often carry cargoes of five or six hundred thousand fish, while the smaller ones engaged in the New Brunswick trade often carry less than a hundred thousand. The average cargo for the entire fleet would be 250,000 to 300,000.

At Eastport, a large trade has sprung up between the dealers and the local fishermen. Many of the dealers have large wooden platforms at some convenient point near the harbor, where the fish are spread and frozen, after which they are stowed in buildings lined with sawdust, to be kept until a market offers. They are then packed in rough barrels and shipped to different portions of the country, some going as far west as Cincinnati or Chicago.

7. MARKETS.

FROZEN HERRING FOR BAIT.—As has already been said, the frozen-herring trade originated with Capt. Henry O. Smith, in the winter of 1854–'55, his object in making the experiment being to supply the vessels engaged in the George's Bank cod fishery with bait. At this time the vessels engaged in the spring fisheries were provided with gill-nets for catching their own bait, and it was customary for them to proceed to the outer edge of the bank, where they remained for several days setting their nets to secure a supply, after which they proceeded to the shoaler parts of the bank to engage in fishing. It frequently happened that herring were scarce at this season, and more time was consumed in catching the bait than in using it.

Captain Smith succeeded in selling 500 fish to each of three vessels that were about to sail, and in addition sold a few to the boat-fishermen of the region. He was, however, obliged to carry the remainder of his catch to Boston for a market. The three vessels thus provided with bait secured large fares and made quick trips, and frozen herring at once came into general favor in this fishery. For many years, however, the fishermen took only a limited quantity, depending largely, or in part, upon their nets for their supply. They continued to buy more herring each season and to depend less upon their nets, till about 1864, when nets were wholly thrown aside and the entire trip was secured with frozen bait.

At this time from 5,000 to 8,000 fish were taken by the average George's-man for a trip of two to three weeks. Gradually the quantity of bait has been increased, and the vessels have remained longer upon the fishing grounds, until now the average George's-man takes from 15,000 to 18,000 fish for a "baiting," while an occasional vessel will use 20,000.

If the fish are to be sold for bait the vessel anchors in the middle of the harbor on her arrival, and hoists her flag in the rigging as a signal that bait may be secured. The captains of the different vessels soon come aboard to examine the fish and to arrange for purchase. If several "baiters" are in the harbor at the same time a lively competition is apt to occur, and prices are lowered accordingly. To avoid this reduction they usually agree upon a definite price, but it frequently occurs that, though they charge according to agreement, they give the captain or owners

of the vessel from $15 to $25 as a bonus for the privilege of supplying them with bait, though the item appears in the vessel's bills at regular market rates, and the crew of the George's-man are obliged to settle on this basis. This bonus was formerly paid to the captains who arranged for the bait, but of late years the owners have come to take the matter in hand, and the baiting vessels make their arrangements directly with them, paying the bonus to the owners rather than to the captains.

Probably one-third of all the frozen herring brought to the United States each season is sold to the Gloucester fishermen for bait. According to Mr. A. Howard Clark, Gloucester used in the winter of 1879–'80 9,954,000 frozen herring, and in the winter of 1880–'81 10,265,000. The price varies according to the scarcity of the fish or the competition in the market. When the supply is large the price sometimes falls to 25 or 30 cents per hundred, but at the beginning and close of the season, or during periods of scarcity, it sometimes reaches $2. The average price for the past two or three winters has been from 50 to 75 cents.

FROZEN HERRING FOR FOOD.—When frozen herring were first taken to Boston there was a peculiar prejudice against them, and it was with difficulty that a market could be found. The Cape Ann Advertiser of February 23, 1877, after speaking of the small quantity sold for bait to the Gloucester vessels, gives the following account of Captain Smith's experience in introducing this fish into the Boston market:

"The balance of the cargo not finding sale for bait was taken to Boston, when the fish merchants and hucksters refused to have anything to do with them, believing that the people would not buy and eat such fish. The captain, however, succeeded in inducing some Irish fish-peddlers to take a few at 75 cents per hundred, and soon after they commenced retailing them (at 2 cents each) it was found that a profitable vein had been struck, and the crew of the Flying Cloud had all they could do in counting out herring, the price soon advancing to $1 per hundred, until the whole was disposed of, and as many more could have been placed on the market without difficulty."

The same difficulty was experienced in disposing of the first cargo of frozen herring in the New York market. The first fish taken to that city were carried by Capt. Sylvanus Smith, in the winter of 1857. "The fish dealers were shy of the new enterprise, but finally the cargo was disposed of, and from that time fresh herring in a frozen state have been an important feature of the New York market during the winter months."

From the introduction of this fish into the leading markets frozen herring have become a favorite article of food among the laboring classes of the larger cities, and are distributed to a considerable extent among the people of the smaller country towns. They form a cheap and wholesome food at a season of the year when other fresh fish are obtained with difficulty and usually bring a high price. They have a great advantage over the ordinary fresh fish in that they can be packed in barrels and shipped to a considerable distance without danger of loss. With the exception of those sold in Gloucester for bait, nearly all of the frozen herring are carried directly to Boston and New York by the vessels, two or three cargoes being carried to Philadelphia each season. At these places they are packed in barrels for distribution, and sent as far south as Washington and as far west as the Mississippi River. Some of them after reaching their destination are thawed and salted by the dealers and sold as pickled herring, while others are salted and placed in the smoke-houses, where they are cured for bloaters or hard herring. Fish once frozen are not particularly desirable for either of these purposes, as they become very soft and their flesh is of a peculiarly dark and unattractive color.

In Boston the fish are usually sold by the hundred, while in New York they are almost invariably sold by weight.

Of the 30,875,000 herring brought from New Brunswick in the winter of 1879–'80, about ten millions were sold for bait to the Gloucester fishermen, eleven millions were brought to Boston, and two millions were sold to New York, the remaining quantity being landed in Portland, Philadelphia, Portsmouth, and the other principal cities along the coast. The price varies according to the supply; the wholesale dealer charges from 75 cents to $2 per hundred, while the retail price averages from 4 to 6 cents per pound.

8. EXTENT OF THE TRADE.

STATISTICAL REVIEW OF THE TRADE, 1854 AND 1880.—From the time of their first introduction into the American markets for bait and food, frozen herring have continued to grow in favor and have found a ready sale. The number of vessels engaged in the Newfoundland trade, though varying considerably from year to year, owing to various causes, steadily increased until, during the winter of 1866–'67, the United States sent 44 vessels to Newfoundland and imported 14,000,000 herring. The business of this region was most prosperous about this time, as, owing to the Rebellion, the market price of the herring was unusually high and the demand often exceeded the supply. The vessels were of large size, carrying from 300,000 to 400,000 fish each, and some of them stocked for as much as $4,000, or, in exceptional cases, even $5,000 on a trip. There were some drawbacks, however, as the fishing ground was a long way off, and the business had to be prosecuted at a season when the weather was particularly unfavorable. In addition to these, the herring fisheries of the island were not always as successful as could be desired, and vessels were at times obliged to return home with only partial fares. As the expenses of the voyage were necessarily large, a failure to secure a full cargo often resulted in serious loss to the parties interested.

Until the winter of 1866–'67 the trade had been confined exclusively to Newfoundland, and only the largest and stanchest vessels could engage in the business. At this time the trade with New Brunswick began, and on account of the nearness of the fishing grounds to the American markets and the diminished risks to the vessels from storms and other causes, a large fleet soon engaged regularly in the business, many of them making two trips during the season. The markets soon came to be well supplied with fish from this source, and the Newfoundland fleet gradually diminished until, in the winter of 1873–'74, but fifteen vessels visited the island. From this time it again increased, but the belligerent attitude of the natives in Fortune Bay and other places has had a decided influence in causing the American fleet to abandon the Newfoundland fisheries and to turn their attention to the trade with New Brunswick. The result is that in the winter of 1880–'81 only three American vessels visited the island, and the business seems to be practically at an end.

The trade with New Brunswick, on the other hand, has rapidly increased. Mr. D. I. Odell, in a letter to Professor Baird dated Eastport, Me., January 22, 1873, gives the statistics of the frozen-herring business of that region as fifty vessel loads, in addition to 500,000 fish that were packed in barrels and shipped by steamer. If we allow 225,000 fish for each cargo we have a total of 11,750,000 herring, which, at $5 per thousand, the price stated by Mr. Odell, would have a value to the fishermen of $58,750. Other authorities place the number of cargoes for the same season at 44, and the total quantity of fish at 10,900,000.

A careful investigation of this fishery in the summer of 1880 showed that the shipments during the previous winter had reached 102 cargoes, averaging 230,000 herring each. In addition to these, 9,500 barrels, containing about 475 fish each, making a total of 28,175,000 herring. These,

at 30 cents per hundred, the average price paid to the fishermen, would have a value of over $84,500. If we add to this the cost of the barrels and the labor in handling it would bring the first cost of the fish up to nearly $90,000.

According to Mr. R. C. Green and Mr. Thomas L. Holmes, two of the principal herring dealers of Eastport, about twenty-five American vessels and eight or ten large boats, with one hundred and thirty men, were engaged in the capture of the herring. During the season, which lasts from late in November to the 10th of March, these fishermen caught about 8,000,000, the remainder being taken by the fishermen of New Brunswick.

According to the statement of Capt. Henry B. Thomas, published in the Eastport Sentinel, there were shipped from Eastport and vicinity during the winter of 1880–'81 32,630,000 herring, which, including labor and barrels, had a value of $98,700 to the producers.

The following table, compiled from the files of the Cape Ann Advertiser, the Eastport Sentinel, and other sources, shows approximately the number of cargoes of frozen herring, together with an estimate of the number of fish brought to the United States each year since the origin of this trade.

Season.	Number of cargoes from Newfoundland.	Number of cargoes from New Brunswick and Nova Scotia.	Total number of cargoes.	Estimated number of herring from Newfoundland.	Estimated number of herring from New Brunswick and Nova Scotia.*	Estimated number of herring from all sources.
1854–'55	1	.....	1	80, 000	.....	80, 000
1855–'56	4	.....	4	720, 000	.....	720, 000
1856–'57	6	.....	6	1, 500, 000	.....	1, 500, 000
1857–'58	11	.....	11	3, 300, 000	.....	3, 300, 000
1858–'59	13	.....	13	3, 900, 000	.....	3, 900, 000
1859–'60	16	.....	16	4, 800, 000	.....	4, 800, 000
1860–'61	19	.....	19	5, 700, 000	.....	5, 700, 000
1861–'62	15	.....	15	4, 500, 000	.....	4, 500, 000
1862–'63	28	.....	28	8, 400, 000	.....	8, 400, 000
1863–'64	39	.....	99	10, 700, 000	.....	10, 700, 000
1864–'65	21	.....	21	6, 800, 000	.....	6, 800, 000
1865–'66	29	.....	29	9, 500, 000	.....	9, 500, 000
1866–'67	44	1	45	14, 200, 000	200, 000	14, 400, 000
1867–'68	29	8	37	9, 400, 000	1, 600, 000	11, 000, 000
1868–'69	32	12	44	10, 400, 000	2, 700, 000	13, 100, 000
1869–'70	24	20	44	7, 800, 000	4, 500, 000	12, 300, 000
1870–'71	23	36	59	7, 500, 000	8, 600, 000	16, 100, 000
1871–'72	18	26	44	6, 280, 000	6, 500, 000	12, 800, 000
1872–'73	18	44	62	6, 300, 000	10, 900, 000	17, 200, 000
1873–'74	15	34	49	5, 250, 000	9, 650, 000	14, 900, 000
1874–'75	23	33	56	8, 000, 000	8, 400, 000	16, 400, 000
1875–'76	20	52	72	7, 000, 000	13, 700, 000	20, 700, 000
1876–'77	28	57	85	9, 300, 000	15, 000, 000	24, 300, 000
1877–'78	26	70	96	6, 300, 000	18, 500, 000	24, 800, 000
1878–'79	10	90	100	3, 400, 000	23, 700, 000	27, 100, 000
1879–'80	8	102	110	2, 700, 000	28, 175, 000	30, 875, 000
1880–'81	3	118	121	1, 000, 000	32, 630, 000	33, 630, 000

* Including the quantity shipped by steamer from Eastport.

3.—THE PICKLED-HERRING TRADE WITH THE MAGDALEN ISLANDS, ANTICOSTI, NEWFOUNDLAND, AND LABRADOR.

1. HISTORY OF THE FISHERY.

ORIGIN AND GROWTH.—From the earliest settlement of the country, as is well known, the American fishermen have been accustomed to catch herring along the shores of New England, and in former years, when the demand was much greater than now, they often pickled or smoked considerable quantities for shipment to the larger markets, and quite a profitable business was developed. Before the close of the last century a number of American fishing vessels were engaged in the Grand Bank cod fisheries, and a little later some of them were accustomed to fish in the Gulf of Saint Lawrence and along the coast of Labrador.

Prior to the Revolution our fishermen had perfect freedom in common with all other subjects of Great Britain to catch and cure fish in any of the British North American waters, and the treaty of 1783 restored to us the right to engage in the fisheries of any part of "His Britannic Majesty's dominion in America, and also the liberty to dry and cure fish in any of the unsettled bays, harbors, and creeks of Nova Scotia, Magdalen Islands, and Labrador so long as the same shall remain unsettled." The convention of 1818, while it took from us the right to fish within three marine miles of the shore in many localities, retained for us the right to visit the western and a portion of the southern shore of Newfoundland, the Magdalen Islands, and Labrador. While engaged in the capture of codfish in these waters the crews of the American vessels came into intimate relations with the resident fishermen, and from them, as well as from their own observations, learned of the abundance of the various species at different seasons.

One of the principal fishing grounds for cod was about the Magdalen Islands, where a large fleet of vessels resorted each spring and spent a greater part of the summer in catching their trips. The fishermen soon learned that the shores of these islands were favorite spawning-grounds for the herring, and that they "struck in" regularly each season about the 1st of May and remained in enormous numbers for several weeks.

Though some of the fishermen had talked of making trips to the Magdalens, especially for herring, nothing seems to have been done toward the inauguration of the trade prior to 1822, when, according to Mr. William Webb, of Deer Isle, Me., the first cargo of Magdalen herring was brought to the United States by Capt. Jonathan Carleton, of Isle au Haut, Me. He arrived at the Magdalens in the early spring for a fare of codfish, but finding them scarce it occurred to him that it would be an excellent time to try the experiment of carrying home a load of herring. He therefore secured 350 barrels, which he landed at Isle au Haut, to be smoked for the Boston market. His venture proved a very profitable one, and the following year two or three sail were sent from the locality to the Magdalens for the same purpose. A year or two later vessels were sent from Deer Isle, Fox Island, Mount Desert, Lubec, and Eastport, and within a few years the business had spread so as to include a large number of the principal fishing towns between Eastport and Cape Cod. From 1858 to 1865 the business was particularly prosperous, and a fleet of about fifty vessels went annually to the region, bringing home full fares, which were sold to good advantage.

The Labrador herring fisheries were probably developed in a similar manner to those of the Magdalen Islands. By the beginning of the present century a small number of American vessels

were engaged in the Labrador cod fisheries, catching their bait, which consisted of capelin, herring, and sand-lant, in the vicinity, by means of nets which they carried with them for that purpose. In this way they came to know of the abundance of herring, and found that they were present during the greater part of the summer, at which time they were very fat. There being a good demand for them in the home markets, whenever the fishermen failed to secure a full fare of cod they usually took a few barrels of them on board to fill out their trips. Mr. Lorenzo Sabine, writing in 1853, describes the herring fishery of Labrador as of little importance, being at that time confined to the capture of small quantities by vessels engaged in the cod fishery, showing that there were no vessels engaged exclusively in the Labrador herring fisheries. From that date to the present time most of the herring brought from that region have been by those employed in the cod fisheries, though a few vessels have engaged exclusively in the capture of this species from time to time.

According to the Cape Ann Advertiser, the American fleet did not engage in the Newfoundland herring fisheries until 1837, when Capt. James Pattillo, of the schooner Tiger, left Gloucester about November 28, returning home in the following May with a cargo of 130 barrels of pickled herring, which were sold "at $7.50 per barrel, being the first Newfoundland herring imported into the United States." The schooner Amazon, of Gloucester, Mass., engaged in the fishery about the same time.

For some years from this time almost no vessels went to Newfoundland for this purpose, and it was only during seasons of scarcity at the Magdalen Islands, or at times when the demand was particularly good, that vessels resorted to the region in any numbers or with any regularity. Even now the business, as far as American vessels are concerned, is of little importance, and the bulk of the fish received are taken by the natives and shipped to the United States for a market.

It is said by fishermen familiar with the fisheries of Anticosti Island that the American herring fisheries of that region resulted from the failure of the fisheries of the Magdalen Islands. Some of the fishermen failing to secure their cargoes in the above locality, knowing of the abundance of herring at Anticosti, set sail for that island, and succeeded in loading up with fish of excellent quality. Prior to 1870 no vessels visited the region, and it is only recently that the fishery has been at all important, and even now the fleet is quite small.

2. THE FISHING GROUNDS.

THE MAGDALEN ISLANDS.—The Magdalen Islands are situated about midway of the Gulf of Saint Lawrence, in latitude 47° 30′, longitude 61° 45′. The group is composed of eight small islands, separated from each other by shoal channels varying from a few rods to half a mile in width. Their greatest length is 36 miles in a northeasterly and southwesterly direction, while their greatest breadth is but 5 or 6 miles. The shores are quite irregular, some portions being very bold and rocky, while others are formed by long stretches of sand. Amherst Island, the southernmost of the group, curves to the eastward, inclosing Pleasant Bay, the principal fishing ground for herring. The shores of the bay in its northern portion are bold and rocky, but at other points they are low and sandy. The bay varies in depth from 3 to 8 fathoms, the bottom being composed of white sand. Coffin's Island, the largest of the group, is 25 miles long, but very narrow. The other islands are named Grindstone, Allright, Grosse, Bryon, and Entry Islands. The principal fisheries are for cod, herring, mackerel, lobsters, and seals. The spring herring fishery is sometimes a failure because of the ice blockade, as in the season of 1882, when Pleasant Bay was full of ice during the entire month of May. The average annual catch of herring at these islands from 1861 to 1876, according to Mr. H. Y. Hind, was about 29,000 barrels.

The fish arrive about the 1st of May and continue in great numbers through the spawning season, entirely disappearing about the 1st of June.*

ANTICOSTI.—Anticosti is an island about 30 miles wide by 120 miles long, lying in the mouth of the Saint Lawrence River, about 90 miles north by west from the Magdalens, with good fishing grounds along almost any portion of its coast. The principal herring grounds, however, are about East Cape, the eastern extremity of the island. The fishing is at its height during the month of June, and vessels failing to load up at the Magdalens can reach this island in time to secure their fares. On account of an abundance of herring at other and more convenient places, few of the American vessels visit this locality.

NEWFOUNDLAND.—Various portions of the coast of Newfoundland are visited by herring, and they are taken, to a greater or less extent, in all of the larger bays and harbors. The principal fishing grounds, however, are Fortune Bay, on the southern side, and Bonne Bay and Bay of Islands, on the western shore, these being almost the only ones visited by the American vessels in search of pickled herring.

Bonne Bay is situated on the western shore of the island, about midway between the Straits of Belle Isle and Cape Ray. It is a small, deep-water bay, with two arms, the southernmost of which is frequented by the herring in the largest numbers.

Bay of Islands is situated about 25 miles further south, and is not only a larger but a more important fishing ground. This bay also has several arms extending 15 or 20 miles into the interior, and, like those of Bonne Bay, they are very deep. The principal fishing is in the southern arm, locally known as the "Sou'west Arm."

The fish are found in this region during the greater part of the year, visiting it in early spring for the purpose of spawning and remaining through the season to feed upon the numerous small crustacea that are so abundant in these waters. When they arrive in the spring they are quite poor, but *with such quantities of food they soon become very fat, and those caught in the fall are consid*ered superior to those taken on the American coast.

The vessels occasionally visit Bonne Bay and Bay of Islands in the spring when failing to secure fares at the Magdalens, but the principal fishing occurs in the fall. The fleet usually arrive in October and leave about the last of December, though they are frequently obliged to leave somewhat earlier to prevent being frozen in by the ice that forms in the bays. Vessels remaining too long have frequently been caught in the ice and have been detained until the following spring.

Fortune Bay, though occasionally visited by the pickled-herring fleet, is more frequently resorted to by vessels engaged in the frozen-herring trade, and will be more properly considered *under that head.*

---

*The following, taken from a table published by Mr. H. Y. Hind, gives the time of arrival of the herring at the Magdalen Islands each season from 1861 to 1876, inclusive:

Year.	Date of first appearance of herring.	Year.	Date of first appearance of herring.
1861	May 1.	1869	.....
1862	May 2.	1870	April 15.
1863	May 17.	1871	May 8.
1864	May 1.	1872	May 3.
1865	April 27.	1873	April 27.
1866	April 25.	1874	May 2.
1867	May 7.	1875	May 6.
1868	.....	1876	May 5.

LABRADOR.—The shores of Labrador are rough and barren, and with the exception of the few families gathered about the principal harbors they are almost uninhabited. The fisheries, though only partially developed, are known to be very valuable. The region is visited annually by companies of fishermen from Newfoundland, and in former times a large fleet of American vessels fished from some of the larger harbors each summer for cod. The herring are very abundant along various portions of the coast, but, though valued for their enormous size and great fatness, they are taken, in limited quantities only, by vessels engaged in the capture of other species. The fishing is confined largely to the region lying between the Straits of Belle Isle and Cape Harrison.

3. THE VESSELS AND THEIR CREWS.

THE VESSELS.—A large portion of the vessels engaged in the Magdalen herring fisheries in former times were those that went to Labrador for cod later in the season. The large schools of codfish visiting the Labrador coast did not usually arrive until the middle or last of June, or sometimes till the first of July, and it was customary for vessels engaged in this fishery to make a trip for herring before the cod-fishing season began. These vessels varied in size from 40 to 80 tons, the average being about 65 tons. A vessel of this size would carry 700 to 800 barrels of herring. Later, as the fisheries became more important, other and larger craft visited the locality, and during the height of the trade the largest fishing schooners and several topsail schooners and brigs, measuring from 150 to 175 tons, engaged in the work, carrying large cargoes to the different markets.

The herring fisheries of the west coast of Newfoundland have been confined chiefly to the Gloucester, Boston, and Eastport vessels of the largest size, these usually going in the fall, after returning from their summer trips to the offshore fishing banks.

Vessels engaged in the pickled-herring trade carried from 100 to 400 hogsheads of salt, and had large salt-pens, located near the center of the hold. They fitted with provisions for a three or four months' trip, and were absent from a few weeks to several months, depending largely on the locality visited and the abundance of the fish.

THE FISHERMEN.—The crews varied considerably, according to the method by which the cargoes were to be secured. In some cases the herring were caught by the vessel's crew, and in others they were bought from parties fishing in the locality. When the fish were to be purchased, only enough men were needed to salt and care for them and to sail the vessel on the passage; but when provided with an outfit for taking their own fish, a crew of ten men were needed.

4. APPARATUS AND METHODS OF CAPTURE.

GILL-NETS AND HAUL-SEINES.—When the fishing began, each vessel carried gill-nets with which to take its load of herring, but as the business increased it was found desirable to introduce seines for the purpose of catching larger quantities of fish and of loading in a shorter time. These were either brought by the vessels and fished by the crews, one seine answering for four or five vessels, or they were owned by Nova Scotia fishermen who came regularly to the island each season and made a business of catching fish and selling them to American vessels at a stated price. The vessels also brought gill-nets, to provide against loss in case the fish did not approach near enough to the shore to be taken by the seines. They very frequently took the greater part of their trip in this way. The usual method adopted by the American fleet was to buy the fish, as considerable time could be saved and a smaller number of men were required for the work.

If the vessels were to catch their own fish, on reaching the islands they usually anchored in Amherst Harbor and at once started out with their seines in search of the fish. Owing to the

whiteness of the sand of the bay, the presence of the herring, if in shoal water, was readily detected by the contrast between their color and that of the bottom. In case the herring remained in deeper water and failed to "show up," their presence was often known by the numerous bubbles that rose to the surface above them. It often happened that one or more of the fishermen were stationed on the top of a high hill overlooking the bay, where they could more easily detect the presence of the fish. If any were seen, the seining-masters of the vessels were at once notified, the lookout indicating by signal or otherwise the exact location of the school.

Whenever a school came within half a mile of the land it was at once surrounded by a seine, and lines made fast to either end were taken to the shore, where the hauling was commenced by some twenty-five to thirty men. While the seine was being landed, one boat was usually rowed back and forth across its mouth to prevent the fish from escaping, and whenever they attempted to swim out, oars were thrown into the water to frighten them back. The ends of the netting having been brought to land, the seine was gradually hauled in until the fish were confined in a small space, after which the seine was made fast and the dipping began.

The catch was often enormous, sometimes reaching four or five thousand barrels at a single haul. At such times it was very difficult to get the ends of the seine to the shore. When only a small haul was made, a smaller and lighter seine was occasionally shot inside of the large one, so that the fish could be more easily handled.

The extensive fishing is said by some to have caused a diminution of the supply, and it frequently happened that the bulk of the fish remained in the deeper water at a considerable distance from the shore, and consequently could not be taken in sufficient quantities to supply all the vessels, and many that had not provided themselves with nets were compelled to return "light" or with only partial fares. To overcome this difficulty the Gloucester vessels began bringing their purse-seines which they used in summer for catching mackerel. With these they were enabled to fish in the deeper waters of the bay, at any desired distance from the shore, and they were often very successful when the haul-seines secured almost nothing.

PURSE-SEINES.—The first purse-seines were carried by Gloucester fishermen about 1865, and from this date to 1872 the large part of the herring was taken in this way. Many of the fishermen of other towns, including Eastport, Lubec, and Lamoine, soon began to use purse-seines, and all were for a time very successful.

For various reasons, principal among which were cleanliness and convenience of handling, the herring were never landed on the beach, and even when the fish had been inclosed in a haul-seine they were simply drawn towards the land until they were brought into a compact mass, after which they were taken out by means of dip-nets into small boats and carried to the vessel. The boats used are usually the ordinary "Hampton" build, 20 to 25 feet in length. Each vessel carried from two to four of these, for transporting the fish from the seine to the vessel. Sometimes the crews of twenty or more vessels would be engaged in dipping from the same net, each vying with the other in securing the largest possible quantity before the supply should be exhausted. The competition has at times been so great that some in their greediness have loaded their boats so heavily that they have been swamped in the rougher water on their way to the vessel. Large, long-handled dip-nets were used in transferring the fish to the boats, one man handling the net and the other assisting in "rolling in the fish." As soon as the boat had been loaded it was rowed at once to the vessel, which usually lay in the harbor, from 1 to 4 miles distant. On arriving the fish were thrown upon the deck, to be cared for by those on board, and the boat returned for another load. From three to seven loads could be taken by a boat in a day, the number depending, of course, upon the distance to which the fish must be carried and the condition of the weather.

The purse-seines are used in a manner exactly similar to that of the mackerel and menhaden fisheries, and they have a great advantage over the drag-seines, especially as they are set in the deeper water at a considerable distance from the shore, where the vessels can be brought alongside and fastened to them; and the herring can be landed directly upon the deck by means of large dip-nets. This is a great saving of time and labor, as no men are required for boating, and the trips are, as a rule, much more easily and quickly secured.

METHODS AT NEWFOUNDLAND AND LABRADOR.—On the west coast of Newfoundland, according to Captain Collins, the fish are taken almost exclusively in gill-nets, as they usually remain in the deep arms of the bays, where they cannot be seined. The fishing is carried on wholly by the natives of the island, who seriously object to the use of nets or other apparatus by American fishermen. For this reason the Americans seldom attempt to catch their own trips, but buy them from the jack (small vessel) and boat fishermen of the islands. The vessels engaged in this trade usually proceed to some convenient cove or harbor, where they remain until a trip box has been secured, the fishermen bringing the herring to the vessel as soon as they have been taken. When for any reason the fish are scarce in the locality first visited they proceed to another harbor, and are sometimes obliged to visit several before securing full fares. The captains before starting from home often purchase a considerable quantity of provisions, such as flour, pork, and beef, besides various articles of clothing, and an assortment of trinkets. These articles are taken to Newfoundland and given to the natives in exchange for their herring. In fact the American fisherman often becomes a trader, having his stock of goods on his vessel, where he is visited by many of the islanders, who frequently purchase considerable quantities. The practice is of great advantage to both parties, as one is enabled to make a fair profit on the goods and the other secures necessary articles of food and clothing, which otherwise it would be almost impossible to do on account of the absence of any resident in the region. At one time the method of barter was almost universally adopted in the trade with the herring-catchers of the island, but of late years a good many captains are paying cash for their cargoes.

On the coast of Labrador the herring are usually taken in ordinary gill-nets carried by the vessels for this purpose. A few, however, are taken by means of small haul-seines owned by the natives of the various harbors or by the Newfoundland fishermen who spend their summers in this country.

5. LAY OF THE FISHERMEN.

When the fishery began the vessels carried nets for catching the fish, and the crew fished on shares. In this case the owners provided the vessels with the necessary outfit, including provisions, while the fishermen furnished their time and labor, receiving one-half of the net proceeds of the trip for their services. This was also the case when the vessels carried purse-seines. When they bought their fish, however, it was customary for the owners to hire a sufficient number of men to handle the vessel on the passage and to hire men and boats at Canso, or some other point along the shore, to transport the fish from the nets to the vessel, paying them a definite sum for their services and leaving them at their homes on their return. In other cases a contract was made with the foreign fishermen to furnish the fish on the vessel's deck, where the crew were of course in readiness to receive and care for them.

In the fall and winter fisheries of the Newfoundland coast the fish are purchased, as already stated, a larger number of men being required to sail the vessel on account of the storms that frequently occur at this season.

6. METHODS OF PRESERVING THE FISH.

SALTING IN BULK AND IN BARRELS.—Various methods have been adopted by different parties in the same and different localities for salting the fish and stowing them in the hold of the vessel. A common method, known to the fishermen as "salting in bulk," is often employed. By it the fish are thrown upon the vessel's deck as they come from the water, and a quantity of salt is sprinkled upon them, after which they are thoroughly stirred with large wooden shovels, made expressly for the purpose, that the two may be thoroughly mixed. From 4 to 5 pecks of salt are required for each barrel of fish. When properly salted the herring are shoveled into the vessel's hold, a wooden shoot being usually arranged in the hatchway to carry them in any direction desired. They are then shoveled against the bulkheads and sides of the hold until it has been completely filled, or till a sufficient quantity have been secured.

The "salters" are men detailed expressly for the work, and it is their duty to see that proper care is taken in mixing the salt evenly among the fish, and that a sufficient quantity is used to properly cure them. These frequently prefer to salt the fish in the hold, in which case the herring are shoveled down the hatchway, a few at a time, and the salters add the requisite amount of salt as the work goes on. The fish are then thrown to one side and stowed loose as before.

The method of salting in bulk, although extensively adopted, is very crude, and the work is generally done in a hurried and careless manner; the result being that the fish often reach the market in poor condition, and are sometimes even unfit for food. This more frequently occurs with the fish taken at the Magdalens, where the fishermen are obliged to work very rapidly in order to care for the fish as fast as they are secured. At Newfoundland and other places, however, the catch is not so large, and the salters have ample to cure them properly.

Even when carefully salted, the bulk herring, when transferred to barrels and covered with brine, are said to be inferior, both in color and flavor, to those that have been put in pickle while fresh; for smoking purposes they are, however, as good as those prepared in other ways, and during the height of the Magdalen trade the greater part of the bulk herring were sold to the smokers. On account of the difficulty of making good pickled fish out of the bulk herring many of the vessels were formerly provided with a quantity of barrels and hogsheads, which were arranged in the bottom of the hold so that the fish would fall in and around them as the hold was being filled. The barrels thus served to retain the moisture that drained from the fish above, and those contained within were in this way kept constantly covered with pickle, and when the cargo was landed they were sold as pickled fish, while the others were used for smoking.

There are several advantages in the method of salting in bulk, the principal one being the saving of the cost of the barrels required for holding the fish. Again, the quantity that a vessel will carry is greatly increased by this method; for though the vessel may be loaded "scupper deep" in the water before starting, the moisture soon begins to drain from the fish, and can be pumped out in sufficient quantities to lighten the vessel sufficiently for the voyage. Some time is also saved on the voyage, as the fish can be handled so much more rapidly.

Herring are also salted in barrels in the ordinary way, each package being filled with pickle before it is stowed in the hold. This method has been frequently employed in the Magdalen fisheries, but it is much more common among the fleet visiting Bonne Bay and the Bay of Islands.

Nearly all of the herring brought by this fleet are known to the trade as "round herring"; that is, they are fish that have been salted just as they came from the water, without even being cut open. A few, however, more particularly of the Newfoundland fish, are cut or torn open and the gills and entrails are removed before salting. These are called "split," or gibbed, herring. The

wives and children of the native fishermen are usually employed for this work. They sometimes work on shore, but as frequently they board the vessel and work on her decks on account of the convenience of handling the fish. Many of them have become very proficient in this work. In most cases the knife is dispensed with, the gills being removed with the thumb and forefinger, and the entrails are drawn out through the opening thus made.

When the vessels arrive home those fish intended for pickling, whether previously packed in bulk or in barrels, are at once taken out and thoroughly washed. They are then packed in barrels with strong new brine, and inspected or not, according to the laws of the State where they are landed, after which they are ready for the market. Those intended for smoking, however, are taken out gradually as they are needed, and soaked from 24 to 48 hours, after which they are strung and again washed before being placed in the smoke-houses.

The fish from Labrador and Newfoundland, being of superior quality, are usually pickled and bring a high price in market. Those from the Magdalens, on the contrary, being taken during the spawning season, are of an inferior grade and are chiefly used for smoking. During the height of the trade the pickled fish from that region were sold to the poorer classes in the Southern States, or were shipped to the West Indies.

SMOKED HERRING.—Formerly, many of the vessel-owners engaging in the Magdalen fisheries had a number of smoke-houses where they prepared the fish before sending them to market. After smoking, they were packed in boxes and shipped to Boston, New York, and Philadelphia for exportation. On account of their large size and poor condition they always rank lower than any other brands and have never been extensively used by the people of the Northern States, the bulk being consumed by the laboring classes of the South. Some of the firms extensively engaged in the smoked-herring trade had no interest in the vessels, and it was customary for these to contract with the vessel-owners or masters for cargoes at a stated price; and they sometimes even chartered the vessels outright, and assumed the responsibility, making their own arrangements with the fishermen.

7. EXTENT OF THE FISHERIES AND THE EXPORT TRADE.

THE FORMER IMPORTANCE AND THE DECLINE OF THE FISHERIES.—As has been said, the first vessel visiting the Magdalen Islands for herring went from Isle au Haut, Me., in 1822. From this date the business spread rapidly to other fishing towns of the New England coast, and within a few years a large fleet was engaged in the business.

Mr. Lorenzo Sabine, referring to the Magdalen herring fisheries in 1853, gives the following statement with reference to the extent of the fisheries in 1839, together with his comments upon them:

"Capt. R. Fair, in command of Her Majesty's ship-of-war the Champion, visited these islands officially in May, 1839, and after the commencement of the fishery. He found the 'quantity of herrings very great, exceeding that of any former year; and the expertness and perseverance of the American fishermen' to be 'far beyond that of the colonists.' 'About one hundred and forty-six sail of American fishing schooners, of from 60 to 80 tons, and each carrying seven or eight men,' were engaged in it, he continues, and caught 'nearly 700 barrels each;' making for the number stated, 'a presumed product of 100,000 barrels, of the value of £100,000; the tonnage about 10,000, and the number of men about one thousand.' Whatever the statistics of the year in question, the average quantity of herrings caught by our vessels is not probably 40,000 barrels; while the price—*a pound sterling the barrel*—is quite fifty per cent., I suppose, above that generally received in any market in the United States for the article of 'Magdalene herrings.'"*

* Sabine's Report on the Principal Fisheries of the American Seas, 1853, pp. 195, 196.

Mr. Sabine, though thoroughly posted on various branches of the fisheries, seems to have less positive information as to the extent of the Magdalen fisheries of this time, for we have it from good authority that the fishery was much larger than would be supposed from his statements.

The Barnstable *Patriot* of June 21, 1859, says:

"A writer from Eastport states that no less than 30,000 pounds of Magdalen herring have already been brought to that place the present season and are now ready for market. They will find a quick sale, thus bringing into the small place $400,000 for a few weeks' labor in one department of the fisheries."

A letter from the Magdalen Islands, printed in the Halifax *Express* of April 30, 1860, says:

"One hundred sail have already arrived for herring, but the bulk of the fleet are detained in Canso by head winds."

Mr Fox, the collector of customs at Magdalen Islands, testified before the Halifax Commission that in 1861 he counted five hundred American schooners engaged in fishing near the island. It is probable, however, that the majority of them were engaged in the mackerel rather than in the herring fishery.*

No records have been kept of the interest of the United States in this fishery, and it is difficult to show its extent with any degree of exactness. The height of the business occurred between 1855 and 1861, when it is claimed that between two hundred and three hundred American vessels were engaged in this trade each season, including the small fleet engaged in the Newfoundland and Labrador fisheries. The cargoes varied from 500 to 1,200 barrels, according to the size of the vessel, the average being about 800. The price received for the fish in the American market varied from $1.75 to $2.50 per barrel, according to the demand.

In addition to the American fleet a few vessels from Nova Scotia and other of the British provinces were engaged in the fishery, smoking their fish before bringing them to the United States for a market. Other of the British Provinces probably caught or purchased considerable quantities of herring in the same locality each season.

From 1861 the fishery as far as American vessels are concerned has rapidly declined. Various causes have operated to bring about this result. The quantity of fish, according to some authorities, has greatly decreased from overfishing, and during certain seasons the catch has been insufficient to supply the fleet. At such times the vessels have been obliged to return home with only partial fares. Instances are cited where the fisheries have either partially or wholly failed. In 1862 the catch is said to have been small. In 1870 the fishery was a total failure, and 1873 was a repetition of 1870. Others claim that the fish are still nearly or quite as abundant as formerly, and that other causes have operated to reduce the catch.

* The following table, published by Mr. H. Y. Hind in his communication to the Halifax Commission in 1877, purports to show the total catch of herring at the Magdalen Islands for each season from 1861 to 1876, inclusive:

Year.	Number of barrels of herring taken.	Year.	Number of barrels of herring taken.
1861	41,500	1869	70,800
1862	9,195	1870	2,915
1863	26,500	1871	52,575
1864	3,000	1872	17,822
1865	29,040	1873	4,647
1866	10,883	1874	12,137
1867	15,626	1875	49,951
1868	30,000	1876	77,443

With these conflicting opinions it is impossible for us at so great a distance to arrive at any positive conclusions as to the varying quantities of herring that resort to the islands each spring, but it is certain that the size of the fleet has been greatly reduced by the loss sustained by natural causes, such as storms and encounters with ice.*

The great decrease in the demand and the uncertainty of reaching the grounds have also played their part in reducing the fleet. The expense of fitting for the trip is considerable, and the loss of time of both vessels and men when they could be profitably employed in other branches or the fisheries caused the parties interested to avoid uncertainties as far as possible. The loss sustained by the owners on several occasions was so great as to cause them to exercise considerable caution lest a repetition of the same should occur. The Gloucester Telegraph of May 25, 1870, gives the following account of the fisheries in the spring of that year:

"Five vessels of the Magdalen Island herring fleet arrived home on Monday and two yesterday; the balance of the fleet will soon be along. This fishery has proved an entire failure this season, the vessels being unable to find herring, and returning home virtually empty. The failure of this branch of the fisheries this season entails a large loss upon Gloucester, as an unusually large fleet fitted away in this business, all of which have lost the time consumed on the trip, as well as the considerable expenses of the voyage. The vessels are all of the first class, and might have been profitably employed elsewhere.

"The herring made their appearance on the coast and in the rivers fully a month earlier than usual, and had disappeared before our vessels put in an appearance at their regular haunts at this season. The fleet from the other fishing towns of New England, though much smaller than the Gloucester fleet, met with the same ill success. Lamoine, Me., had ten vessels in this fishery, all of which together did not secure enough to make a single full fare. Newburyport had two vessels in the fishery, both of which have arrived home, one with 50 barrels of herring to show for a month's work, and the other without a single herring."

---

* "These islands [Magdalens] were visited on the 23d August by one of the most terrific hurricanes which have ever yet swept the gulf, and lasted till the 26th. At the beginning of the gale there were 83 vessels anchored in Pleasant Bay. Of this number 48 broke away from their moorings and were stranded (10 on the shores of Pleasant Bay and 38 in Amherst Harbor), and 26 were able to make the harbor and anchor in safety, while 9 rode out the tempest with their anchors and cables. From what I have heard it must have been a fearful sight to witness these little vessels struggling against the gale, and, finally conquered by the contending elements, strike against the rocks during the cruel hours of darkness. It seems almost incredible that three persons only were drowned when we look at the deep cliffs on which some schooners grounded. The unfortunate men belonged to the E. J. Smith, of Wellfleet, United States, which vessel came ashore during the night under the cape at the entrance to Amherst Harbor and went to pieces two hours afterwards. Some other vessels, such as the Diploma, Helen C. Woodward, and Emma L. Rich, after tossing about and losing their anchors, ran ashore on a solid ledge at the foot of the Demoiselles Hill, where the sea was breaking 100 feet high! The crews of these vessels would most probably have been lost had not two of the islanders, Aimé Nadeau and James Cassidy, seen them coming ashore. These hardy fellows let themselves down the side of the cape by a rope, and were saved with the help of Cassidy's Newfoundland dog, which plunged into the surf and seized the men, bringing them all on shore. Had it not been for this courageous behavior on their part, thirty-one more lives would in all probability have been lost.

"Among the stranded vessels was a Jersey bark, the Swift, Captain Le Sellour, who had on board one hundred and thirty fishermen from the islands, all returning from Blanc Sablons. Most luckily for her passengers she was able to be guided to a sand bank at the entrance to the harbor when she lost her moorings. Had she gone a little to leeward there would have been a fearful loss of life to chronicle. A steamer, the Commerce, from Boston, with the agent of the insurance offices, Captain Proctor, and all the appliances on board necessary to haul off vessels, was sent by the interested parties to give what assistance she could. Several schooners were got afloat, but I doubt if all will be as lucky. The United States Government also sent a vessel, the revenue cutter Woodbury, Commander Barr, to render what assistance he could in the way of transporting distressed fishermen back to their homes. Most of those shipwrecked men had, however, left in the schooner before she arrived. The gale will long be remembered by all seafaring men, not only for its duration but for the destruction it caused to life and property all throughout our gulf—many are the families left fatherless and with scanty means of subsistence. Let us hope our shores will never again witness such a storm, or at least that a great number of years will elapse before its occurring again."—Sixth Annual Report of the Department of Marine and Fisheries of Canada, 1872–'73, Appendix B, pp. 53, 54.

N. Lavoie, in his "Report of the Cruise of the Government Schooner La Canadienne in the River and Gulf of Saint Lawrence for the Season of 1870," gives another and more detailed account of the fisheries, from which we learn the extent of the catch at the islands for two seasons and the exact size of the American fleet. He says:

"The yield of the first part of the season in herring fishing was much below an average, if we can call fishing a catch of 2,100 barrels of fish divided between one hundred and nineteen schooners and the whole of the islands fishermen. The same fishery yielded in 1869 75,000 barrels. The failure is in nowise to be attributed to a want of fish in the waters of Pleasant Bay. They resorted thither as usual to spawn, but owing to an early spring and the early disappearance of the ice, the fish struck in three weeks earlier than usual, thus disappointing the expectations of foreign as well as of our own fishermen. At the date of our reaching Magdalen Islands we found one hundred and nineteen schooners from the United States in Amherst Harbor and Pleasant Bay. They were expecting new shoals of herring, but they waited in vain; the fish did not come. The first schooners of the spring fleet arrived on the 27th, the second and third on the 28th April. A few herring were still near shore when these fishermen arrived. They managed to catch about half a cargo on their first arrival, but next morning the fish were all gone.

"It is useless to remark here that the owners and outfitters of these vessels must have suffered heavy loss from the disappearance of herring. On the 18th of May, thirty schooners, which had been detained by the ice, reached the islands for the same fishery, but on finding out that it was over they immediately left. Mr. Painchaud, of Amherst Island, is the only one who has been provident enough to supply himself with seines and salt. He caught 1,100 barrels in two hauls, which pays him a hundred fold for the cost incurred. This improvident spirit displayed by our people is the more to be regretted, as, when they repair to the coast of Labrador again for herring fishing, they are still at the mercy of foreign fishermen, and often return empty-handed after undergoing great hardships and danger."*

Again, in his report for 1873, Mr. Lavoie, in referring to the herring fisheries, shows that though fish were plenty, the fisheries were almost a total failure owing to the abundance of ice that caused most of the fleet to abandon their voyage and return home. He writes as follows:

"Herring made its appearance along the shores of this coast several days sooner than last year, and on the 27th of April Pleasant Bay was full of them. As I have said before, the greater part of the herring fleet were unable to reach the islands, and had to put back to their respective ports on account of the large quantity of ice they met with in the straits or gulf. Four schooners, however, were able to make their way to Amherst Harbor, and to complete their loads in a few days. The following gives their names, tonnage, &c.:

Date of arrival.	Name of vessel.	Port of registry.	Master.	Tons.	Men.	Boats.	Nets.	Seines.	Barrels.
May 13	A. B. Higgins	Lamoine	A. B. Higgins	42	8	2	.....	1	800
May 14	Susan	Canso	J. Walker	19	4	2	.....	2	300
May 28	Hero	Prince Edward Island	McKay	29	3	1	.....	.....	500
May 29	Anemone	Anticosti	Battersy	10	4	1	.....	.....	50
			Total	100	19	6	.....	3	1,650

"On the 27th of April some fishermen from the islands had a cast of the seine, which brought in about 300 barrels of herring. Only a few barrels were, however, saved, as with their usual negligence they had not thought of procuring last year the means of pickling their fish this spring. Salt was too dear and the price of fish too low to allow them to take advantage of their good luck.

* Annual Report of the Department of Marine and Fisheries of Canada, 1869–70, pp. 222, 223.

"Owing to the above-mentioned causes the herring catch of 1873 is much inferior to that of 1872. In that year 14,806 barrels of it were caught by foreign vessels, while 2,956 barrels were prepared by the inhabitants.

"From what I have heard herring was not much more abundant this season than last."*

From that time the fleet has been so small as to be quite unimportant, and during several recent seasons no vessels have visited the Magdalens for herring. We know of but one vessel that engaged in the trade in 1879, and in 1880 it is said that none were employed. According to Mr. A. Howard Clark, herring were plenty at Magdalen Islands in the spring of 1881, when two Gloucester and four Boston vessels brought home 2,500 barrels salted in bulk. They were taken in a haul-seine carried by one of the fleet, all of the fishermen assisting in the work of capture. Nearly all of the fish were landed in Boston.

The Newfoundland and Labrador herring fisheries are so wholly different from those just described that it is difficult to give any statistics of the quantity of pickled herring brought home by American vessels. The fish being present during a greater part of the year, the fleet visiting these localities for other species often bring home partial cargoes of herring, and no vessels can be said to be regularly engaged in the pickled-herring trade with either place, though a few vessels fit out for trips to some of the principal harbors whenever they chance to be otherwise occupied, provided, of course, that the condition of the herring market will warrant such a venture. From our limited information on the subject we would say that from six to ten cargoes, aggregating 3,000 to 4,000 barrels, would be landed yearly by American vessels. This represents, of course, only a small part of the herring brought to the United States from these places, as the various transportation lines bring considerable quantities and a number of cargoes are brought by the fishing vessels of the provinces. In addition to these, American vessels are engaged in running frozen herring during the winter months. The following table, compiled from those given under oath before the Halifax Fishery Commission, by James S. Hayward, assistant collector of Her Majesty's customs at St. John's, Newfoundland,† shows the quantity of herring imported into the United States from that island each year from 1851 to 1876, inclusive:‡

Year.	Herring.		Year.	Herring.	
	Barrels.	Value.		Barrels.	Value.
1851	2,538	$6,134	1864	22,512	$81,043
1852	9,259	15,000	1865	34,633	121,216
1853	6,640	18,326	1866	40,957	122,871
1854	2,166	4,939	1867	37,418	112,254
1855	8,904	29,968	1868	40,199	120,597
1856	6,652	22,824	1869	37,651	112,953
1857	18,478	55,430	1870	19,833	79,332
1858	21,247	63,739	1871	31,863	95,589
1859	30,123	72,299	1872	26,551	79,653
1860	27,460	65,904	1873	35,664	106,992
1861	22,550	55,120	1874	26,701	69,503
1862	13,251	31,800	1875	45,208	108,724
1863	35,736	120,072	1876	28,875	93,647

EXPORT TRADE.—For many years the fish dealers of several of the larger cities have been

*Sixth Annual Report of the Department of Marine and Fisheries of Canada, 1872–'73. Appendix B, pp. 55–56.

†See Documents and Proceedings of the Halifax Commission, 1877. Vol. II, pp. 1509–1518.

‡In the original tables no mention is made of fresh or frozen herring prior to 1872, but they were probably included with the pickled fish up to that time. Since 1872 the pickled fish have been separated from the others, but we have combined them so that the table given here may represent all of the herring imported during the period mentioned.

accustomed, when sending cargoes of dried and pickled fish to the West Indies and other countries, to include a quantity of herring, though they have seldom sent cargoes composed exclusively of herring. This has been particularly true of Boston, and more herring have been sent from there than from any other port. There seems to have been no well-established trade in this particular fish, however, and the quantity sent has varied considerably from year to year, depending largely on the catch and the price, and none of the merchants seemed to exert themselves to secure a supply.

Our market has as a rule been restricted to our own continent, as most of the European countries have large and prosperous herring fisheries, which not only furnish an abundance for their own people, but supply many of the other countries with all that their markets require.

We can, therefore, not expect an extensive European trade so long as our own fishermen give so little attention to the fishery, unless the failure of some of the herring fisheries of Europe shall create a demand that will warrant our merchants in importing herring in considerable quantities from Nova Scotia, Newfoundland, and Labrador. Such a condition presented itself recently, when the failure of the spring herring fisheries of Norway for several consecutive seasons gave a favorable opportunity for our merchants to engage in the trade. The Norwegian herring fisheries are among the most important in the world, and her fishermen not only catch fish for their own country, but they supply Sweden with enormous quantities and send a good many to the countries farther south. The "summer herring," it is said, still put in an appearance along the north coast, but the supply is much below the requirements of the home and export trade.

The Gloucester merchants saw this opening, and with characteristic energy decided to try the experiment of sending cargoes of pickled herring to Sweden, Ireland, and even to Scotland.

The first cargo of herring exported to Europe from this great American fishery port was sent by Messrs. D. C. & H. Babson, who have from the first been more largely engaged in the trade than any other parties. The schooner Nulli Secundus, formerly of Gloucester, was the first vessel to sail. Having been sold to Capt. Caleb Lindahl, of Gottenberg, Sweden, in January, 1876, for the cod and halibut fisheries of Greenland, and being about to sail to Gottenberg to fit out, it was decided to load her with herring. She cleared from Gloucester on the 1st of February and from Halifax on the 14th, arriving in Sweden March 8. The venture proved a profitable one, and a new vessel, the Herman Babson, left Gloucester for the Magdalen Islands on the 27th of April to load with herring for the Gottenberg market. Other vessels followed in rapid succession, some of them belonging at Gloucester and others being chartered from other places on Gloucester's account until, by the 1st of February, 1877, thirteen cargoes had been shipped, Messrs. Babson alone, according to their statement before the Halifax Commission, having handled 28,208 barrels, of which 16,063 were caught on the American shore, and 12,145 came from the Provinces.*

*The statement of Messrs. Babson was as follows: We have been asked to make a statement of the number of barrels of herring caught in American waters on the coast of the United States, and the number of barrels of herring caught in foreign waters during the last year handled by us, and to state the relative value of each barrel in its green state, as it is when taken from the water. We find upon examination of our books that we have taken in our business during the last year 28,208 barrels of herring. Sixteen thousand and sixty-three barrels were caught on the coast of the United States between Eastport, Me., and Provincetown, Mass. The herring cost us for those caught on the coast of the United States from $2.25 to $2.75 per barrel; that is, for the herring, not including the barrel, salt, labor, &c.

Twelve thousand one hundred and forty-five barrels were caught on the coasts of Newfoundland, Cape Breton, Nova Scotia, Magdalen Islands, and Labrador, as follows:

Caught at Fortune Bay, Newfoundland	8,587
Caught at Port Hood, Cape Breton	200
Caught at Nova Scotia (coast)	348
Caught at Magdalens	510
Caught at Bay of Islands, Newfoundland	2,500
	12,145

More than ordinary care was taken in packing the first two or three cargoes, which met with a ready sale; but the fishermen soon became negligent, and not only gave little attention to their preparation, but even bought and shipped fish of inferior quality. The result was that the Swedes, who have always surpassed us in the methods of preparing herring, and who not only know good fish, but will use no others, on seeing the condition of the herring offered for sale, refused to buy them, and our vessels were obliged to seek a market in other countries at a greatly reduced figure.

The parties interested lost heavily, and as the American brands had come to be regarded with suspicion, the business was suddenly terminated, and for over a year no one ventured to make a shipment. In March of 1879, however, the Babson Brothers chartered the British brig Lapwing and loaded her with herring for Sweden. Again in the fall of 1880 the same parties chartered the Norwegian brig Triton and shipped by her 3,000 barrels of herring to Queenstown, Ireland.*

As already stated, on account of the limited extent of our own herring fisheries most of the stock for shipment necessarily comes from the Provinces, and our vessels have as frequently loaded in the Provinces as in our own country. Mr. Clark informs us that in the spring of 1880 Mr. Horatio Babson visited Newfoundland and bought several cargoes of herring for the European trade, chartering vessels in that locality for the work.

It is difficult to say just how fully this trade can be developed, but it is perhaps safe to assume that until our fishermen give more attention to the capture of the species and take more care in salting their catch the home business cannot become important, and if carried on to any considerable extent our merchants must either go to Newfoundland, New Brunswick, and the Magdalen Islands to buy and ship the fish, or they must import them from those regions and ship by their own vessels.

Those caught at Fortune Bay in-paid 75 cents (gold) per barrel; at Port Hood, $1 per barrel; Magdalens, 75 cents per barrel; and at Bay of Islands, Newfoundland, $2 per barrel. These prices include what is paid for the fish, and does not include the barrels, salt, labor, &c.

All the herring which we put up in the provinces, as stated herein, we bought from the fishermen and paid them at prices as stated, and in no case whatever did we catch any in nets or seines, but always purchased the fish from the natives.

The above number of barrels does not include any herring which our vessels bought in the provinces during the year for bait.

We have taken from our books the number of barrels packed.

D. C. & H. BABSON.

Witness: CHAS. H. BROWN.

GLOUCESTER, MASS., U. S. A., *October* 17, 1877.

—*Documents and Proceedings of the Halifax Commission*, 1877, Vol. III, pp. 3344, 3345.

* Mr. G. Brown Goode has kindly furnished data from which we are enabled to compile the following list showing vessels engaged in the export trade, exclusive of those sent from Newfoundland by Gloucester parties in 1880:

Name of vessel.	Date of departure.	Destination.	Remarks.
Schooner Nulli Secundas	Feb., 1876	Gottenburg, Sweden	Sailed from Gloucester.
Schooner Herman Babson	Apr., 1876	do	Secured her fish at the Magdalen Islands.
Schooner Dora S. Prindle	Apr., 1876	do	Cleared from Boston.
Barkentine Ada G. Pearl	May, 1876	do	Cleared from Gloucester.
Schooner Cornelius Stokem	June, 1876	do	Went from Gloucester to fishing grounds; arrived in Gottenburg July 27.
Schooner Setagawa	July, 1876	do	Cleared from Gloucester.
Schooner Centennial	July, 1876	do	Do.
Schooner Setagawa	Oct., 1876	Leith, Scotland	Met with disaster and changed her destination to Jamaica.
Bark Frigg	Oct., 1876	Gottenburg, Sweden	
Barkentine Christiana Reedman	Nov., 1876	do	
Schooner Eva L. Leonard	Dec., 1876	do	Chartered on Gloucester account.
Barkentine Alice C. Dickerson	Jan., 1877	do	Do.
Bark Norway	Feb., 1877	do	Sailed from Halifax, Nova Scotia, on Gloucester account.
Brig Lapwing	Mar., 1879	do	Cleared from Gloucester.
Brig Triton	Nov., 1880	Queenstown, Ireland	Do.

4.—THE SMOKED-HERRING INDUSTRY.

a. Hard Herring.

1. ORIGIN OF THE SMOKED-HERRING INDUSTRY.

Nothing is definitely known of the man who smoked the first fish; in fact, so meager are the records that we cannot state with certainty either the country or the century in which he lived, and the origin of the method now so common throughout the world must forever remain a mystery. A recent writer, in referring to the herring fisheries of Norway, accounts for their small commercial importance prior to the fifteenth century by saying that the people were ignorant of the art of pickling and contented themselves with either smoking their fish or drying them in the air. The method of pickling fish in brine is thought to have originated in the fourteenth century, and smoking was practiced at even an earlier date. There seems little doubt that the preservative qualities of smoke were discovered independently in different countries, and not alone by civilized nations, but by savages as well. According to Webster, the word *bărbecue* was coined by the Indians of Guiana to denote the frame on which the flesh of beasts and fish was roasted or smoked, showing that this people must have been familiar with some method of smoking. The different tribes of Central and Southern Africa are said to cure flesh by means of smoke. All civilized nations smoke fish and meats either to be stored away for future use or to give them the characteristic smoky flavor.

The methods of smoking vary endlessly, though the principle is everywhere the same. In some countries the smoky products are so black and hard as to disgust a person of ordinary taste, while in others such care is taken in the preparation and such a delicate flavor is imparted to the products that they are in great favor with the epicures. Thus, though a comparatively simple process, great care must be exercised in smoking in order that the desired results may be secured; for two commercial products so wholly unlike as to command different prices, to sell under different names, and to be consumed by entirely different classes, may be made by the same person from similar individuals of the same species. The hard or red herring and the bloater—products totally unlike in flavor and in keeping qualities—are both made from our common herring (*Clupea harengus*).

Many kinds of fish are smoked, though some species are more desirable for this purpose than others. The principal requisite is that the fish should be fat and oily, as species of firm, coarse flesh when smoked are usually hard and poorly flavored. The various herrings are perhaps more generally smoked throughout the world than fishes of any other family, and next in importance come the mackerel. Salmon and haddock are also extensively smoked in different countries. Some fishes, however, though frequently smoked in one country, may, either from their restricted geographical range or the lack of information as to their value, be nearly or quite neglected by the inhabitants of other regions. Thus the "finnan haddie" trade was for some time peculiar to Scotland; smoked halibut and whitefish are prepared only in America; and codfish bellies (*rögerump*), as we are informed, are smoked only by the Norwegians.

Fish have probably been smoked in America for many centuries, and the first European colonists being familiar with the method of smoking at home, doubtless found it a very convenient way of curing fish on their arrival in this country when salt was not easily obtained. But the limited commercial demand naturally rendered the business of little importance, and for many

years it was carried on only in a small way, the work being done chiefly by fishermen who had rude smoke-houses near the shore, in which they prepared a sufficient quantity for local use. The New England, New Brunswick, and Nova Scotia fishermen smoke the sea-herring, and those along the southern coast smoke the alewife, or fresh-water herring, as it is more frequently called. As the northern fisheries grew in importance a trade sprung up with the West Indies, and large quantities of dried fish were exported yearly, a market being thus found for small quantities of smoked herring. A few of the Massachusetts and Maine fishermen, as well as those of the British Provinces, became interested in the work, and small smoke-houses might be seen here and there along almost any portion of the coast, though in no locality was there any extensive business.

2. LOCATION OF THE INDUSTRY.

The first town on the continent to become noted for its smoked herring was Digby, Nova Scotia, where a Scotch fishermen located about 1795, and turned his attention to the preparation of the fish by a method similar to that employed in his native country. His fish, being much superior to the ordinary brands, met with considerable favor in the markets of both Nova Scotia and the United States, where they soon came to be known as "Digby chickens," a name which they retained for many years. Later, some of the fishing-settlements along the coast of Maine became extensively interested in the smoking of herring, large quantities being put up annually and sent to Boston for distribution. The principal towns engaged in this work during the first half of the present century were Eastport, Lubec, Millbridge, Deer Isle, Lamoine, Booth Bay, Southport, and Westport. Some of these, after continuing in the business for a number of years, found that the margin of profit was so reduced that if they continued the business it must be done at an actual loss. One after another the fishermen of these places turned their attention to other branches of the fisheries, and since the Rebellion the business has been practically controlled by the towns of Eastport and Lubec; the latter at the present time putting up fully half of the smoked herring prepared within the limits of the United States.

DEVELOPMENT OF THE INDUSTRY AT EASTPORT AND LUBEC.—As these towns have from the first taken a leading part in the smoked-herring industry and are now the principal ones engaged in the work, it seems proper to give a more detailed account of the origin and development of the industry among their people. The historical facts relating to the smoked-herring business in this region were obtained during an interview with Mr. Jacob McGregor, who was among the pioneers in herring smoking at Lubec. As early as 1808 parties in the vicinity of Eastport, then a trading post of considerable importance, engaged extensively in the herring fisheries, smoking each season considerable quantities of herring, which they sent to Boston for a market. About 1812 the region came to be more thickly peopled, and a settlement was formed at Lubec Narrows for the purpose of trading with foreign vessels that came to the region. These narrows were at the time the favorite path of the herring on their way from the sea to the large salt-water bays, farther in. Finding large quantities of fish at their very doors the inhabitants engaged extensively in catching them, and occupied a considerable portion of their time in smoking and salting the fish. The year 1812 may then be properly considered as the time of the origin of the herring smoking at Lubec, from which time this place has taken the lead in this branch of the fisheries. In 1821, according to Mr. McGregor, there were about twenty smoke-houses, each curing 2,500 to 3,000 boxes of herring annually. The business gradually increased until 1845, when it occupied the attention of a majority of the inhabitants, and from this date to 1865 not less than 500,000 boxes of herring were cured annually within the limits of the town.

Owing to the increased demand, and to the difficulty of securing an abundance of fish at home,

Eastport and Lubec vessels, as well as those from other portions of the coast, visited the Magdalen Islands and secured cargoes of herring, which were salted in bulk, as described in the chapter on the Magdalen herring fisheries, and brought home to be smoked. During the war of the rebellion there was an unusual demand for smoked fish, and Magdalen herring came to be an important brand in the market. Since 1866 the herring have failed to visit these islands regularly, and vessels resorting thither have frequently failed to secure cargoes, and many that formerly made yearly trips to the Magdalen have filled their vessels from the other fisheries. The demand for herring has also greatly diminished, so that the market is satisfied with a much smaller quantity than formerly, and the price has been proportionately lower. These facts have had their influence upon the smoked-herring industry of the entire country. Many of the towns have suffered heavily, Eastport and Lubec being perhaps less seriously affected than the others, though the smoking of Magdalen herring has even there been practically discontinued.

3. THE FISHERMEN AND CURERS.

As already stated, herring smoking was, at first, confined to no particular class, for many of the fishermen living in the locality where the fish were abundant caught and smoked small quantities in the fall for their own tables. As the business increased certain ones became more extensively interested in the work. Some of these were professional fishermen, who followed hand-lining from small boats or vessels during the summer months and devoted their attention to herring smoking only in the fall, after the weather had become so stormy as to make their former occupation both dangerous and unprofitable. In many localities the farmers also engaged extensively in herring smoking; and, after spending their summers in tilling the soil, they resorted to the inner bays for the capture of herring, continuing the work till the close of the season. Some of them built smoke-houses and carried on the business independently, while others worked together, catching and smoking their fish in common, dividing them equally after the work had been completed. In some localities the business was followed chiefly by the professional fishermen, who secured extra help during the height of the season, the laborers taking herring in pay for their services. At the present time the smoking of herring is done chiefly by the semi-professional fishermen. These usually own small farms on which they raise sufficient produce for their own tables, and in addition a small surplus which they dispose of in the locality. They give some little attention to fishing during the early part of the season, but do not follow the business with any regularity until the time for herring-smoking begins. The herring are present in some localities during a greater part of the year, and the weirs are put in order about the last of May and fished occasionally from that date, though the fishing does not practically begin till September.

From this time till late in December the men give their entire attention to this work. Several of them usually own and fish a weir in common, dividing equally the herring, which they smoke on their own premises. In case a man is so unfortunate as to have no smoke-house of his own he usually arranges with one of his neighbors to share his, giving a certain quantity of fish in payment for its use.

4. METHODS OF THE FISHERY.

TORCHING.—Three methods are employed by the fishermen of the various localities for securing their supply of herring for the smoke-houses, namely, torching, weir fishing, and netting. The first mentioned has been fully described in the chapter on the shore herring fisheries. It is the oldest method and practically the only one employed to any extent prior to 1828.

BRUSH WEIRS.—The second and most important apparatus is the brush weir. This is also

described below in detail in the chapter on the sardine industry. It is thought to have been introduced into the fisheries of Quoddy River by Nova Scotia fishermen about 1828, since which time it has been quite generally adopted, and weirs have been built at various points along the entire coast of the State, though they have always been more extensively used in the region lying east of Penobscot Bay.

GILL-NETS.—Gill-nets are said to have been used in the fisheries of Digby, Nova Scotia, as early as 1795, but owing to the small size of the fish used for smoking they were not extensively employed along the coast of the United States until very recently. Most of the herring put up in early days were fish ranging from 6 to 9 inches in length, these being so small as to readily pass through the nets of ordinary mesh. Fish of this size have always been thought more desirable than larger ones, and have commanded a better price in the markets. The first large fish smoked were those secured at the Magdalen Islands, and it was not until this fishery had ceased to be important that the large herring along our coast were utilized for smoking. When these fish came to be used nets were very naturally employed in their capture, and the gill-net is now an important apparatus in the fishery.

5. THE SMOKE-HOUSES.

HERRING SMOKE-HOUSES.—The houses used for smoking herring vary greatly in size, according to the locality and the amount of business to be done. At first they were very small, some of the fishermen using ordinary barrels or hogsheads for preparing a sufficient amount for their own tables, while others used some old shed or other small building for the purpose. Those engaged more extensively in the business had larger houses, but as a rule these were mere huts made of coarse material and in the rudest manner. They were often so loosely put together as to be seriously injured or entirely destroyed by heavy winds.

It is not necessary that the houses should be at all elaborate or expensive, and few of the fishermen care to put much money in them as there is much danger of loss from fire, houses being very frequently burnt through the negligence of the person in charge. Some of the fishermen of late are building houses of a better class, but even now a majority of them are quite crude. As a rule a site is selected on the shore in the vicinity of some boat-landing, but the fishermen occasionally build on their own land near their homes on account of the greater convenience in caring for the fish. The houses are without floors and consist simply of rough board walls with a gabled roof of the same material, every crack being battened with slabs or sheeting, both to render the building water tight and to prevent the smoke from escaping. As a protection against fire, many of the larger houses are lined with brick or mud on the inside to a height of several feet. Each house is provided with board windows or longitudinal openings on either side, while in the more modern ones an opening is also made along the ridge-pole and covered with boards so arranged that they can be raised or lowered by means of cords attached to levers. These answer as ventilators, and it is often necessary to keep most of them open to prevent the fish from being ruined from excessive heat. The interior construction is very simple. It consists merely of a series of rows of "two by four" pine stringers or scantlings, one above the other, extending from near the ridge-pole to within 6 to 8 feet of the floor. These scantlings are 13 to 14 inches apart and are 38 inches distant from the rows on either side. The space between two adjoining vertical rows is called a "bay," and the size of the smoke-house is reckoned by the number of "bays" that it contains, these varying from 5 to 12. The capacity is in proportion to the size, small smoke-houses holding only 1,000 or 2,000 boxes, while the largest contain 8,000 or even 10,000. A smoke-house of average size is about 18 feet wide by 30 feet long, with the ridge-pole 25 to 30 feet from

the ground. Such a house holds about 4,000 boxes of herring. A fisherman will frequently own two or three smoke-houses, separating them from each other by a sufficient space to prevent the loss of all in case one should be burned. Where an extensive business is done requiring several buildings it is customary to have a small landing or wharf to which the boat containing the herring may be fastened. One or more small sheds are also necessary for the work of salting and stringing the fish and, in addition, a larger building is erected where the boxes are made and the fish are packed and stored until such time as they can be marketed to advantage. Single smoke-houses usually have a small shed attached, but they are seldom provided with packing-houses, the fisherman almost invariably using some portion of his own dwelling for this purpose. An ordinary smoke house, if we include the boat landing, costs, when new, about $200, but if provided with salting and stringing sheds and packing-houses it has a value of fully $400, which is increased to $450 or $500 if the land occupied is considered.

6. METHODS OF SMOKING AND PACKING.

The small fish used for smoking are taken either by torching or in weirs, as already mentioned, while the larger ones are caught in gill-nets. Several fishermen usually visit the weir at low tide and secure the catch by means of a small seine, which is hauled either on the "shore side" or in the "bunt" of the weir, the fish being transferred to the boat by means of large dip-nets made expressly for the purpose.

SCALING.—As soon as the herring have been secured the fisherman fastens his oil-trousers tightly about his boots and begins scaling the fish, or "treading them out," as he calls it, by moving his feet briskly back and forth through the mass without raising them from the bottom of the boat. By the motion of the fish upon each other, as well as by contact with the legs of the fisherman, the scales are readily removed, four or five hogsheads being easily scaled in half an hour. Another method of scaling is to move the fish among each other by means of a stirring stick, locally known as a "spudger." This instrument is simply a piece of board about a foot in length and 4 or 5 inches wide, which has been securely fastened to a long handle. By means of this the mass of herring is stirred until the scales have all been loosened. The scaling must take place at once upon the removal of the fish from the water, as when they become dry the scales set, and can then be removed only with the greatest difficulty. According to Mr. McGregor, no herring were scaled prior to 1820, when Mr. Samuel Myers, of Lubec, noticed the deciduous character of the scales and began an investigation of the subject, which led to the methods already described. He found that the appearance of the fish was greatly improved by removing the scales, and that scaled herring brought from 20 to 30 cents more per box in the market than those put up in the ordinary manner. From this time he scaled all of his fish before smoking them, and although he attempted to keep the process a secret, the fishermen watched him until they discovered his method, which was soon universally adopted. Great care must be exercised in scaling, as when the fish are not sufficiently stirred numbers of scales will remain, making an undesirable contrast with the scaleless portions of the body. Again, if the fish are stirred too long the texture of the flesh is injured, and they are less saleable, many of them being "belly-broken" and worthless.

SALTING.—As soon as the scales have been loosened the fish are washed in dip-nets for the purpose of properly cleaning them, after which they are transferred to large tubs, barrels, or hogsheads, where they are carefully salted. The amount of salt required varies with the size and condition of the herring, large and fat fish needing more than small or lean ones. The average quantity used varies from 1½ to 2 bushels to the hogshead. The small fish are allowed to remain in the pickle from twenty-four to thirty-six hours, while the larger ones, in order to be thoroughly

"struck," must remain about forty-eight hours. A good deal, however, depends upon the season, as the fish usually "strike" quicker in warm than in cold weather. It is also found that fish just from the water require a longer time in the pickle than those that have been caught a number of hours.

STRINGING.—When properly salted the fish are again washed and transferred to large stringing tables, where three to six persons are engaged in stringing or "spitting" them, as it is frequently called. The stringing sticks are bought at the saw-mills in the vicinity in a partially manufactured condition. When purchased they are simply long strips of wood $\frac{3}{4}$ of an inch square. They are cut into pieces 3 feet 4 inches in length by the fishermen, after which the sharp edges are taken off and one end is pointed. When ready for use they are worth from $3 to $4 per thousand, according to quality. In stringing the stick is held in the left hand by the blunt end while the fish is clasped by the right hand and held with its back away from the stringer. The left gill-cover is then raised by a movement of the thumb and the pointed stick is inserted and passed out through the mouth, the fish being moved down to its proper position. It requires some time to become expert in this work, but after one has the knack he can work very rapidly, as only two movements are necessary to complete the operation. The most rapid workers will string 1,000 sticks in from eight to ten hours, while an average day's work for a professional stringer is from 500 to 700. Each stick holds from 25 to 35 fish, according to their size, while a hogshead (5 barrels) of herring will make 80 to 90 boxes of herring when smoked. The stringing is usually done by boys and girls who are hired for this purpose, though when the fishermen have leisure they frequently string their own catch, or, in some cases, they hire men for the purpose.

DRAINING.—When properly strung the fish are again dipped into a trough of water for the purpose of removing the blood and dirt that has gathered upon them, after which the sticks are placed in position upon a rectangular frame or "herring-horse," as it is called. When the frame, holding from 25 to 30 sticks, has been filled it is carried to the open air and allowed to drain for several hours, the time depending upon the heat and dryness of the atmosphere. The object in exposing the fish in this manner is to dry and harden the gill-covers, as when tender they often give way, allowing the fish to fall from the stick, thus rendering it worthless for smoking purposes. When the sun is shining the moisture evaporates quite rapidly, and the gill-covers very readily harden; but during rainy or foggy weather a good deal of difficulty is experienced in drying them, and great quantities of herring drop off and become worthless. At such times the usual method is to allow them to drain for a few moments, after which they are at once hung in the smoke-house, all the doors and windows being opened to give a free circulation of air, while a good fire is kept burning beneath. In this way the gill-covers soon dry, and they are ready for smoking.

HANGING.—When ready for "hanging" the herring are brought to the smoke-houses, where two men are engaged in putting them up, one passing them to the other, two sticks at a time, the pointed end being held upward, so that the fish shall not slide off. The fish are placed in the bays already described, the ends of the sticks resting on the stringers, each being separated from the other by 2 or 3 inches, so as to prevent the herring from touching each other, as well as to allow a free circulation of smoke. The upper part of the smoke-house is usually filled first, though, when the house is to be but partially filled, one bay is often entirely filled before another is commenced. Two men can hang about 2,000 boxes a day, if the fish are brought to the smoke-house; but half that quantity is a fair average if they are obliged to go out for their supply. It seldom happens that the house can be completely filled in a day, as only a few fish are secured at a time, and these must be cared for at once to prevent them from spoiling.

As soon as the first lot has been placed in the smoke-house, the fires are started and the smok-

ing begins. When another lot is to be hung, the fires must be extinguished and the windows and ventilators thrown open to allow the smoke to escape and enable the fishermen to remain in the bays for the purpose of hanging the balance of the catch. This process is continued until the smoke-house is full, when the fires are again lighted and usually kept burning until the fish are thoroughly smoked.

FIRES.—The fires are differently arranged in different smoke-houses, their relative position depending largely upon the ideas of the particular fisherman that is interested in the work. The usual plan is to collect logs, 4 to 8 inches in diameter and 3 or 4 feet long, and arrange them, with the proper kindling, in heaps at equal distances from each other and a few feet from the side of the building. From six to twelve of these heaps are arranged in the average smoke-house, two or three logs being placed together with a quantity of smaller material. When all is in readiness the fires are lighted and kept burning day and night until the fish have been considerably affected by the smoke. Owing to the closeness of the air the fires burn very slowly, it being found desirable to keep the fish as cool as possible, and if allowed to burn briskly the heat generated by the flames would destroy every fish in the smoke-house in a few hours. When there is a tendency to burn freely the fishermen separate the logs and cover them with ashes, to a greater or less extent, to smother the flame; but ordinarily they are allowed to remain near together, some one visiting the smoke-house every few hours to care for them. At times some or all of the fires are allowed to go out, as, after the fish are partially smoked, the absence of fire for a day or two is not thought to effect their quality. Generally, however, the fishermen are anxious to smoke them as rapidly as possible, in order that the house may be cleared for another lot.

WOODS.—Different woods are used for smoking in different countries. Some claim that the selection of particular kinds is an important matter, while others insist that the quality of the wood has little if anything to do with the flavor or value of the products. In France, white birch is commonly used; in England, Scotland, and Holland, the chips and sawdust of oak are said to be favored; in Norway, heather and juniper are extensively used, though birch and alder are employed to a limited extent. In the United States various kinds are selected, pine logs that have been soaked in salt water being preferred by a majority of the fishermen. These are usually picked up along the beach by the fishermen, and are claimed to be superior to other wood, as the salt absorbed while in the water renders them less inflammable, causing them at the same time to last much longer and to give off a greater volume of smoke. When the smoking process is nearly complete some of the fishermen build a fire of oak, for the purpose of giving a higher color to the fish. In most localities, however, the question of woods is not considered important, the only point being to have a kind that will burn slowly and at the same time yield a large amount of smoke.

TIME REQUIRED FOR SMOKING.—The time required in smoking varies considerably, depending upon the size of the smoke-house, the size and condition of the fish, and the weather. Small fish in dry weather can be cured in two weeks, while large herring often require fully six weeks, and those put up for exportation to warmer countries are smoked for even a longer period. The time of curing is also affected by the position which the fish occupies in the smoke-house. Those nearest the fires and about the sides of the building, where there is a better circulation, are cured first, while those in the center are cured more slowly. It sometimes happens, when the fish are hung very closely, or when it is desired to hasten the curing, that the lower and outer fish are removed as soon as cured, thus exposing the central mass to the direct action of the smoke. Many claim that the best fish are those taken from the upper bays, as these are farthest removed from the fire and the smoke is thoroughly cooled before reaching them.

MAGDALEN HERRING.—The Magdalen herring, already referred to, are larger and, at the same

time, in poorer flesh than those taken along the American shore. Owing to the distance of the fishing grounds, they must necessarily be salted before being stowed in the vessel. They are usually salted in bulk, as already described in the chapter on the Magdalen herring trade, and on arriving at their destination are placed in floating cars or crates beside the wharf, where they are allowed to soak for some hours to remove the surplus salt which they have taken up. When sufficiently freshened they are strung and smoked in the ordinary manner, the only difference being that the time required in smoking is greater than for the smaller and fresher fish taken on our own coast.

KEEPING IN SMOKE-HOUSE.—If, for any reason, it is not thought desirable to market the fish as soon as they have been cured, they are usually allowed to remain hanging in the smoke-house, where a fire is built under them every two weeks to dry off any moisture that may accumulate. They keep better in this way than when packed in the ordinary herring-boxes.

PACKING.—When the packing-time arrives the fish are carried to the "shop," or packing-house, where they are removed from the sticks and placed in boxes made expressly for them. At the close of the eighteenth and the early part of the present century they were marketed in kegs holding about a bushel each.* Later, as the trade increased, boxes were substituted, their shape and dimensions being regulated by special legislation, that there might be a uniformity in size. The quality of the fish was also regulated by law, and an inspector was appointed to visit the smoke-houses in person or to send a deputy to cull the herring into grades and see that they were properly boxed and branded. The first boxes, known as the "half-bushel boxes," were 18 inches long, 9 inches wide, and 7 inches deep, inside measurement. When purchased they cost from $8 to $10 per hundred; but the fishermen frequently made their own supply, visiting the forests, felling the trees, and rifting out the material by hand. Later, as the saw-mills became more numerous, the sawed boards were purchased by the fishermen and cut into the proper lengths. Of late years the material for herring-boxes is usually made from refuse lumber and short pieces at the various saw-mills along the coast, and shipped in the form of shooks. These are made up by the fishermen during their leisure hours, and cost, when ready for use, about 1¾ cents each. The best workman can make five hundred of them in a day, while the average is not far from three hundred.

Certain States have repealed their laws regulating the size of the boxes, and in some others, though the laws still remain upon the statute-books, they are practically a dead letter, as they are seldom, if ever, enforced. Notwithstanding these facts, the boxes used in the various localities are still of nearly uniform size, being usually 15½ inches long, 7½ inches wide, and 4 inches deep, inside measurement. At Eastport, however, where large herring are extensively smoked, the boxes for the brand known as "lengthwise herring" are 15 inches long, 7½ inches wide, and 3½ inches deep, holding about the same weight of fish as the other.

The first law relating to smoked herring established two brands, namely, fish of the "first" and "second" quality. About 1822 this was modified to accommodate the newly-introduced scaled herring, thus making three brands; the scaled, number ones, and number twos. The scaled herring included all the best fish of medium size that were well scaled. The number ones were a good quality of fish, of small size, and such unscaled fish as were in good condition and of good color, while the number twos were the poor fish of various sizes, including those from the Magdalen Islands. Mr. M. H. Perley, in speaking of the smoked herring of Maine in 1851, at which time the laws had been again modified, says: "When sufficiently cured, the herrings are packed in boxes of the legal size in Maine—that is, 17 inches long, 8¼ inches wide, and 6 inches deep, measured on the

* It is said that kegs are still used by the French for marketing their fish, and that such care is taken in packing that each layer of herring is separated by a thin board.

inside of the box. The best quality of smoked herrings are called 'scaled herrings.' These are the largest and best fish. Those called 'number one' are herrings not scaled and small fish. A scaled herring must be 7 inches long, fat, and good. The number one must not be less than 6 inches in length, and larger but poor fish are also branded of this quality. All other descriptions of fish are considered refuse."

Sections 10 and 11, of chapter XI, of the Revised Statutes of Maine, passed in 1871, read as follows:

"SEC. 10. All smoked herring shall be sorted by the inspector, according to their quality, as follows: Scaled herrings shall consist of all the largest, fattest, and best-cured fish of not less than 7 inches in length; number one of well-cured fish not less than 6 inches in length; and in both cases all those shall be taken out as refuse which are belly-broken, tainted, scorched, slack salted, or not sufficiently smoked.

"SEC. 11. All boxes for packing smoked herrings shall be made of sound boards sawed and seasoned; the top, bottom, and sides, of boards not less than three-eighths of an inch thick; and the ends, of boards three-quarters of an inch thick, securely nailed, and 16 inches in length, 8 inches in breadth, and 5 inches in depth by outside measurement: *Provided*, That any change in the dimensions, above named, shall not operate to reduce their capacity, which shall not be less than 464 cubic inches in the clear for each box; and each box shall be filled with the same kind and quality of fish; and if the box contains Magdalen herring, that word shall be abridged if considered convenient; and no fish shall be considered merchantable unless salted and smoked sufficiently to cure and preserve them, which shall then be packed in boxes in clear dry weather."

Sections 6 and 7, of chapter CXXIV, of the General Laws of New Hampshire, approved August 6, 1878, give the following, governing the smoked-herring interests of that State:

"SEC. 6. All herrings or alewives intended to be smoked and packed shall be sufficiently salted and smoked to cure and preserve the same, and afterward closely packed in the boxes in dry weather.

"SEC. 7. All smoked alewives or herrings shall be divided and sorted by the inspector or some deputy, and denominated, according to their quality, 'first sort' or 'second sort.' The 'first sort' shall consist of all the largest and best-cured fish; the 'second sort' of the smaller, but well-cured fish; and in all cases all fish which are belly-broken, tainted, scorched, slack salted, or not sufficiently smoked shall be taken out as refuse.

"SEC. 8. Each box of alewives or herrings so inspected shall be branded on the top by the inspecting officer with the initials of his Christian name and the whole of his surname, the name of the town where it was inspected, with the abbreviation of 'N. H.,' the quality, whether 'first sort' or 'second sort,' and the month and year in which they were so branded."

Sections 48 to 52, inclusive, of chapter XLIX, of the General Statutes of Massachusetts for 1859, regulate the brands and boxes of herring in the following manner:

"Alewives or herrings intended to be packed for sale or exportation, shall be sufficiently salted and smoked to cure and preserve the same, and afterwards shall be closely packed in boxes in clear and dry weather.

"SEC. 49. Smoked alewives or herrings shall be divided and sorted by the inspector or his deputy, and denominated according to their quality, *number one* and *number two*. Number one shall consist of all the largest and best cured fish; number two, of the smaller but well-cured fish; and in all cases those which are belly-broken, tainted, scorched, or burnt, slack salted, or not sufficiently smoked, shall be taken out as refuse.

"SEC. 50. Boxes made for the purpose of packing smoked alewives or herrings, and containing

the same, shall be made of good sound boards sawed and well seasoned, the sides, top, and bottom of not less than half inch, and the ends of not less than three-quarter-inch boards, securely nailed, and shall be 17 inches in length, 11 inches in breadth, and 6 inches in depth, in the clear, inside.

"SEC. 51. Each box of alewives or herrings inspected shall be branded on the top by the inspecting officer with the first letter of his Christian name, the whole of his surname, the name of the town where it was inspected, with the addition of Mass., and also with the quality of *number one* or *number two*. Herrings taken on the coasts of Nova Scotia, Newfoundland, Labrador, or Magdalen Islands, and brought into this State, shall also be branded with the name of the place or coast where taken.

"SEC. 52. The fees for inspecting, packing, and branding shall be 5 cents for each box, which shall be paid by the purchaser; and the inspector-general may require from his deputies 1 cent for each box inspected, packed, and branded by them."

As has been already stated, many of these laws, though never repealed, are not regarded by the fishermen, who suit their own convenience as to the size of the boxes and the quality of the fish put up. Few are ever examined by the inspectors, and the returns of these officers are so incomplete as to render the statistics obtained from their reports utterly worthless. Few of the fish now seen in the markets are branded, but smoked-herring dealers have adopted various trade names for fish of different size and quality.

The following table gives a list of the names recognized, together with the number of fish contained in a box of average size.

	Herring to the box.
Small scaled	150
Medium scaled	120
Scaled	80–100
Medium tucktails	35– 40
Large tucktails	25
Lengthwise	30
Magdalens	30
Number ones	80–100

The principal brands are *scaled, tucktails, lengthwise, number ones*, and *Magdalens*, the others being less generally recognized.

7. MARKETS AND PRICES.

MARKETS.—When the Magdalen fishery was at its height the smoked herring were marketed by the same vessels that brought them from those islands. On arriving home the vessel proceeded to her wharf to unload her cargo, remaining until the fish were smoked and boxed, after which they were stored in the hold and she set sail for market. The principal dealers at that time resided in Boston, these handling the greater part of the fish prepared within the limits of the United States. Many of them were engaged in the export trade, and in addition sent large quantities of herring annually to the different portions of the South, a majority of those consumed there being purchased by the large planters for distribution among their slaves. The trade continued to increase until the close of the Rebellion, when the emancipation of the negroes interfered seriously with it, and for a number of years parties engaged in the business lost heavily, owing not only to the decreased demand, but also to the improper method of curing and the poor quality of the fish placed upon the market. During the abnormal demand the fishermen became anxious to realize the high prices, and for this reason they often put their fish upon the market in a half-cured con-

dition, the result being that many of them spoiled before reaching their destination. This in many cases resulted in a direct loss to the fishermen and dealers, as country purchasers refused to pay for them. But a greater injury to the trade was found in the fact that the former customers finding the herring so inferior in quality sought other articles of food as a substitute.

Several years of depression followed, many who had formerly engaged extensively in the business allowing their smoke-houses to remain idle rather than incur the risk of loss. Within the last few years, however, the trade has been somewhat revived, and a better feeling exists among the dealers, while the demand in New England and in certain portions of the West is gradually increasing. Boston, however, has lost much of her former influence, and New York now ranks as the important market, handling over half of the herring smoked in the Quoddy River region.

PRICES.—In the early part of the century, according to Mr. McGregor, the price realized by the fishermen for the regular half-bushel boxes varied from $1 to $1.25. From 1830 to 1850, according to the same authority, the average price was about $1.10 for *scaled herring*, 80 cents for *number ones*, and 35 to 40 cents for *number twos*. From this time the price was gradually reduced, though perhaps not in proportion to the size of the box, for during the "war-period" boxes no longer than those employed at present sold as high as 30 to 40 cents. From this date the price (taking the paper currency as a standard) decreased rapidly for a number of years, and fish of good quality often sold as low as 7 and 8 cents per box. Later, with the revival of the trade, it again improved, until, in 1880, it ranged between 12 and 25 cents, according to the quality of the fish, good scaled herring averaging fully 22 cents, while the lower grades usually sold at 15 or 16 cents.

8. FURTHER PREPARATION OF SMOKED HERRING.

EUROPEAN METHODS.—Most of the smoked herring are eaten with no further preparation than that received in the smoke-house at the hands of the fishermen; but recently attempts have been made by enterprising European houses to render them yet more palatable before finally placing them upon the market. In several European countries smoked herring are now packed in oil in small tin cans which, when properly filled, are at once hermetically sealed.

In Finland, according to Mr. Wallem, the round fish are salted just enough to give them flavor, after which they are lightly smoked. The heads, tails, and entrails are next removed, the roe being left in. They are then placed in tin boxes, just long enough to receive them and large enough to contain about twenty small fish, and covered with olive oil. When filled, the boxes are carefully sealed and sent to the bath, where they remain in boiling water for some time, and after venting and cooling are ready for the market. As far as known, nothing is done in this line within the limits of the United States, though other kinds of smoked fish are sometimes canned.

A less praiseworthy innovation, and one which we are glad to say is unknown among the dealers of the United States, has been made by European ingenuity, which, not content with the slow process of smoking, has at last discovered a way by which the fish can be prepared without the aid of smoke. Mr. Wallem alludes briefly to the subject, saying:

"There are manufacturers who injure the smoking business by manufacturing smoked herring which have not been near smoke. The mystery or humbug consists in covering the herring with a specially prepared yellowish-brown varnish or oil which imparts to the herring a little of a smoky flavor, and sometimes the imitation is so good as to deceive even experienced persons." This imitation, however, can hardly represent the hard herring of our country. It must rather be intended as a counterfeit of the bloater, which is discussed below in this chapter.

AMERICAN METHODS.—Little is done in the further preparation of the herring within the

limits of the United States after they leave the smoke-house. As far as known, but one attempt has been made in this direction. This was brought about by the growing demand for products in a state in which they could be placed upon the table. The idea occurred to Mr. George T. Peters, of New Jersey, that the herring might be skinned and boned, and arranged in neat and attractive packages before they were put upon the market. Accordingly, in 1878, he proceeded to Eastport, Me., and conducted a series of experiments that led to a method which he covered by a patent dated December 10, 1878. The following extract taken from his letter of specification will give a sufficiently accurate idea of his invention:

"The object of my invention is to pack herrings in such a way that they can be eaten directly upon their removal from the package—namely, without any further preparation; also, so that their flavor and moisture are preserved, and so that they are convenient for sale in small bunches or packages without weighing or counting the fish separately.

"It consists in salting, smoking, skinning, and boning the herrings, then tying them in bunches, and, finally, putting them up in a box, as hereinafter fully set forth.

"The box may be made of wood or metal, and I prefer to introduce a pane of glass in one of its sides, so that its contents are rendered visible from the outside thereof.

"In carrying out my invention, I salt and smoke the herrings in the usual way, then remove the skin therefrom and extract the bone in any suitable manner.

"By first smoking the herrings the subsequent operations of skinning and boning the same are greatly facilitated. I then arrange the same in bunches of one dozen each (more or less) by tying that number together with a cord, and pack a half dozen (more or less) of such bunches into a box of the proper size and shape. The herrings are thus packed up in such a condition that no further preparation thereof is needed, except, perhaps, to cut the same up on their removal from the package, wherefore they form a very useful article for tourists or travelers.

"By skinning the herrings and putting the same up in bunches their raw flesh is brought in close contact, and by this means their inherent moisture and flavor are preserved in the best possible manner, the effect thereof being also increased by packing the bunches in a box, and another advantage of the bunching being that no time is lost in counting the herrings singly, when a dozen or more are sold.

"I am well aware that the practices of salting, smoking, skinning, and boning fish have long been known, and I therefore do not claim any of them as my invention.

"What I claim as new, and desire to secure by letters patent, is—

"The new commercial package, consisting of salted, smoked, skinned, and boned herring, tied together in bunches, which are packed together in a suitable box, substantially as described."

In 1879 Mr. Peters engaged quite extensively in boning and packing the fish after the manner described, employing between twenty and thirty hands at his Eastport factory. For some reason, however, the fish did not meet with as ready a sale as he had expected, and it was found desirable to discontinue work at Eastport, though the same method is still carried on in Massachusetts and New York, where it is meeting with better success.

9. STATISTICS OF THE BUSINESS.

If we were to confine ourselves to trade statistics it would be difficult to give the exact quantity of herring smoked in the United States, for the different market reports include many fish as American that have been prepared by the fishermen of the British Provinces. According to Mr. W. A. Wilcox, Manager of the American Fish Bureau, there were 443,597 boxes of herring handled in Boston in 1880, 262,482 of which were received from home ports; the remainder coming from the Provinces. This statement is misleading, as shown by the statistics of Maine, which practically

produces all the smoked herring put up in this country. These statistics prove that only 307,300 boxes of hard herring were put up within the limits of the State during that year, over half of which were shipped directly to New York, while considerable quantities were sent elsewhere, leaving Boston a very much smaller quantity than is reported. The apparent discrepancy is easily explained when we remember that Eastport is located in the very center of the herring district, and that the dealers purchase annually many thousand boxes of fish directly from the New Brunswick fishermen. Besides this, many of the foreign fishermen land their fish at Eastport, where they are taken in charge by the steamboat officials, who treat them as domestic products. Others still ship their fish direct by the trading vessels of the locality that always find it convenient to clear from an American port, the fish carried by them being naturally considered as domestic products, though they may never have touched our territory until landed in Boston. Eastport is thus very naturally credited with all the herring received from the Passamaquoddy region, while actually producing only a small portion of them, the bulk, as has been said, being put up on the adjacent islands belonging to the Province of New Brunswick. In 1879, according to the New Brunswick Fishery Report, ninety-nine weirs were fished, 74,260 barrels of herring were pickled, and 683,530 boxes were smoked in the district tributary to Eastport, which includes the coast and islands lying between Beaver Harbor, New Brunswick, and the coast of Maine. A majority of these are sent to the United States, and are credited in the market reports as American fish. It is an easy matter to get from the herring smokers of New England the statistics of their business; but a trade has recently sprung up in smoked herring prepared from frozen fish after they have reached the markets of consumption. Of this business no exact statistics are obtainable, and the quantity prepared in this way can only be estimated. It seems that during the winter months when any market happens to be glutted with frozen herring, parties are in the habit of purchasing them at a low figure, and, after thawing, salting, and smoking them, place them upon the market. There is no regular business in this line, as the smokers engage in the work only when the price is peculiarly low, wholly neglecting the business when fish are scarce. Fish are prepared in this way in most of the larger sea-port towns and also in many of the principal cities of the interior, where one would scarcely expect it. Even in Washington, D. C., the business is carried on to a considerable extent, and in 1880, according to Mr. Gwynn Harris, city market inspector, the fish dealers of that city smoked 45,000 herring which they received from the north in a frozen state. The fish are also smoked to a limited extent by the retail dealers, who thus utilize any surplus that might otherwise spoil. Frozen fish, however, make an inferior quality of smoked herring, as the fiber of the flesh is injured, rendering it brittle and giving the herring a dull, bluish color along the back. These herring are much larger than the ordinary smoked herring, and, owing to a lack of suitable smoke-houses, they are only partially cured, thus resembling more nearly the bloater than the hard herring of Maine.

The smoking of hard herring proper is, as has been said, confined wholly to Maine, the fishery census returns of New Hampshire and Massachusetts failing to mention any products from either of these States. A careful investigation of this branch of the fisheries for Maine shows that there were, in 1880, 202 smoke-houses, valued at $33,700, and that 229 persons, exclusive of the weir-fishermen, were engaged in preparing 307,300 boxes of hard herring (in addition to 51,700 of bloaters), valued at $55,320. A detailed table of these facts will be found on page 488.

To form a correct impression of the smoked-herring business, it would be necessary to include those made from frozen herring, which may be as well considered here as with the bloaters; estimating these at 75,000 boxes, which is probably not far from the actual quantity produced, we have a total of 383,000, valued at $68,320 (exclusive of bloaters), put up in the United States.

b. Bloater Herring.

10. ORIGIN, METHODS OF PREPARATION, AND STATISTICS OF THE BLOATER-HERRING INDUSTRY.

Origin and growth.—Smoked bloaters were prepared as early as the sixteenth century, for Shakespeare mentions the bloater in his writings. Just where the method originated is not known, but Scotland has certainly developed the business to a greater extent than any other country, and the town of Yarmouth has been the leader in this industry for more than a century. Bertram, in speaking of the herring fisheries of Scotland, says:

"There has always been a busy herring fishery at the port of Yarmouth. A century ago upwards of two hundred vessels were fitted out for the herring fishery, and these afforded employment to a large number of people, as many as six thousand being employed in one way or another in connection with the fishery."* He also claims that the origin of the name is derived from the peculiar roundish or bloated appearance acquired during the process of curing.

Notwithstanding the fact that the bloater has been generally known as an important article of commerce throughout Europe for many centuries, it was not known to the American dealers till within the last half century, and, according to the statements of prominent dealers, it is only thirty-five years since the first bloaters were put up in the United States. Mr. Wilcox informs us that Boston was the first city to engage in the preparation of bloaters in this country, and that they were first smoked about 1859. At this time considerable quantities of large fat herring were brought to the Boston market from the Bay of Islands, Newfoundland. Many of these were utilized for smoking, and the bloaters prepared from them were said to be of excellent quality. When it was found that there was a demand for the bloater in the markets, one of the enterprising Boston dealers attempted to secure a patent on the process of curing; but in this he was unsuccessful, as his opponents, by quoting from Shakespeare, showed conclusively that the idea was not a new one, and that bloaters were known hundreds of years earlier. The Boston business developed gradually, until, in 1868, as high as 10,000 barrels of herring were annually smoked and put upon the market as *Yarmouth bloaters.*

Shortly after the introduction of the bloater into the Boston market, parties in the vicinity of Eastport began preparing the fish in the same manner. The introduction of the method into this region is, according to Mr. J. F. Buck, of Eastport, the result of measures taken by the Dominion government to encourage its subjects in the careful preparation of fishery products. It seems that a thorough examination of the fisheries in 1849 revealed the fact that the larger part of the sea-products were improperly cured, and that, consequently, much of their value was lost to the fishermen on account of the low price realized for them in the different markets. Accordingly, a series of local fish-fairs were inaugurated and kept up for some time. These were usually held in the fall, and the people of the vicinity were induced to place their best-cured products in competition for money prizes that were given as premiums. Considerable interest was aroused, and the contest in many sections became quite exciting, the fishermen giving careful attention to the preparation of their fish. It was certainly an ingenious method of educating the people in a line in which they were sadly deficient. This rivalry led to the preparation of fish in different ways, and bloater herring were at this time first prepared by Scotch fishermen, who had been familiar with the method in the mother country. When first introduced into the region these fish met with little favor, and the business was consequently small, nothing of importance being done for same

* Harvest of the Sea, p. 194.

years. In 1867, as we are informed by Mr. R. C. Green, Richard Young, a native of Leith, Scotland, but lately residing in Portland, Me., removed to Eastport for the purpose of smoking haddock. Finding herring abundant, and knowing of the extent of the bloater business in Boston, he began curing them for shipment, practically on account of the lower price at which he secured his fish, driving the Boston dealers out of the field and compelling them to purchase their supplies from him and other parties who soon built smoke-houses in the locality. The business of the region has gradually increased from that time, until now Eastport puts up the greater part of the bloaters prepared in the United States. Several fishermen from three or four other towns have engaged in the work from time to time. A few hundred boxes were put up annually at Jonesport, Me., between 1872 and 1875, and the fishermen of Sutton's Island, near Mount Desert, smoked a few bloaters about the same time. Portland dealers soon began curing bloaters, and they have continued the business, until now they rank second to Eastport in the quantity prepared. The people of Lubec are just turning their attention to the business. These three towns are the only ones at present engaged in the preparation of bloaters in the State of Maine, and, as far as we have been able to ascertain, none are put up in other parts of the country.

METHODS OF PREPARATION.—We are indebted to Mr. R. C. Green, of Eastport, for the following description of the methods employed in the preparation of bloaters in that locality. During the months of October and November the supply of herring for bloaters is taken largely by the net-fishermen off the southern head of Grand Manan. Later the fish are secured in the same manner along the New Brunswick shore, between L'Etete and Point Lepreaux. They are usually brought to market as soon as they have been taken from the nets, but when not convenient to make the journey the fishermen salt them in bulk in the vessel until such time as it may be convenient to market them. The bloaters prepared from the fresh fish are known as "fresh-water bloaters," and are considered far superior to the others, which are known as "salt-herring bloaters." On reaching the shore the salt fish must be soaked for some time to remove any surplus of salt that they have absorbed, after which they are at once strung and hung in the smoke-house. The fresh fish on reaching the shore are immediately placed in strong pickle, where they are allowed to remain for two to three days, after which they are washed and strung on ordinary herring-sticks and placed in the bays with the others. Fires are then built and the fish are smoked for three to six days, according to the distance of the market for which they are intended. The method of smoking is similar to that employed in the preparation of hard herring, with the exception that the bloaters, though salted a little more, are smoked for a much shorter period. Hard wood sawdust and chips are mostly used as giving the best color.*

When the smoking is over and the fish have become cold, they are packed in boxes holding 100 fish each, equal to 30 to 35 pounds in weight, and shipped as soon as possible, it being necessary to market them at once, as they are so lightly smoked that they will not keep for any considerable period.

The box at present used is made of pine. It is 21 inches long, 11½ inches wide, and 6 inches

*According to Mr. Wallem, the French bloaters are smoked for a much shorter period than the American. His translator represents him as saying of the French fish:

"After the herrings have been 12 hours in the smoke, they are ready, and are in the north of France called '*bouffi*;' they do not keep long, and are intended to be eaten soon. After they have been smoked 24 hours they keep better, and are called '*prêt*,' i. e., 'ready;' but for the distant markets they are not yet 'ready;' they must be smoked 36 hours, and are then, strange to say, called 'half-ready' (*demi-prêt*), because after they are 'ready' they are moved higher up and smoked for a while longer. These last-mentioned fish can from the north of France be sent to the south, whilst the *prêt* herrings are principally intended for the Paris market. If the '*bouffi*' herrings do not have a ready sale, they are again put in the smoke-house and are made into '*prêt*' herrings."

deep, inside measurement. Half boxes are also used to a limited extent, these containing 50 fish in number.

STATISTICS OF THE BUSINESS.—The price of bloaters has changed considerably from time to time. The fish prepared in Boston in 1859 sold at $1.25 to $1.50 per hundred. In 1865 the price had increased to $1.80, but since that time it has gradually decreased, until in 1880 it ranged from 60 to 75 cents. The majority of the bloaters are consumed in New England, though a few find their way to the Middle and Western States. Boston receives fully two-thirds of those prepared in Eastport, distributing them to its trade in different parts of the country. Portland dealers received about 7,000 boxes of bloaters from Eastport in addition to the 7,000 prepared at home, giving that place a total of 14,000 boxes yearly. Two-thirds of this entire quantity are sold in Canada, the remainder going to different parts of New England and to New York.

When first introduced the Americans seemed to care little for the bloaters, not having acquired a taste for them. The bulk of the products were at that time sold to the Scotch and English. Of late, however, the Americans are coming to consume a fair proportion of the products, though even now a majority of the fish are consumed by foreigners.

As has been remarked, the only towns engaged in the preparation of bloaters are Eastport, Portland, and Lubec, named in the order of importance. According to Mr. Green, there were twelve firms engaged to a greater or less extent in the preparation of bloaters at Eastport in the winter of 1879 and 1880, these smoking 41,000 boxes, valued at $29,190. During the same period Lubec put up 3,000 boxes, worth $2,100, and according to Weir Brothers, the largest dealers in Portland, there were 7,000 boxes, valued at $4,900, prepared in that city, making a total of 51,700 boxes, valued at $37,800, prepared in the State of Maine.

c. STATISTICS OF THE SMOKED-HERRING INDUSTRY.

11. STATISTICS OF THE INDUSTRY IN MAINE IN 1880.

The following table gives in detail the entire products of the smoked herring and bloater industry for the State of Maine in 1880; this being equivalent to the production of the entire country if we neglect the frozen fish that are smoked in the larger cities farther south:

Table showing the extent of the smoked-herring business of the State of Maine in 1880.

District.	Persons employed, exclusive of weir-fishermen.	Smoke-houses.		Additional cash capital.	Barrels of herring used for smoking.	Quantity of smoked herring put up.					
						Hard herring.		Bloater herring.		Total.	
		Number.	Value.			Boxes.	Value.	Boxes.	Value.	Boxes.	Value.
Eastport district	180	106	$18,460	$6,000	26,562	230,800	$41,550	44,700	$32,900	275,500	$74,450
Machias district	3	19	1,380	300	420	6,300	1,135	.....	.....	6,300	1,135
Ellsworth district	22	62	4,980	1,000	3,667	55,000	9,900	.....	.....	55,000	9,900
Castine district	.....	2	300	200	668	10,000	1,800	.....	.....	10,000	1,800
Belfast district	.....	1	60	75	80	1,200	215	.....	.....	1,200	215
Wiscasset and Bath districts	.....	5	500	100	267	4,000	720	.....	.....	4,000	720
Portland district	24	6	8,000	2,000	1,750	.....	.....	7,000	4,900	7,000	4,900
Total	229	202	33,700	9,675	33,412	307,300	55,320	51,700	37,800	359,000	93,120

5.—THE SARDINE INDUSTRY.

1. ORIGIN AND DEVELOPMENT OF THE BUSINESS.

THE WORK IN FRANCE.—The idea of packing small fishes in oil under the name of "sardines" seems to have originated in France, where for many years the people have been accustomed to catch and prepare small fish that would be nearly valueless for other purposes. But though the business began in a small way many years ago, it is only within the last few years that it has assumed important proportions. Mr. Frederick M. Wallem, of Norway, in his Report of the French Fisheries, as exhibited at the Paris Exposition in 1878, states that in 1850 France produced only 3,000,000 cans of sardines, and that eight years later the quantity had increased to but 10,000,000. At the time of writing (1878) he states that the business developed rapidly, and that there were between fifty and sixty establishments engaged in the work, quite a number of them producing several millions of cans each during the season.

THE BUSINESS IN OTHER PARTS OF EUROPE.—Seeing the advantages to be derived from this business other countries have interested themselves in the work, and at the present time many of the principal countries in Europe utilize some one or more of their small fishes for packing and sale under the name of sardines. According to Mr. Wallem, Italy, Spain, and Portugal, in 1878, produced considerable quantities of sardines in oil in addition to their large trade in "pressed sardines," and Sweden and Norway have for some time been exporting small herring in oil under the name of sardines. Japan also has recently begun to develop a sardine industry which seems destined to assume important proportions. Germany has also for some time been extensively engaged in packing small herring in barrels with various spices, and now exports large quantities of them under the name of "Russian sardines." From the above it will be seen that though France still leads the nations of Europe in the business she has by no means a monopoly of the trade; and it is only a question of a few years when some of the other countries will, on account of the abundance of some particular species and the readiness with which they can be secured, become formidable rivals in the business.

FIRST EXPERIMENTS IN THE UNITED STATES IN WHICH HERRING WERE USED.—The case with the United States is very different from that of the European countries. The latter have, from their nearness to France and their intimate relations with the French, been constantly coming in contact with the various phases of the sardine industry, and have had no difficulty in watching the new developments that have been introduced from time to time, while they have been more or less familiar with the methods and details of the business. Americans, on the contrary, have had little knowledge of the work beyond that obtained from the manufactured goods imported by the trade, and it was only recently that our people came to understand that fishes different from those used by the French were being put up in other countries under the name of sardines.

Having learned this much, the Americans were not slow in examining into the subject to see if some of our own fishes could not be utilized for the same purpose. The first to act in this matter was Mr. George Burnham, of the firm of Burnham & Morrill, of Portland, Me., who are among the largest packers of canned goods in the United States. In answer to a letter of inquiry Mr. Burnham replies:

"The idea of using the small herring as a substitute for the sardines occurred to the writer

in 1865. It was well known to me that myriads of little herring were annually caught at Eastport, Me. These were too small to be of use for smoking or pickling, and I thought that as they belonged to the same family as the sardine they might be used with profit as a substitute, and that if properly prepared they would be equally good. Acting upon this thought I visited Croissett, on the coast of France, where there were several canneries for the packing of sardines, and made a careful examination of their works. I also studied the methods of taking the fish and the different processes to which they were subjected before being placed in the cans. Later, I proceeded to Nantes, on the river Loire, for the purpose of inspecting the canneries of that region. Having made myself familiar with the French methods, I purchased a quantity of olive oil and other articles to be used in the packing of herring and returned home.

"In the fall of 1867 I proceeded to Eastport and secured suitable buildings for the work and began a series of experiments. I put up the fish in cans similar to those used by the French and used only the best quality of olive oil in preserving them. Great difficulty was found in properly drying the fish, and after a loss of considerable time and money I was obliged to abandon the business on account of my inability to get rid of the herring-oil flavor."

This failure to prepare a suitable article was but a single step in the line of progress toward an important industry. Had Mr. Burnham pushed his experiments a little further he would doubtless have been rewarded, as he well deserved, by the discovery of a suitable method of drying the fish, after which his way would probably have been clear. As it was, his failure had its effect upon those who were interested in the work and the result was, that parties began looking about for other fishes which did not possess the "herring-oil flavor."

AN ATTEMPT TO UTILIZE THE MENHADEN FOR THIS PURPOSE.—An attempt was soon made to utilize the common menhaden (*Brevoortia tyrannus*) for canning purposes. The parties engaged in this work met with fair success, and the canned menhaden were at first received with considerable favor, but for some reason the business is now of little importance, if, indeed, it has not been wholly abandoned.

Prof. G. Brown Goode, in his History of the Menhaden, gives the following account of the manufacture of sardines from menhaden:

"On the coast of New Jersey, near Port Monmouth, are several factories, which carry on an extensive business in canning menhaden in oil and spices. Mr. F. F. Beals, of New York, gives the following description of the methods in use in one of these establishments:

"'We aim to have our catch of mossbunkers in by 6 or 7 o'clock a. m., as the fish seem to be strongly impregnated with phosphorus and soon spoil in warm weather. As soon as the fish are landed, we put our entire force of men to cleaning, cutting, and scaling, for which we have machines adapted. When the fish are cleaned, they are at once put in hogsheads, and salted just sufficiently to keep and to remove their extreme freshness. They are then packed in cooking cans, which are a little larger than the packing cans, and put into the tanks, where they are steamed for the space of about two hours. After the fish are taken out, they are placed in the regular market cans, which are then laid upon zinc-covered tables, where they are filled with salad oil. They then go to the tinners, who solder on the lids, after which the can is again steamed and vented, and passed up into the cleaning and labeling room. Each day's work is piled up separately, each can being thoroughly tested to see that it is perfectly air-tight. For this we have an experienced hand. Not a can is packed until it has stood for at least a month. At the expiration of this time, after being again tested, the cans are packed in wooden cases containing two dozen each, and are then ready for the market. As we make all our tin cases, we

are able to secure good results, and it is a rare occurrence to have a swollen can. If there is one, it is at once thrown aside.

"'Our company was incorporated April 21, 1871, under the laws of the State of New York. Seeing the magnitude of the sardine business on the other side of the Atlantic, we were impressed with the idea that there was a large field for operations in this country alone. We at once set about to find a fish which would supply the place of the European sardine. After many experiments, we at last found one to suit the purpose, viz, the mossbunker, and commenced a series of experiments to find a means of extracting or softening the bones without the use of acids of any kind. After over a year of experiment, we at last found the desired process, which we secured under United States letters patent, dated May 21, 1872. This process consists of various modes of steaming until the bones become so soft that they can be eaten, like the flesh of the fish, without the slightest inconvenience. The first two years most of our time was consumed in experimenting, so that it was not until a year ago that we really commenced to manufacture, though prior to that we put up some goods. Last year, 1873, we packed and sold about 30,000 dozen whole cans or boxes. We have now capacity to turn out double that amount and we expect to be obliged to do so, as our trade is rapidly increasing. Our goods have received various awards, including a medal of merit at Vienna in 1873, and a silver medal at Bremen in 1874.'

"During the season of 1877, the works of the American Sardine Company were not in operation. Mr. Beals, the secretary, informs me that the manufacture will be pressed strongly in 1878. * * *

"There are other establishments near Port Monmouth which prepare menhaden in spices and vinegar under the trade names of 'Shadine,' 'Ocean Trout,' and 'American Club-Fish.' I have been unable to obtain statistics of this branch of manufacture. Hoope & Coit, of New York, contributed samples of these preparations to the Centennial collection of the United States Fish Commission, and I suppose this firm to be engaged in the manufacture."*

In speaking of the quality of these fish Professor Goode remarks:

"Many persons are incredulous with regard to the possibility of manufacturing sardines of good quality from the menhaden. It need only be said that they have been carefully tested by many unprejudiced judges in the city of Washington, and that the verdict has always been that they were almost equal to French sardines of the best brands. There can be no reasonable doubt that if olive oil of good quality were to be substituted for the cotton-seed oil now used in the preparation of American sardines, they would be fully equal to similar articles imported from abroad."†

EXPERIMENTS IN THE USE OF HERRING FOR "RUSSIAN SARDINES" LEADS TO THEIR USE FOR OIL SARDINES.—About the year 1872 the small herring that were being imported from Germany under the name of "Russian sardines" suggested the idea of using the herring taken at Eastport as a substitute, and experiments were soon under way. The "home-made Russians" were found superior to the imported ones, and their manufacture soon became an important business. This led to a better knowledge of the abundance of the small herring in the locality, and in the fall of 1875 Mr. Henry Sellmann and Mr. Julius Wolff, of New York, began experiments in putting up the herring in oil, under the direction of the Eagle Preserved Fish Company, of which they were both members. They were successful in finding a method by which a superior quality of sardines could be put up. As the result of their labor these gentlemen have had the satisfaction

* Report of U. S. Commissioner of Fish and Fisheries, Part V, 1877, pp. 137-138.
† *Ibid.*, p. 138.

of seeing the industry gradually develop to such an extent that it now constitutes the principal business of Eastport, and is rapidly spreading to other portions of the State.

MR. SELLMANN'S ACCOUNT OF HIS WORK.—Mr. Sellmann has furnished the following very interesting account of the causes that led to the experiments and of the methods employed in the work:

"The Franco-German war in 1870–'71 was the approximate if not the immediate cause of the origin of the American sardine industry, and it was brought about in the following manner: For about ten years previously there was imported from Hamburg, Germany, by a firm in New York, an article of merchandise known as 'Russian sardines.' These were put up in kegs of three different sizes, weighing, respectively, 4, 7, and 11 pounds gross. The fish used for this purpose were small herring taken on the coast of Norway, and were prepared as follows: After being suitably salted the heads and entrails were removed; the fish were then thoroughly washed, and, after draining in baskets, packed in layers in kegs, every other layer receiving a definite quantity of whole spices, such as cloves, pepper, mustard seed, bay leaves, allspice, red peppers, and capers. A pickle of slightly salted vinegar was added after the package had been filled up with fish. From a small beginning this article grew rapidly in favor, principally among the German population, and the demand for the goods became so extensive that by 1870 the importation amounted to not less than 50,000 kegs per annum, mostly of the larger packages. The price up to that time ranged, upon a gold basis, at from $1.10 to $1.25 for the larger, and at from 50 to 80 cents for the smaller sized kegs. When in the early part of the Franco-German war, in consequence of the blockade of German ports by the French navy, the importation of the article from Hamburg had to be abandoned for the time being, the price of the article advanced 50 per cent. in New York, owing to the small supply in market. It was under these circumstances that the writer, who for many years previously and at that time was engaged in the importation of other kinds of preserved fish, conceived the idea of finding a suitable fish taken in American waters for the purpose of producing the so-called Russian sardines in this country. The small smoked herring that are put up in boxes, and known in our markets as No. 1 and scaled herring, furnished a basis for investigation as to suitability of the fish under a different mode of curing and preparation for the purpose mentioned. As these fish were principally prepared at Eastport, Me., an order was transmitted to Messrs. Griffin Brothers, of that place, for a sample shipment of small salted herring, with full instructions as to the manner of salting and preparing the same. The shipment came to hand in due time, and the quality of the fish proved satisfactory. In the further development of the work considerable difficulty was experienced in procuring suitable kegs at a moderate price for putting up the fish; but this was finally overcome by Messrs. Kellogg & Ives, of Fair Haven, Conn., who were engaged in the manufacture of oyster kegs. This firm succeeded in making a good imitation of the foreign keg at a reasonable price. Next, the fish were put up carefully and in good style, and offered for sale to the jobbing trade. Notwithstanding, however, the continued great scarcity of the imported article, in connection with the high price asked for it, there was much prejudice and negative shaking of heads on the part of the dealers against the new domestic article, and the difficulty of finding a market for it was subsequently increased by the raising of the German blockade, thus restoring former facilities for importation.

"A further difficulty in the fight against prejudice and odds was encountered in the fact that it was late in the fishing season, and suitable fish were scarce at Eastport. However, with a moderate supply of material, the writer succeeded after awhile in interfering to a considerable extent with the foreign article, and in making valuable friends for the 'home-made Russians.' Objections were, however, soon made by some of the trade against the better appearance of the American machine-made kegs than of the hand-made imported ones. Stimulated by increasing success, the

writer decided to overcome this objection by putting up the fish in square and oblong tin cans, holding two pounds each, hoping at the same time that by ornamenting the cans with an attractive label they could be more readily introduced to the trade. It was by such and other means and devices that the domestic article was soon well introduced, and it took but a few years, on account of the excellent quality of the goods and the lower price at which they could be sold, to establish them so firmly in the market that the importation from Germany had to be abandoned by the parties who up to that time had made it a well-controlled specialty and had grown rich at the business.

"It may be well to add that a powerful help in the introduction of the domestic sardines presented itself in the fact that their keeping quality was found to be far superior to that of the imported sardines, which were very liable to spoil in a comparatively short time, especially in the summer season, during which and in the early fall the demand for Russian sardines is greater than at any other time. For years dealers had been much annoyed and in many instances had lost considerable money by the spoiling of the imported sardines after they had been shipped to the trade. Your correspondent took good care that the fish were immediately and thoroughly salted upon being taken from the water. The care taken in the preparation of the fish placed their keeping qualities beyond question, and justified the packers, after stipulating a reasonable time during which the guarantee should hold good, in making the following offer to the trade: 'Warranted to keep sound; if not so found, money will be refunded.' No such guarantee was given in regard to the imported sardines. This proved a great stumbling-block to the importers; it was, indeed, the death-blow to the imported article.

"The firm of Hansen & Dieckmann, of New York, who had so far controlled the importation of the article, at this stage of the introduction of the domestic article began to realize the fact that the importation of Russian sardines was a thing of the past; and they at once turned their attention to the preparation of the home-made goods in order to retain their hold on their American trade. Their efforts in the introduction of the domestic article had a very beneficial effect, and the sales were greatly increased. Later, when the supply of fish was found to be practically inexhaustible, other parties engaged extensively in the work, and the competition greatly reduced the price of the manufactured article. Fishermen and dealers in fish at Eastport were not slow in profiting by the demand for small salted herring, and they soon began to put up quantities of them. It was found profitable now to prepare the fish at Eastport and to extract the oil from the heads and entrails by means of presses, and to convert the residuum into pomace for manuring purposes.

"During my first visit to Eastport I had an opportunity of examining the quality of the little fishes before they were salted, and it at once occurred to me that they would answer other purposes than those for which they were then used, namely, for smoking, pressing, and preparing as Russian sardines. I dressed a few of them after the manner of French oil sardines, and, after frying them, was satisfied that the fish, if properly prepared, would be a good substitute for the imported oil sardines, and that by their use a new home industry of great promise might be opened up. For the purpose of personally conducting careful experiments, I found it necessary to temporarily locate at Eastport, after having associated myself with the firm of Wolff & Reessing, of New York, and with them, under the firm name of the "Eagle Preserved Fish Company," pushed the experiments very vigorously. I made it my business to inform myself as thoroughly as possible on the methods employed by the French in the preparation of sardines, and for this purpose spent many hours in the public libraries of New York in search of such information, with but little success. I

finally got hold of the French Encyclopédie—Roret on 'Conserves Alimentaires'—which contained a description of the process.

"The following is a translation of the article above referred to:

"'As soon as the fish are brought in by the fishermen the heads are cut off and the entrails are removed, and in some instances even the bones are taken out. They are then promptly salted. A skillful person may prepare a thousand fish in this manner in an hour. After the fish have been in contact with the salt for twelve hours they are washed clean in fresh water or in clean salt water, the latter being preferable. In order to prevent any deterioration of the fish the process is reversed by some manufacturers by first salting the fish for twelve hours and then removing heads and entrails. Whatever may be the most suitable process, immediately after the fish are washed clean they are spread out on willow or wire-work frames for the purpose of drying the same suitably in the open air, if the weather permits, or in a properly constructed drying-room, by means of an artificial current of dry and warm air. After they are sufficiently dried they are put into wire baskets and immersed for two or three minutes, according to the size of the fish, in olive oil, heated to 250 degrees centigrade. After the fish are thus cooked they are placed horizontally in the well-known little tin boxes, which are packed full, the fish being packed as snugly as possible, after which a fine quality of olive oil is added, enough being used to fully cover the top layer. This done the cover is put in, and the can is carefully sealed up with a soldering iron; after which the cans are placed in perforated low iron pans, and subjected to a water bath heated to 100 degrees centigrade, in which they remain from one and a half to two hours, according to their size. This process has the effect of expanding the air in the cans, which, upon being taken out, are convexed on top and bottom in consequence of the air-pressure from within. The cans are then vented by a sharp-pointed instrument, and the vent hole is promptly soldered up as soon as the air has blown out. The cans are then allowed to cool, after which, if found to be tight, they are rubbed clean with sawdust and packed in wooden boxes for shipment.'

"The instructions of the French encyclopedia appeared explicit at first sight, but when it came to carrying them out it was found that they were rather general. The apparently simple method of drying the fish 'suitably' I found to be a matter of extreme difficulty, and the problem has only been satisfactorily solved after many and patient experiments. The advantage in this respect of the Mediterranean climate as compared with that of Eastport, Me., is very great, and it is a matter of much importance in this industry. Fine drying weather at Eastport during the season of packing sardines is the exception, while on the Mediterranean it is the rule. Fish dried by an artificial current of dry warm air are far inferior to those dried in the open air in favorable weather. At times the percentage of moisture of the air at Eastport, resulting from the great fog factory of the Bay of Fundy, is so great that even our modern drying-rooms, provided with powerful blast blowers which supply a current of dry warm air, prove inefficient. I found that the most approved drying-rooms in use for drying wood, fruit, and other material were not suited to the purpose of drying the little fishes properly. The instructions of the French authority for salting the fish for sardine purposes, if applicable to the sardines of the Mediterranean, are certainly not suited to the nature of our small herring, experience having demonstrated that instead of salting the fish for twelve hours it is all sufficient to give them one hour's salting here, and if the fish are small one hour even is too much. Excessive salting of the fish not only spoils their flavor and deteriorates their quality generally, but it increases the difficulty of drying them promptly and properly. Now as the fish should be salted but slightly, it is a matter of much importance that the drying process should occupy as little time as possible in order to prevent decomposition. I learned at Eastport that an attempt had been made ten years earlier by Messrs.

Burnham & Morrill, of Portland, Me., to pack oil sardines, but that the enterprise had been abandoned owing to the fact that they failed to put up a merchantable article, even though the best materials, including first quality olive oil, were used, and that the firm had informed themselves thoroughly of the French methods, a member of the company having personally investigated the *modus operandi* in France. From my experience I am led to believe that this failure resulted from no other cause than that of prolonged delay in the drying process. The time for drying should not exceed two hours if the fish are but slightly salted; beyond that time they decompose very rapidly, and will then vitiate the finest quality of oil, while difficulty is experienced in properly frying them after decomposition has begun, as they are apt to break in pieces under the influence of the hot oil. The same effect also results from oversalting. For frying the fish I adopted strong sheet-iron pans about 6 feet in length, 2½ feet wide, and 6 inches deep. These proved perfectly suitable, and have been generally adopted by the different packers, with but slight deviations from the given dimensions. The wire baskets in which the fish are placed for immersion in the oil are nearly square and suited to the width of the pan, which rests over an open fire, while it is protected from the direct action of the flame by a piece of sheet-iron of proper length and thickness. Wood is used for fuel in the furnace, which is built of common brick. The fire-place underruns the whole length of the pan. The oil for frying, when of proper heat, will evaporate the water from the fish, which will rise to the surface when sufficiently cooked.

"In the early spring of 1879 I dissolved my connection with Messrs. Wolff & Reessing, and associated myself with Messrs. Martin & Balkam, of Eastport, and with Messrs. Rosenstein Brothers, of New York. The new firm was known as the American Sardine Company, and property was at once purchased at Eastport, where our first factory was put up. I make mention of this change simply because under this new firm a very important change was made in the manner of preparing the little fishes for sardines by a method not previously employed in this country. This method, which has proved thoroughly satisfactory, is vastly superior to the old process of first drying the fish and then frying them in oil. It differs in many particulars from that employed by the French, and we have secured a patent for it. By our method the fish are placed on frames of wire-work and subjected to the action of live steam in a steam-box and then baked or broiled on the same frames in an oven furnished with a revolving reel. By this process, it will be perceived, we do away with the drying process altogether. The steaming requires but a few minutes, and can be performed as soon as the fish have been washed from the salt or pickle and spread on the wire frames. The whole process of steaming and baking the fish takes only 10 to 15 minutes, and we are thus enabled to pack fish perfectly sweet and fresh, while by the old process the drying of the fish takes up from 5 to 20 hours, according to the state of the weather and the character of the drying-rooms. The fish as taken from the weirs vary greatly in size, and generally but a small portion are of suitable size for oil sardines, although at times they run quite uniform for that purpose, while again, particularly in the spring, they run rather too small even for oil sardines. For the purpose of utilizing the larger fish, which, on account of their size, are not suitable for oil sardines, larger cans are made, and the fish are put up in a mustard or spiced sauce in handsomely decorated cans, and sold as mustard and spiced sardines. They are prepared in exactly the same manner as those to be packed in oil up to the time when they are ready for the cans. The demand for these fish preparations has so far rapidly increased, and they form quite a relish for the family table, picnics, excursion parties, &c. They, no doubt, if properly put up, will find their way to foreign markets; in fact, a few are now being exported."

OTHER SPECIES USED FOR CANNING PURPOSES.—From the beginning of the experiments in 1875 to the present time the different firms engaged in the sardine industry have kept constantly

at work and have succeeded in placing the business upon a permanent basis. But while they have been thus engaged they have not wholly overlooked the other fishes that are so abundant along our shores. When for any reason the supply of herring has not been regular, some of the more energetic parties have turned their attention to the preparation of eels and mackerel. They have been remarkably successful with their experiments in this line, and have succeeded in producing goods that find great favor with the trade.

THE CANNING OF EELS.—The canning of eels has thus far been carried on only to a limited extent by one firm, namely, the American Sardine Company, for the simple reason that eels are not sufficiently abundant on the coast of Maine to warrant any extended business. This firm has willingly taken all of the eels that could be secured, and even then have failed to fill their orders. By their process the fish, after being strained, are fried in the oven and packed in boxes, either plain or with a sauce made of vinegar and spices. The cans, which are similar in shape to those in which sardines are packed, after being neatly decorated with a pretty label, are placed upon the market as "Fried Brook Eels." It seems probable that with a cannery located on some portion of the coast where eels are more abundant, and where the demand for them is limited, an important business could be easily developed with profit to all concerned. The mouth of the larger rivers emptying into Chesapeake Bay would probably be found an excellent location for a cannery of this kind.

THE CANNING OF MACKEREL.—The canning of mackerel by different methods has been carried on by American capitalists for some time. The principal business in this line was formerly by parties engaged in the canning of lobsters. By their methods the fish are neatly dressed, and after their heads and tails have been removed they are placed in cans, which are at once carefully sealed. They are then immersed in boiling water and allowed to remain for about two hours. After cooling, the cans are branded and packed in cases for shipment to the trade.

Another method has been practiced to a considerable extent for several years. It consists simply of the packing of the ordinary salt mackerel in tin cans of a size convenient for family use, the object being to present the fish to the trade in attractive form, and by sealing the can to keep them in excellent condition until they reach the consumer.

The parties engaged in the sardine business have hit upon two new methods for the preparation of mackerel, either one of which is far superior to those formerly employed. The business began in the summer of 1880, at a time when mackerel happened to be plenty for several days about Eastport. The first method originated with Mr. Julius Wolff, of the Eagle Preserved Fish Company. By it the fish are treated in a manner exactly similar to that employed for the sardines. The mackerel are first carefully cleaned and dried, after which they are fried in oil and packed in cans with vinegar and spices.

The second method originated with Mr. Henry Sellmann, of the American Sardine Company. Fearing that the increased number of canneries at Eastport would result in a scarcity of herring, Mr. Sellmann established a branch cannery at Camden, Me., on the western shore of the Penobscot River, where small herring were reported abundant. Here, owing largely to the lack of interest on the part of the local fishermen, he failed to secure as many herring as were needed and was obliged to turn his attention to the mackerel, which are usually very abundant in the locality during the summer months. By careful experiment he found that the fish could be prepared by a method quite similar to that employed for sardines. The mode of treatment is almost identical to that already described for the preparation of eels. The fish are first eviscerated, after which the heads and tails are removed and the bodies, after being thoroughly washed, are placed in strong brine for a few minutes. When they have absorbed a sufficient quantity of salt they are taken out, and after

another washing are spread upon wire frames and placed on a revolving frame in a large oven, where they are allowed to remain until they are well broiled. They are then packed in large oval cans, holding about 3 pounds each, and covered with a sauce of tomatoes and spices. They next go to the sealers and later to the "bathing-room," after which they are labeled as "fresh broiled mackerel" and packed in wooden cases for shipment. These fish are far superior to any of the brands of sardines on account of the delicate flavor of the mackerel. From the first the demand was greater than the supply, and at the close of the busy season the firm began looking for a more suitable location for the erection of a larger cannery. They at length selected Gloucester, Mass., and in the spring of 1881 made extensive preparations in the way of buildings and apparatus, and during that season employed upwards of one hundred and fifty hands in the work.

For many years the mackerel fleet have been catching great quantities of fish which, on account of their size, are usually rejected by the fresh-fish dealers, and for the same reason are nearly worthless for salting. For lack of a market these fish were formerly thrown away after they had been taken. For canning, the small fish are preferred, and should the business become as extensive as present indications would lead us to believe, a market will soon be found for these fish. This will result in a great saving to the fishermen and will be a benefit to the masses, as it will render available for food small-sized mackerel which the fishermen have usually turned back into the sea.*

2. LOCATION OF THE CANNERIES.

EASTPORT AND VICINITY.—Eastport was the only American town engaged in the packing or canning of small herring, under the name of sardines, prior to 1880. The fish selected for ascertaining whether herring could be utilized in the manufacture of "Russian sardines," were purchased at Eastport and shipped to New York, where the experiments were made. When it was found that they could be made to answer the purpose the business was at once transferred to Eastport. There were several reasons that necessitated this change: In the first place, it was found that herring salted in the ordinary way for shipment were not all that could be desired for making a superior article, and it was therefore desirable to buy the fish fresh, and to prepare them expressly for this trade; it was also found that fish of a certain size and quality were best suited for the purpose, and these could only be secured by making the selection before they were salted; again, the saving in freights by the shipment of the manufactured article instead of the raw material, was an important item, and the saving in rent and labor was considerable.

When the preparation of sardines in oil began there was another and more important reason why the canneries should be located in the vicinity of the fisheries. Only the small fish can be used to advantage for canning, and these are so delicate that they must be used within a few hours, at most, after they are taken from the water. When sailing vessels are employed, as is usually the case at present, the fishery cannot be prosecuted at a distance much exceeding 8 or 10 miles from the cannery, and it often happens during the calm warm weather of mid-summer that the fish are spoiled on the passage. Steamers have recently been employed in towing the sardine boats to the cannery, or in gathering and transporting the catch, and in this way the distance to which the fish may be carried is proportionately increased. The first parties to use the steamboat for this work were Messrs. Wolff & Reessing, of Eastport, who, in the summer of 1879, bought a small tug for towing the fish-boats.

OCCURRENCE OF SMALL HERRING IN DIFFERENT LOCALITIES.—The fact that the business

* Since the above was written (in 1881) mackerel-canning factories have been established at Boston and at several places on the coast of Maine, and the industry has greatly increased.—A. H. CLARK.

was limited to a single locality up to 1880 is readily understood when we remember that this was the only district within the limits of the United States where small herring had been extensively taken during any considerable part of the year. True, herring 5 to 7 inches in length, locally known as "spurling," were caught in large numbers in Ipswich Bay, Massachusetts, for a few weeks in the fall, and they were also taken to a limited extent at various points along the coast of Maine. Still, the business had never been fully developed in any locality aside from Eastport, and many of the fishermen in various sections were ignorant of the abundance of the fish at their very doors, while others, though aware of the presence of the small herring, did not consider them of any value.

METHOD OF INTRODUCING THE GOODS.—The business was wholly under the control of New York parties, who had long been engaged in the sardine trade. These were doing an extensive business in French sardines, and were among the heaviest importers in America. Having a large business already established, it was not necessary for them to direct public attention to their home canneries, as it was thought that there would be a foolish prejudice against the American products. For the same reason it was thought necessary to disguise the herring under a French label, a practice that has been continued to the present time. Instead of calling attention to their growing business, it was natural that the interested parties should keep the matter as quiet as possible. It was for this reason that the value of the small herring for canning purposes did not become generally known, and that the business was so long confined to a single town.

DEVELOPMENT OF THE BUSINESS IN OTHER LOCALITIES.—Until 1880 only five canneries were in operation, and the preparation of the fish had been kept secret as far as possible. In the mean time, some of the Eastport merchants who controlled good fishing privileges had become thoroughly interested in the business, and, finding that the trade was fully established, a number of them decided to build canning establishments, and others soon followed their example. During the summer of 1880 eight additional canneries were located at Eastport. Fearing that the catch of herring would not be large enough to supply the additional demand created by these establishments, some of the original packers began to look about for new fishing grounds. On examination it was found that there were many localities along the coast of Maine where small herring were remarkably abundant, and before the close of the season canneries were established at Robbinston, Lubec, Jonesport, East Lamoine, and Camden.

Camden is situated on the west side of Penobscot Bay, considerably over 100 miles in a direct line from Eastport. This distance is increased to upwards of 500 miles if we follow the shore-line, which is very irregular, owing to the numerous bays, harbors, and coves that occur on this portion of the coast.

The region already described is thus far the limit of the sardine fisheries, and many of the localities within this district abound in herring during the entire summer, while others are frequented by large schools at certain seasons. To the westward of the above region small herring are known to occur in considerable numbers. In Ipswich Bay, Massachusetts, on the north side of Cape Ann, several thousand barrels are taken every fall, and among the small islands of Casco Bay they are reported to be very abundant. From our knowledge of the extensive spawning grounds between Cape Ann, Massachusetts, and Seguin Island, Maine, including those in the vicinity of Wood Island, and from the quantities of fish taken about Matinicus Island, we feel confident that, when the condition of the market will warrant it, large sardine interests may be developed at almost any point between Cape Ann and Eastport.

3. APPARATUS AND METHODS OF CAPTURE.

HERRING TAKEN BY MEANS OF LIGHTS AND DIP-NETS.—Two methods are now employed in the capture of small herring for supplying the sardine canneries of the United States. The first is the ordinary method of torching or "driving," as it is often called. This has already been described in the chapter on the shore-herring fisheries. Driving seems to have been extensively employed by the inhabitants in the vicinity of Eastport from the earliest settlement of the region, and up to 1828 it was the principal method for taking small herring to be used for smoking. It has always been more or less successful, though it involves considerable labor and exposure. At present boats frequently drive for herring to a limited extent during the summer and fall months. From twenty to thirty of them are said to be engaged in taking herring to supply the sardine canneries at Eastport or for smoking. In this locality a crew of four or five men frequently dip three or four hogsheads of fish in a single night.

As mentioned elsewhere, torching is extensively carried on in Ipswich Bay, where small herring called "spurling" are taken for supplying the shore fishermen of Gloucester with bait. From eighty to one hundred men are regularly employed in this work for about two months, beginning with the middle of October.

Torching is also carried on to a limited extent at various points along the coast of Maine, especially in the western portion of the State.

THE FISHERY WITH BRUSH WEIRS.

THE BRUSH WEIR PECULIARLY ADAPTED TO THE CAPTURE OF HERRING.—Wherever the brush weir has been introduced it has been found to be peculiarly successful in the capture of herring, and has largely superseded torching, as it is found to take a larger quantity of fish than can be secured by the use of lights, and with much less labor and trouble to the fishermen.

At the present time the typical brush weir is used within the limits of the United States only on the coast of Maine, though modifications of it are employed in the river fisheries of numerous localities in other parts of the country. The weirs are more numerous in the vicinity of Eastport than in any other place.

THE TYPICAL BRUSH WEIR INTRODUCED FROM NOVA SCOTIA.—According to Mr. D. I. Odell, of Eastport, and Mr. Jacob McGregor, of Lubec, the fishermen of the United States owe their knowledge of the brush weir in its present form to Nova Scotia, where it was in use before the beginning of the present century. According to these parties, the date of its introduction into the United States was about 1820, when two or three small ones were built near the western end of Campobello Island and along the shores of North Lubec for the capture of different species. These were not sufficiently successful to warrant their extended use, and after one or two seasons' fishing they were abandoned. The first large weir exclusively for herring is said to have been built in 1828, by Mr. John McGregor and his son Jacob, at North Lubec. Mr. McGregor was a native of Digby, N. S., and had become thoroughly familiar with the brush weir as employed in the fisheries of that region before his removal to the United States several years earlier. Thus far during his stay in Lubec he had been engaged in the smoking of herring, depending wholly upon torching for his supply; but he soon found that the movements of the herring were very similar to those of the school that visited Digby, where the weir was successfully used. He therefore decided, on account of the labor and exposure in torching and the comparatively small quantity of fish taken, to build a brush weir for the capture of the fish. Accordingly he selected Rogers Island as a suitable location, and proceeded at once to construct his weir. It was built in shoal

water and was much smaller than the weirs of the present day. It proved very successful in the capture of herring, and other parties soon built weirs of similar size for the same purpose.

GROWTH OF THE WEIR FISHERY.—From this small beginning the weir-fishing gradually spread to the adjoining section, and Campobello, Grand Manan, and the various settlements along the American shore soon had extensive weir fisheries. In 1835 the weir was introduced into the fisheries of Grand Manan Island by Lubec parties. In 1836 the first one was built in West Quoddy Bay, which soon came to be the principal fishing-ground on the American shore, and within fifteen years from that date there were 30 weirs between Lubec and West Quoddy Head, a distance of three or four miles at most.

In 1849, according to Mr. M. H. Perley, there were 27 weirs at Grand Manan, 21 at Campobello Island, and 7 on the West Isles. We find no printed record of the number on the American shore at that time, but the older fishermen of the region informed us that there were about 45 in the town of Lubec, with 20 additional at Eastport and along the Maine shore between Lubec and Calais. This would give 65 for the American shore and 55 on the English islands, making a total of 120 at that time.

In 1878 there were, according to the New Brunswick Fishing Report, 86 weirs, valued at $25,740, in the British territory above described. In 1879, according to the same authority, there were in the same region 99 weirs, distributed as follows:

St. Croix district	6
Inner Bay district	1
Lepreaux, Beaver Harbor, and L'Etete districts	11
Deer Isle	32
Campobello Island	24
Grand Manan Island	25

During our visit to Eastport in the summer of 1880 we found that the American fishermen were still exclusively engaged in the fishing with weirs, located as follows:

Outer shore of Lubec	4
American shore of West Quoddy Bay	10
English shore of West Quoddy Bay (owned by Lubec parties)	7
North Lubec	10
Eastport, and the small islands in the vicinity	17
West shore of Saint Croix River, between Eastport and Robbinston	12
Above Robbinston	6

In addition to these, there were 7 weirs not fished during the season of 1879.

Prior to 1865 all weirs were built on the flats along the shore, some of them being dry at low tide, while the largest had but 2 to 5 feet of water at most. About this time the fishermen began building in deeper water, and within a few years their weirs were so arranged as to have 12 to 14 feet of water at low tide.

PRINCIPLE ON WHICH WEIRS ARE CONSTRUCTED AND THE DIFFERENT KINDS.—As the brush weir is so extensively used in the capture of sardine herring, it may be desirable to give a more detailed account of its construction. *It is built on a principle similar to that employed in all the* weirs, traps, and pounds along the shore, the plan being to direct the fish towards the bowl by the use of long leaders and funnel-shaped openings, and to prevent them from escaping by means of projecting curves or hooks that carry them beyond the opening or by stretching the net across the mouth of the weir after the fish have entered.

Several kinds of weirs are employed in the fisheries at Eastport. These have names depending largely upon their shape and the character of the shore and adjoining bottom on which they are built.

A "bar" weir is one that is located near a rocky ledge or bar that is usually exposed at half

tide. It is so arranged that the fish shall pass over the bar and into the pocket at high water, and shall be effectually prevented from escaping by its exposure as the tide falls.

The "shore" weir is usually built very near the land, which answers as one side. It has a long leader running obliquely out from the shore, which directs the fish to the entrance of the bowl or pocket.

A "channel" weir is built between two ledges or islands in such a way that all the herring passing between them are obliged to enter it.

The patent weir has recently been introduced into the Eastport fisheries, and is rapidly coming into favor among the fishermen of that region. It is much more effective than those formerly used, as the fish are readily taken during either flood or ebb tide. In shape it is similar to the ordinary pound-net. It has a long leader extending from near high-water mark to a depth of 12 to 18 feet at low tide, with an opening on either side of its outer end leading directly into the pocket, so that the fish may enter regardless of the direction in which they are moving.

A PROPER LOCATION FOR A WEIR.—Many fishermen devote considerable attention to the proper location of their weirs, and those poorly situated are usually unsuccessful. The best location is at the extreme end of some point of land that extends well out into the water or in a channel between two or more islands and ledges. It is usually desirable that the weir shall be placed where the tide runs with considerable force, as the fish are known to remain most frequently where the current is strongest, and they are often carried by it into the weir.

Many of the weirs are built so as to fish only when the tide flows in a certain direction, and are accordingly known as flood or ebb tide weirs, as the case may be. Most of them are so arranged that the mouth or opening is toward the west, as the best fishing is usually in the early morning, when, it is said, the herring, being attracted by the light, are moving toward the sun.

CONSTRUCTION OF THE WEIR.—The brush weir, as the name implies, is built exclusively of brush and poles. After the site has been selected, posts 6 to 12 inches in diameter are driven firmly into the mud at distances varying from 6 to 7 feet, to mark the outline of the weir and to hold it in position. Other smaller posts 2 to 4 inches in diameter are next selected, and after the lower ends have been pointed they are driven into the ground, the upper end being secured to a ribband of wood extending between the larger posts near the line of low water. These small posts are placed about 3 feet apart, and are carefully interwoven with fine brush placed horizontally, the branches passing over the first, under the next, over the third, and so on, each alternating with the next above or below it. The entire frame is woven with brush to within a distance of 3 feet of the pointed end of the stake, and in this way the frame is made very strong.

This frame of small poles and brush must be made on the shore, as it is to go below the surface of the water. The posts are therefore secured to the ribband, and the brush carefully woven in, and the completed section is taken out and placed in position between two of the larger posts, the lower side being firmly embedded in the mud, so that the brush shall reach to the bottom, after which the whole is carefully secured to the posts. The fishermen then return to the shore and build the next section in the same manner and place it in position as before. When all of the spaces have been filled the lower portion of the weir is complete. This extends from the bottom to low-water mark, and is much more carefully constructed than that higher up, as it must retain the fish at a time when they are most anxious to escape.

The upper portion, or that part lying between tide-marks, is more easily constructed. For this purpose small poles are placed horizontally between the larger posts, about 2 or 3 feet apart. Brush is then woven vertically among them to fill up the opening. It is not necessary that the

branches should be very close together, as the herring seldom attempt to escape unless the opening is large.

Formerly spruce posts were used in the construction of the weir, but these would last only two or three years, as they were soon attacked and badly damaged by the worms. At the present time white birch is extensively used, and if protected by bark it is said to last fully ten years.

It often happens that the site selected for the weir has a rocky bottom, into which the posts cannot be driven. In this case it becomes necessary to make a platform of heavy material, to which the posts and smaller poles are securely fastened. The whole is then placed in its proper position and carefully weighted with stones, which are lowered upon the platform. These weirs require considerable labor in their construction, and often many tons of stones are used in properly ballasting them.

COST OF BUILDING WEIRS.—The weirs vary greatly in size and strength, according to their location and exposure to the sea. Some are very small, and can be built of light material, so that the entire cost will not exceed $40 or $50, while those that are most exposed must be made of the heaviest material, and securely fastened, at a comparatively greater cost. The value of the average size mud weir is from $200 to $250, while that of the largest ballasted weir sometimes reaches $800 or $900. The posts and ribbands cost from 20 to 25 cents each—from three to four hundred of them being required. The brush averages from three-quarters to a cent a "spear," and for the ordinary sized weir 4,000 are needed. The spikes or nails cost from $10 to $15.

The labor forms a considerable part of the cost of construction, as it will take four men nearly a month to complete a weir under ordinary circumstances, though the time varies from two to eight weeks, according to the size and the condition of the bottom. The cost of labor is frequently neglected by the fishermen, as several of them usually own a weir in common, and build it during their spare hours; or, again, a number of "gangs" will assist their neighbors in building one without making any charge for their labor; they, however, expect their neighbors to return the compliment by assisting them whenever it becomes necessary to rebuild or repair their own weirs. Where help is hired, it usually costs from $20 to $30 a month for each man, making the total cost for labor about $100.

FISHING SEASON FOR THE WEIRS.—The fish taken in the early spring are usually quite small and have little value for smoking or for bait; they are also in such poor condition that they yield but little oil, and it therefore seldom pays to press them. For these reasons, during the early years of the fishery, the weirs were seldom put in order before the first of June, and frequently few fish were taken prior to the beginning of September, when the fishing began in earnest and continued till the close of the year. Now, however, owing to the demand for small fish by the sardine canneries, the weirs are usually repaired in the early spring, and the fishermen tend them regularly from the first of April till the following January.

THE WEIR PECULIARLY ADAPTED TO THE CAPTURE OF HERRING.—The success of the weir is largely due to the habits of the fish in feeding. The shores are quite abrupt in most places, and the weirs can therefore extend but a short distance into the channel, and at low tide a greater part of each is often exposed. During the hours of low water the herring usually remain in the channel, where the tide is strong, but at high water they approach the shore in search of the small crustacea that are so abundant in the region. The strong tides of the Bay of Fundy carry these minute forms from place to place, and the herring need simply remain with their heads toward the current and sift them from the water as it passes.

The weir owners claim that when feeding the herring usually head toward the current, and that they move forward or backward according as they swim faster or slower than the tide. In

swimming rapidly they often enter the weirs against the tide, when they are said to "stem in;" but when swimming slowly they are frequently carried or drifted into the weirs, when they are said to "drop in." On entering they are very apt to swim slowly about in a circle, keeping several feet from the brush, seldom attempting to escape through the numerous openings, which are often 2 or 3 feet in diameter. Many of the openings in the lower part of the weir are partially or wholly closed by the muscles and algæ that grow very rapidly in these waters and soon nearly or quite cover the brush, making it much more compact than it would otherwise be.

THE CATCH AFFECTED BY THE TIDES AND MOON.—All agree that the fishing is best at night, as the fish seem somewhat timid about entering the weir in the day-time, or even when the moon is full. The best fishing is therefore during the new moon or when the nights are peculiarly dark, and the fishermen speak of "the darks" as something particularly desirable.

The time of night during which the weirs will fish is thoroughly understood by the fishermen. For some weirs it occurs when high water is between 8 p. m. and 2 a. m., and for others when it is between 1 and 4 a. m. Others still fish best when high water occurs about sunrise.

When the conditions are favorable the tides "serve" or "the tides are on," as the fishermen say. At other times "the tides are off," and the fishermen frequently neglect to visit the weirs, as they expect nothing. On this account the catch is very irregular.

METHOD OF FISHING THE WEIR.—The services of three to five men are required in fishing a weir. Just before low water one of the number rows out to see if there is a sufficient quantity of fish to pay for the trouble of seining. If it is night a torch is lighted and held over the edge of the boat in order that the fish may be drawn to the surface, where they may be readily seen. From one to two hogsheads are considered enough to warrant them in using the seine. If the weir is to be fished the men arrive at low water with two or three boats, one of them proceeding to the reel near by, where the seine is kept. This is usually from 15 to 25 fathoms long, 10 to 20 feet deep, and when new is worth about $50. Two men enter the boat to stow the seine, while one remains on the platform to unreel it. The gate of the weir is now opened wide enough to admit the seine boat, after which it is again closed and securely fastened, that the fish may not escape. This gate is built in the pocket or "bunt" of the weir, for the purpose of admitting the boats and of liberating any small or worthless fish, or any surplus catch that for some reason cannot be utilized.

Two methods of seining are practiced by the fishermen of Eastport, as follows:

By the first method the fish are drawn by the net into shoal water near the beach, after which they are "rolled" into the boat and secured. It is not desirable to land them upon the shore on account of the dirt that would adhere to them, but when they are confined within narrow limits they are easily taken by means of large dip-nets.

By the second method the fish are drawn together in the "bunt" of the weir where the water is deepest, and secured in a similar manner. In seining, one end of the net is fastened to the side of the weir and the net is "paid out" within a few feet of the brush, until the "hook" is reached, when a small boat is sent to drive the fish into the bunt. This is done by splashing, or by striking the side of the boat with the oars. After the fish have been driven in, the seine is rowed back to the weir on the opposite side. The herring are thus confined in a space bounded by the weir on one side and by the netting on the other. One end of the net is now fastened to the bow of the boat and slowly carried along the weir until it meets the other, after which the staffs are firmly planted in the mud. The circle inclosed by the seine is now slowly reduced until the mass of fish is sufficiently compact, when the dipping begins. The dip-net, which is 3 or 4 feet in diameter and 5 or 6 feet deep, will hold about 5 or 6 barrels of fish. It is attached to a short wooden handle, by

means of which it is slowly moved about among the fish until it is nearly full, when the lower rim is brought over the gunwale of the boat; it is then "righted up" and two or three men begin pulling on the upper part of the net, until the fish are brought out of the water and begin sliding into the boat. The process is called "rollin' 'em in." When fish are plenty two men can easily roll 20 hogsheads, or 100 barrels, in an hour. If the catch is large several boats are brought alongside and quickly loaded by their respective crews, but when few herring are secured all are taken into one boat and the others return to the shore empty.

The boats used for this purpose vary both in size and number, from two to five belonging to each weir. These are from 18 to 25 feet long, 7 to 10 feet broad, and are valued at from $75 to $300. The more expensive ones are used for general purposes at other times, and are therefore much better than would be necessary for ordinary fishing purposes unless the weir happens to be in a position where it is exposed to the sea. The average boat is valued at about $150.

QUANTITY OF HERRING TAKEN IN WEIRS.—The catch is very irregular and uncertain. The fish are not caught every day, and sometimes an entire month, or even more, may pass during which not a herring may be taken. Again, when the "darks are on" and "the tides serve" they may sometimes be caught in immense quantities for several consecutive nights.

The following tabulated statement, kindly furnished by Mr. Benjamin Green, of Eastport, shows the catch of his weir, located at Flye's Island, during the seasons of 1878 and 1879:

SEASON OF 1878.

Month.	Number of days in which fish were taken.	Total quantity.
		Hogsheads.
June	2	3
July	10	40
August	20	99
September	10	104
October	10	123
November	8	36
December	7	144
January	2	32
Total	69	572

SEASON OF 1879.

May	7	17
June	5	7
July	2	2
August	10	47
September	11	95
October	4	7
November	6	128
Total	45	303

We learn that enormous quantities have been taken at different times. Four hundred hogsheads, equal to 2,000 barrels, were secured at one tide by one of the weirs on Grand Manan, and frequent catches of 200 to 250 hogsheads in a day are reported to have been made at Treat's Island weir, near Eastport, in former years. During our stay at Eastport, a weir at Flye's Island is said to have taken 150 hogsheads at a single tide. The largest quantity taken by any weir in 1880 was secured by Mr. McLain from his weir, located at L'Etete Passage. Prior to the middle of September, he had realized over $5,000 on fish sold fresh, while large numbers of small fish had been

"turned out" during the early part of the season, and frequent lots of larger ones were liberated at intervals during the summer, when the catch was greater than the demand. The best part of the fishing season still remained, and it was thought that the weir would stock as much more before the end of the year.

The instances already cited are, of course, exceptional, and the average catch is very much less. It depends largely upon the location of the weir and the character of the surrounding bottom. Some weirs may be very successful, while others within a few rods of them will take almost nothing. There are, however, certain places that herring seem to frequent in large numbers, and in such localities most of the weirs, if properly constructed, are fairly successful. At Lubec, according to Mr. Jacob McGregor, the catch averaged fully 300 hogsheads yearly for each weir prior to 1865. At the present time the largest quantities are taken at Grand Manan Island, where, according to Mr. J. W. Fisher, the catch in 1879 averaged about 225 hogsheads, and in 1880 it was fully as large. Deer Island, New Brunswick, ranks next to Grand Manan in the quantity of fish taken, and according to Mr. J. K. Wetmore the catch at that place was about 100 hogsheads to the weir in 1879, and a trifle larger in 1880. The American fishermen seem to have been less successful, and from a careful examination of the subject it seems probable that the average weirs along the American shore will not secure more than 75 hogsheads, and at Lubec, where the herring were formerly so abundant, only 60 to 65 hogsheads will be captured.

DIFFERENT WAYS IN WHICH THE WEIR CATCH IS UTILIZED.—Until 1855 a larger part of the catch was "turned out," and most of those saved were smoked for shipment to the principal markets of the United States and to the West Indies. From that date to 1876 about half of the fish were pressed for the oil and pomace, and thousands of barrels were smoked annually. Since 1876 a large percentage of the herring taken have been sent to Eastport to be put up as sardines.

Before the practice of pressing the fish for the oil was adopted the greater part of the catch, as has just been mentioned, was turned out; but as soon as it was found profitable to utilize the herring in this way, the majority, especially of those taken in the summer and fall, were saved for this purpose. The business was found to be a very remunerative one, as with oil at $9 per barrel the fish would pay an average of $3 per hogshead after deducting the cost of labor in pressing. During the spring months, according to Mr. Green, it requires 5 hogsheads of fish to make a barrel of oil; but in the fall the fish are much fatter, and 2½ or even 2 hogsheads will yield an equal quantity. It is said that during a single season Mr. U. S. Treat, of Treat's Island, near Eastport, made $24,000 worth of oil and pomace from herring taken in his weirs. About that time nearly all of the more thrifty fishermen owned screw presses and made a regular business of cooking their fish, and not less than 10,000 pounds of pomace were marketed in Eastport yearly.

ARE THE SARDINE-HERRING BEING EXTERMINATED?—For a number of years prior to the establishment of sardine canneries the weir-fishing was less important than formerly. This was by some thought to be due to the scarcity of fish, but it seems more probable that it was owing to the low price both of oil and smoked herring, which made the prosecution of the fishery unprofitable. Many fishermen claim that the herring are rapidly decreasing, and they cite the large quantities taken in former times, and the present small catches at Lubec, as proving their theory. The fish are undoubtedly less abundant in the vicinity of Lubec and in the waters of Cobscook Bay than formerly; but this seems to be explained by the peculiar method of fishing at that place. Though the weir-fishing had been extensively prosecuted for many years, the catch had not perceptibly diminished up to 1865, when the building of deep-water weirs, which extended so far out into the channel as to nearly meet from the opposite shores, effectually shut out the herring from their usual entrance to Cobscook Bay, which seems to have been a spawning ground. The herring,

thus practically debarred from this entrance, seem to have moved a few miles farther east, and are now more abundant in the vicinity of Deer Isle. In other sections there is no sufficient evidence to show any permanent decrease, though the catch of one year, for various reasons, may vary considerably from that of the following or preceding one.

LAY OF THE FISHERMEN.—The financial arrangement between the owners of the weirs and the fishermen varies with the locality. Several methods are commonly adopted for regulating this matter. Many of the weirs are built and owned by a number of men, who fish them in common, all sharing equally in the proceeds of the catch. Others are owned by a capitalist and tended by the regular fishermen. This is the case at Grand Manan, where, according to Mr. Fisher, the weir is built and kept in repair by the owner, who also furnishes the seine; as a return for this he receives one-fifth of the smoked herring after they have been prepared for market. The fishermen furnish the boats, dip-nets, scoop-nets, wash-nets, smoke-houses, boxes, and the labor in catching and preparing the fish, and receive four-fifths of the products of the weir, which in this region average about 16,000 boxes of herring annually.

In the vicinity of Lubec the weirs are owned by the men who fish them. These have an agreement among themselves whereby only those who are on hand to help fish the weir on any particular occasion shall have a share in the catch. Thus a man who absents himself when his services are required loses his portion of the catch as long as he continues to be absent.

ADVANTAGES AND DISADVANTAGES OF THE BRUSH WEIR IN ITS RELATION TO THE SARDINE INDUSTRY.—In order that the apparatus may be adapted to the herring fisheries of Quoddy River it should be strong, inexpensive, easily kept in repair, and capable of retaining the smallest fish; it should also fish at all seasons and with regularity. Most of these conditions are met by the brush weir, which, though seemingly primitive, answers the purpose for which it is intended better than any apparatus with which we are familiar. It resists the strong tides of the Bay of Fundy and the pressure of the drift material that is frequently abundant in the region. It costs little in proportion to its durability and can be easily repaired at a slight expense, though repairs are seldom needed other than those required for putting it in order for the season's work each spring. It retains the fish admirably, and even the smallest will not attempt to escape through the openings in the brush, which soon becomes well covered with muscles and algæ; on the contrary, they seem to avoid the brush and do not approach within a foot or more of it unless they are frightened, and even then they will seldom attempt to escape. In this particular the weir is far superior to a net, for unless of the smallest mesh most of the fish would pass through or become gilled and by their weight tear it from the posts and carry it to the bottom.

In the canning of sardines it is found very desirable that there should be a constant supply of fish; and as the business increases the question of a regular supply will be one of the greatest importance. The thirteen canning establishments at Eastport already employ over one thousand hands when running, and this entire number thus become wholly dependent upon the daily catch of herring, and any lack of fish therefore occasions much loss. The total capacity of these canneries when working on full time is 375 barrels, equal to 62 hogsheads, daily; and it is quite important that this supply should be constant; otherwise a large amount of capital remains idle and hundreds of people are thrown out of employment.

ADDITIONAL WEIRS BUILT TO INSURE A REGULAR AND CONSTANT SUPPLY.—To overcome this uncertainty of daily supply, many new weirs have been built, in the hope that some of them might be successful in taking fish each day; but when one has good fishing nearly all are apt to be equally successful, and when one fails most fail, so that there is usually either an over-supply or there are no fish. Even with these additional weirs the canneries often lose from one-fourth to

one-third of their working time in the spring and early summer and an occasional day in the fall, and they are often obliged to run day and night when the fish can be obtained, in order to supply the trade.

The men fishing for the canneries must be able to make enough when "the tides are on" to pay them for waiting when "the tides are off"; and for this reason the canneries are often obliged to buy a larger quantity than can be put into cans, the surplus being cut into Russian sardines.

The weir, as has already been mentioned, is not fished with any regularity, as there are weeks and even months together when there are not fish enough to pay for hauling the seine. The herring seemingly avoid them in the day-time, and even on light nights, fishing being best when it is darkest. Again, they enter the weir in considerable numbers only at or near high-water. We have, therefore, two varying conditions that greatly affect the catch; it being largest when high-water occurs at a particular time and the night is peculiarly dark. The record furnished by Mr. Green shows that during the season of 1879, which lasted one hundred and seventy-three days, herring were taken forty-five times, or an average of one day in four, the total catch being 303 hogsheads. In 1878 the same weir was fished about one day in three.

Formerly the daily irregularity of the supply was no serious drawback, and if the total catch of a season was good the fishermen were satisfied. Now, however, since the sardine business has grown to such large proportions, it is important that the fish should be taken regularly, as they cannot be kept from day to day, but must be used within a few hours after they come from the water, and when there are no fish the canners must stop work.

THE INTRODUCTION OF THE POCKET FOR RETAINING THE FISH TILL NEEDED.—Another method of overcoming the seasons of scarcity is proposed by Mr. McLain, who owns a large weir at L'Etete. He intends building a pound or pocket just outside and connected with his weir, into which he can turn any surplus to be kept until needed. This seems an excellent plan and deserves to come into general favor.

THE INTRODUCTION OF SEINES INTO THE FISHERY.—A fisherman at Deer Island recently purchased a 75-fathom haul-seine for surrounding the fish and hauling them upon the beach, but he found the herring so scattered that the seine could not be used to advantage in this way. He has since cut the seine in pieces of 25 fathoms each, these being set across the mouths of small coves to retain any fish that may chance to have entered at high-water. In this way he is meeting with only moderate success.

PROFESSOR BAIRD'S SUGGESTION THAT FISH EGGS BE EMPLOYED AS BAIT IN THE FISHERY.—Knowing of the use made of fish eggs as bait in the French sardine fisheries, Professor Baird suggested that they might be employed in the herring fisheries at Eastport, and that the difficulty of obtaining a constant supply might be overcome in this way. He requested the writer, while conducting his investigations at Eastport, to make a number of experiments in this line to ascertain whether the spawn of fishes could be successfully employed in this fishery. Accordingly, a quantity of salt cod-roes were obtained in Gloucester, and in company with Capt. J. W. Collins I visited the localities most frequented by the fish and made such experiments as were thought necessary for settling the question. From these experiments* it seems probable that fish eggs

*The young herring are occasionally seen at the surface, but seldom in schools of any considerable size, except during the calmest weather. They are, however, often seen "breaking" in small numbers in the numerous tide eddies and in places where two currents meet. This is most noticeable on the "young flood," when the fish are most frequently in the channels. Accordingly, the flood-tide was selected as a suitable time for testing the matter, and when the desired locality had been reached the boat was "hove to" and allowed to drift with the tide while the bait was being thrown. The eggs separated nicely and sank slowly as they were carried away by the current until they were finally lost to sight. The work was continued for nearly an hour, but the fish refused to "rise to the bait."

Thinking the locality unfavorable, Casco Bay Eddy, a favorite resort of the herring, was visited, and another

cannot be successfully used in the sardine fisheries of the United States, as the herring refuse to follow them to the surface, so that they cannot be attracted in large schools and secured by means of the purse-seines, which would, of course, be a very desirable way of catching them. Again, the observations made during the experiments lead us to believe that the fish give so little attention to this food that it could not be profitably employed in connection with gill-nets, the method commonly employed in France. Some other method must therefore be adopted for overcoming the difficulty already mentioned.

THE LACK OF CONSTANT SUPPLY DUE TO DEFECTIVE METHODS OF FISHING RATHER THAN SCARCITY OF FISH.—Small herring are undoubtedly abundant during a greater part of the year in the principal channels, but weirs cannot be built for them on account of the deep water. The difficulty then is to find some way of taking the herring there, or of drawing them into the coves and harbors along the shore. If they could be attracted by bait and the purse-seine could be used in their capture there would be no difficulty, and the supply would be regular. Our sardine interests would then be on an equal footing with those of France. The experiments with fish-eggs, if properly conducted, show that herring will not rise to bait. Furthermore, the tides are so strong about Eastport that the purse-seine would be wholly unmanageable, except "in the slacks" or in the coves, and dip nets to be used without seines, in order to be serviceable, must be so large that the fish would be frightened away before any considerable number could be secured.

THE USE OF ELECTRIC LIGHTS SUGGESTED.—The method of torching suggests to the writer an idea that might be made practicable. The herring have long been known to be attracted by and even to eagerly follow a bright light. Perhaps an electric light, or some other of great brilliancy, might be made to answer the place of bait; it would certainly be less expensive, and would affect as large or even a larger area of water. After the fish had been drawn together they might easily be led toward the shore, where they could readily be surrounded by haul or purse-seines and secured, or, on the slacks, purse-seines could be successfully used in the channels. By the use of this method, together with the pocket suggested by Mr. McLain, there seems no reason why the seasons of scarcity may not be fully overcome and a regular and constant supply be furnished to the canneries, thus rendering the business more profitable, and enabling the manufacturers to give steady employment to their help.

4. PREPARATION OF THE FISH.

THE BUILDINGS.—The canneries are located on some convenient wharf, where they may be easily reached by the herring boats. They are usually large two-story wooden structures, built of ordinary material, and finished off only in so far as is necessary for the work. Each has a large

attempt was made as the boat drifted about, but with no better success. Again, in passing among the numerous small islands, with weirs on every hand, another trial was made, but with like results.

By this time the tide was nearly full, and leaving the vessel we proceeded in a small boat toward the shore, where herring were "breaking." Here the fish could occasionally be seen swimming about under the boat, apparently giving no attention to the bait that was being thrown. At high-water a large weir was visited. Here herring could be distinctly seen swimming about near the bottom, but they seemed quite indifferent to the bait, and, if they ate it at all, could not be induced to follow it to the surface.

The following day the ebb-tide was selected for the experiments, and proceeding in another direction from that previously taken we kept throwing the bait while under sail, and while lying to, both in the channels and near the shore. In neither case were the fish induced to "rise."

An hour before low water, one of the weirs, where several hogsheads of herring were confined, was visited, and the boat was "dropped down" over them by means of a long painter fastened to the shore, after which the bait was thrown out. Though the herring undoubtedly ate more or less of the food when they came in contact with it, they would not follow it to the surface, and even refused to remain long in its path as the tide carried it through the brush. In order to be positive that they had swallowed some of the food, a number were examined after the weir had been seined, and a small number of eggs, together with small crustacea and other food, were found in their stomachs.

platform on the grounds near the building, where the fish may be exposed in pleasant weather, and is also provided with a room for drying the herring by artificial heat when it is damp and rainy outside.

Some have several buildings, where the different branches of the work are usually kept separate; but the best arranged have all under one roof, with separate rooms for each particular class of workmen. The cutting, salting, pressing, and bathing rooms are usually on the first floor, while the drying, frying, packing, and soldering rooms are on the next above. The drying room frequently forms a third story, situated just below the roof, with one or more large ventilators, through which the damp air passes out; or in some cases a small addition is made above the main roof, which is in turn used as a place for spreading the fish during pleasant weather. With most firms it is customary for the boxes and cans to be made at the cannery, in which case there is usually a carpenter-shop and several tinshops—either in separate buildings or in some part of the cannery—in which this work is carried on.

The cost of the canneries depends wholly on the amount of machinery used and the extent of the business done. Those built at Eastport vary from $2,500 to $15,000, including apparatus and land, the average for each being about $4,000.

THE TRANSPORTATION BOATS.—The boats employed for carrying the fish to the canneries are usually small open sail-boats, 18 to 30 feet long and 10 to 12 feet wide. Each cannery has from two to four of them. They generally start out at half-ebb, visiting the weirs in the different localities to see what ones have fish in them, and these are visited at low water to get the herring when they have been seined.

As the fish are very delicate, it becomes necessary that they should be brought to the cannery within a few hours, at most, after they are taken from the water, and it is therefore desirable that no time should be lost, and the boats are usually on hand as soon as the fish are seined.

Care must be taken that the boat shall not be overloaded, for if too many herring are put in they are apt to heat and spoil, while the lower ones may be bruised from the pressure of the mass above, and when in this condition they soon turn red and become soft and worthless. It is also desirable that the fish should be distributed through different compartments, so that they may not slide about as the boat lurches in the trough of the sea. The largest boats carry about 10 hogsheads, while those of average size carry only 5 hogsheads. The quantity for each varies considerably with the weather, for when warm the load must be proportionately lighter.

The fish must also be carefully protected from the sun during the summer months, and for this reason the boats are usually supplied with a covering of canvas for the protection of the fish. In some cases the compartment that holds the fish is made light, and has a covering of boards in place of the canvas, thus giving a more uniform temperature.

The mode of transportation is still very crude, and it is very important that some one should build a boat that shall be adapted to the work, as many times the present quantity of fish can easily be brought in one that is suitably arranged. Large shallow trays would be very desirable for this purpose. These could be arranged on either side of the boat or in the bottom, so that the air would circulate freely among them. They could be filled full of fish, and in this way the weight of those in the upper trays would be kept from the ones below, and a much larger quantity could be carried than in the ordinary way, while the tendency to slide about as the boat labored in the sea would be entirely overcome.

As soon as the fish have been taken aboard the sail is set, and the boat starts for the cannery, but it often happens during the calm weather of summer, especially when the tide is unfavorable, that they are detained for many hours, and the fish frequently spoil before they reach the can-

nery. To overcome this difficulty, several enterprising firms have purchased steamers, which are used for gathering the fish or for towing the boats to the factory during the warmest weather. This gives a decided advantage in many ways. By the use of steamers the fish can readily be brought to the canneries in better condition, and the territory from which the fish can be gathered is greatly enlarged. By the ordinary sail-boat the fishery is limited to 12 or 15 miles, while there is often considerable difficulty in carrying small herring half that distance. With a steamer properly constructed with trays for holding the fish, we see no reason why the fishery cannot be extended to 25 or even 30 miles on either side of the canneries, and the quantity obtainable be proportionately increased. The herring taken at Grand Manan Island would thus be available for the canneries at Eastport, and the business could be carried on with a far greater degree of certainty. A firm at Camden already sends its steamer 20 or 30 miles to secure its supply, carrying the herring in barrels that have been filled with water. In this way the fish in the lower portion of the barrel are in a measure relieved from the weight of those above them; but it seems doubtful if fish that have remained in water for any length of time after they have been taken will have as good a flavor as those brought in a dry state.

The men owning their own boats are paid so much per hogshead for the fish taken, and they are, therefore, quite anxious to secure as many as possible. Those sailing the boats owned by the canneries are paid by the month, receiving an additional percentage on the fish secured as an incentive to extra exertions. In some cases the weir-owners own boats which they use for carrying the fish to market.

PRICE OF THE FISH.—The herring are purchased by the hogshead, which, according to the dealers, should hold 5 barrels. In most localities, however, the measure has been enlarged so that it is equivalent to 6 barrels, or to 15 baskets holding upwards of a bushel each. The price paid varies greatly, depending, not only on the supply, but on the amount of competition and other circumstances. When the business started, the herring were bought for $1 per hogshead, with 50 cents additional for bringing them to the canneries. Later, as competition increased, the price advanced to $5 and $6, and for a short time during the fall of 1879 it reached $10, and even $12. During the season of 1880, the price paid by the Eastport dealers averaged about $4.50 per hogshead, with $1 additional for "running" the fish. At other points, the price was very much less; in some cases being as low as $1 to $1.50, and contracts were made in the summer of 1880, with the fishermen of Millbridge, Me., to cover all fish taken by them during a period of five years, the price agreed upon being $1.90.

There seems to be a natural limit to the price for which the herring may sell; this being governed largely by the price of pomace and oil on the one hand, and by the demand for sardines on the other. The fish ought seldom to have a value of less than $3 at the weir, for the fishermen can realize that price for them, even in the spring when the fish are poor, by boiling and pressing them, and selling the oil and pomace. During the late summer and fall, when they are usually very fat, they are worth $4.50 per hogshead for the same purpose. Again, every hogshead of the larger sized herring caught in the weir is worth $10 to $14 when smoked, and if the fisherman has any leisure time he will prefer to prepare his fish rather than to sell them at too low a figure. The average price to be paid by the canneries must, therefore, under present conditions, range from $4.50 to $5 per hogshead at the weir, in order that a full supply may be insured.

THE METHOD OF CUTTING AND DRESSING.—When the boat nears the wharf, the cannery whistle or bell is sounded as a signal for the cutters, who are usually boys and girls from eight to fifteen years of age. These are presently seen brandishing their large knives as they rush through the street on their way to the building. On entering the cutting-room, each seizes his oil-cloth

apron and is soon at his place ready for work. The fish are at once "hoisted out" of the boat and emptied upon the cutting table. A lively scene now presents itself, as all are anxious to cut as many as possible, since they are paid in proportion to the amount of work done. Each is provided with a box, holding a little more than a peck, into which the fish are thrown, while the heads, entrails, and tails are put into a barrel at one side.

The fish is taken in the left hand, while the knife is held in the right, and, beginning on the back at some distance behind the gills, the blade is driven downward through the body and the head is severed. The intestines do not cut so readily as the flesh, and therefore usually remain attached to the head, and are removed with it by one or two lateral strokes or scrapes of the knife. By a movement of the hand the fish is then reversed, and the tail is severed by a quick blow, and after being washed the body is ready for salting.

The children become very proficient in this work, and handle their knives with great rapidity. They will usually cut 3 or 4 barrels of ordinary-sized fish in a day, while a few of the most expert will cut fully a hogshead.

The price paid for cutting is 5 cents per box. When one has been filled it is removed and an empty one put in its place, a man being regularly employed for this work. The child receives a ticket or 5-cent check for each box cut. These are redeemable at the company's office on Saturday of each week, but it often happens that they are carried regularly to the stores of the town before pay-day arrives and exchanged for candy, fruits, or merchandise, the merchant presenting them for redemption when the proper time arrives. As it is desirable to have the fish cut as soon as possible, a large force is employed and the work is completed in a few hours, after which the children return to their homes. A smart boy will often earn over $1 a day when he has steady employment, but, on account of the small number of hours during which he has work, the average wages do not exceed $3.50 per week.

THE MANNER OF SALTING.—As soon as the heads, tails, and entrails have been removed the fish are emptied into a small car, which is rolled into the salting room. Here they are thoroughly washed and placed in the strongest brine. The time required for salting varies greatly, being dependent on the size of the fish, their freshness, and the weather. Large and fresh herring should be salted for fully an hour, while smaller ones, and those that have been kept for some time, will be sufficiently "struck" in thirty to forty minutes. In cold weather, owing to their firmer flesh, they must be salted longer than in summer. When a larger quantity is received than can be used for canning, the balance are at once salted in large hogsheads and allowed to remain until such time as they can be cut into Russian sardines. These have no value for canning, as they become so salt as to injure their flavor.

FLAKING.—As soon as they have been sufficiently "struck" the herring are taken from the salting troughs and thoroughly washed in spring water. They then go to the "flaking" rooms, where boys and girls, and occasionally grown people, are engaged in arranging them upon frames made of wood or galvanized wire. These frames, technically known as "flakes," are 30 inches square, and hold about 175 fish each. The "flake" is simply a square frame, with small triangular strips of wood, or small galvanized iron wires, stretched across it. These are separated from each other by 1 or 2 inches, so as to give a free circulation of air, and to touch the fish at only a few points, in order that evaporation may go on from all parts of the body.

The fish are arranged in rows with their tails in the same direction, so that when placed in the drying room the anterior portion shall be lowest, in order that the moisture may the more readily drip from the herring.

THE VARIOUS DRYING PROCESSES.—Up to this point the fish go through the same prepara-

tion in all the different canneries, but the next, or drying process, is managed differently in different places. The object is simply to remove the moisture from the herring before placing it in the oil. The prompt drying of the fish is a matter of great importance, and in the moist atmosphere of Eastport it is a much more difficult operation than in France. The small herring, being so delicate, require considerable attention during the drying process, and unless great care is taken they soon begin to decompose; and experience proves that if they remain until the first stages of decomposition begin, the oily matter of the fish will turn rancid and destroy the flavor of the oil in which they are packed.

The most desirable method for drying is to place the fish in the sunlight in the open air, where the moisture readily evaporates in a few hours; but, on account of the prevalence of fogs and the great humidity of the atmosphere in the region where the sardine industry is prosecuted, drying in the open air cannot be depended upon. When the weather is unfavorable for sun drying the moisture must be removed by artificial heat.

Drying rooms are usually located on the second floor or near the roof of the cannery, with racks arranged for holding the "flakes" obliquely, so that the moisture will readily drain from the fish. The racks in which the "flakes" are inserted are movable skeletons or frames, so constructed as to hold forty to fifty "flakes" each, these being placed about 3 inches apart and directly over each other. The room is supplied with a constant current of warm, dry air, which is brought from stoves or furnaces in the lower part of the building by means of large pipes, and after passing upward among the fish is allowed to escape through a ventilator in the roof. It usually requires twelve to twenty-four hours to dry the herring in this way under favorable circumstances. During the dampest weather a considerably longer time is required, and the fish frequently spoil in the process, while their flavor is often greatly injured and they are rendered nearly worthless.

To overcome this difficulty a number of different plans have been resorted to. One company has secured a large patent fruit drier, in which the "flakes" of herring are placed. The hot air is carried through a long pipe from the furnace room to near the roof, where it terminates in a funnel-shaped opening situated just above the top of the fruit drier. The drier, or box, as it might be called, is a tight compartment, about 4 feet square, extending from the ground floor to the top of the building. It contains a series of endless chains, with cleats at regular intervals of 3 or 4 inches. The chains are made to revolve slowly by means of machinery, and the flakes, after being covered with fish, are put in at the bottom and carried slowly upward, being taken out a half an hour later at the top. The hot air from the pipes is drawn down through the box and carried away by means of large fans worked by machinery, the temperature of the current being regulated by means of dampers in the air pipe.

In the fall of 1879 Eastport parties decided to construct a large oven in which to dry the sardines. A description of this, in the Eastport Sentinel of December 10, 1879, is as follows:

"The oven is 18 feet high, 14 feet wide, and 16 feet deep, with walls from 2 to 2½ feet in thickness. Its capacity to retain heat, which can be raised to above 600° Fahrenheit, is such that it will bake articles thoroughly two days after all fire has been withdrawn from the furnace. The whole is inclosed by a two-story building, the lower part of which is used as a boiler and furnace room, while in the upper story the process of preparing the fish is carried on. The flues and dampers are constructed to regulate the fire and heat to a nicety, and the heat can be reduced or increased more than 200° in a few minutes, according to the requirements. The machinery consists of eight skeleton iron frames attached to a cylinder, and remaining in a horizontal position while revolving in the oven. Notwithstanding the ponderous weight of the machinery, it works so accurately that, although arranged for steam-power, it may be revolved by a mere boy without difficulty."

The oven above described is simply an ordinary baker's oven of large size. It serves the purpose of not only drying, but at the same time cooking the fish. After the herring have been cut, salted, and thoroughly washed they are placed on "flakes," when they are taken to the oven room and placed in a small chest, where they are subjected to the action of steam for several minutes. This opens the pores and breaks up the fiber of the flesh, so that evaporation will go on very rapidly. After being steamed for two or three minutes the "flakes" are transferred to the revolving arms in the oven, where the fish are subjected to a heat of about 250° Fahr. for from five to twenty minutes, according to circumstances. As soon as they have been removed and allowed to cool they are ready for the cans without the additional cooking which is required by the other methods. The process of steaming has been patented by the American Sardine Company of Eastport, which originated the idea.

By the method above described the time necessary for preparing the fish is greatly reduced, and it often happens that the herring are placed in the cans within two hours after they are brought to the cannery, while by the old method during foggy weather they are not unfrequently kept two days. Another advantage of the new process is found in the reduction of expenses; as boiling in oil, which is a large item in the expenses of the other canneries, is entirely done away with. The baked fish are considered equal in every particular, and by some they are even pronounced superior, to those prepared in the old way.

In France, various methods of drying have been resorted to, the principal one being that of exposing the fish to the sun and drying them by natural heat; but though this method is preferred, when the weather will not permit of sun-drying, the moisture must be evaporated by artificial heat. The driers used in that country are different from those employed at Eastport; from descriptions which have been seen of them it would appear that they resemble, in some particulars, the fruit-dryer, and, in others, the regular baker's oven.

Mr. Frederick M. Wallem, of Norway, gives the following description of the drying process employed in the sardine fisheries of France:

"When the weather does not permit of drying them in the open air, an oven especially constructed for this purpose is used; but this way of drying sardines does not answer the purpose so well and is more expensive. Sometimes, however, it cannot be avoided, and the point is to furnish a sufficient quantity of warm air which can be brought to bear upon the sardines quick enough to make them dry rapidly.

"The drying ovens which are commonly used resemble a long and narrow brick baker's oven, with a fireplace at both ends and a drying place along its whole length. It depends on the heat and dryness of the atmosphere how long the sardines must be kept in the oven, and in order to regulate these two essential conditions a special drying apparatus has recently been invented. The model of this apparatus, which has been patented, has been exhibited in the French Department of Cooking and Distilling. It looked like five large closets placed side by side. The end closets contained ventilators and fans for distributing the warm air. The center closet was closed and the sardines were put in and taken out through the second and fourth closets. From the patentee I learn that this apparatus is constructed on the principle of the American cooling apparatus used in the slaughter-houses of the West; the main difference being that in the latter dry cold air is used, whilst the former requires dry hot air. Just as the fanning apparatus first pumps the warm air out of the bodies of the hogs and then exposes them to a strong current of cold air, thus in the French sardine drying apparatus a current of hot air is brought to bear upon the sardines after the cold damp air has been expelled. The sardines are kept on frames set

on a movable stand, and are thus rolled into the apparatus through door number two. They are kept there for a certain time under a certain degree of warmth, are rolled through the center closet, and finally out through door number four. As the stands move on rollers the whole process is done quickly and with great regularity."*

FRYING THE FISH.—After the fish have been dried to a suitable degree they are taken to the frying room and arranged on small wire trays or baskets before they are immersed in the oil. The frying pans are made of sheet-iron and are five or six feet long, two feet wide, and six inches deep. Two of these are usually placed on a large brick furnace, being protected from the direct action of the fire by sheet-iron plates. Oil is poured in the bottom of these pans until it covers them to a depth of about two inches. After it has been raised to a temperature of a little over 200° the wire frames on which the fish have been arranged are immersed in it. These frames are made of galvanized iron wire and have long handles on either end by which they can be readily lifted.

The frying requires from one to two minutes, according to the dryness of the fish. During the frying any water that may remain in the herring is readily converted into steam, when it at once ascends and escapes, its place being supplied by particles of oil.

The oil generally used for frying is a superior grade of cotton-seed oil, though in some cases the oil of different species of nuts is used. It can be used only a short time, as small particles of fish are apt to remain in it, and these soon settle on the bottom of the pan, where they form a crust which largely destroys the action of the heat, and by burning also injures the flavor of the oil. On this account the pan must be frequently scraped to remove the coating, and a greater or less quantity of new oil must be introduced.

When the fish have been sufficiently cooked they are taken out and emptied on a table, where they are allowed to drain and cool before they go to the packing room. In some instances they are allowed to remain on the frames on which they have been fried until a greater part of the oil has dripped from them, as the drainage is more perfect when they are left in this way.

BOILING IN CLOSED VESSELS WHERE ADDITIONAL HEAT IS OBTAINED BY THE USE OF SUPERHEATED STEAM.—The method of frying employed by the French in their sardine canning is very similar to that already described; but a new method of boiling where steam is employed has recently been introduced and deserves mention in this connection. Mr. Wallem, after describing the methods of boiling in open pans, gives the following:

"In order to save oil, and at the same time to accelerate the boiling process and make it pass off in a cleaner and more even manner, new apparatus have recently been constructed, which are heated by steam of an atmospheric pressure of 14 (in some even of 25). In this way the oil can be kept at an even degree of temperature (+160°—170° C.), and about 9,000 sardines can be boiled in an hour in thirty to forty-five boilings. The quality of the sardines of course depends on a careful and clean way of boiling them and on the quality of oil used. * * * In using the steam apparatus a great deal of oil is saved, but only if the manufacture of 'sardines in oil' is carried on on a large scale, for otherwise the expense for apparatus, boiler, &c., will swallow up all that is saved in oil, and modern apparatus, with drying apparatus, steam-boiler, &c., having one to forty kettles for boiling, costs 3,500 to 9,400 crowns [$938 to $2,519.20]. If, as is the case in large factories, 10,000,000 to 20,000,000 of sardines are boiled yearly, a steam apparatus will save 60 to 70 per cent. of oil. Instead of using $2\frac{2}{10}$ kilograms of oil per 1,000 sardines, only 850 grams are used, which, for 15,000,000 sardines, would be a saving of 20 kilograms of oil, valued at 19,000 to 21,000 crowns [$5,042 to $5,628], not counting the higher price obtained for a better article."

* Rapport fra verdensudstillingen 1878 i Paris. | Om de franske fiskerier | og | nogle fiskeri-industrielle forholde | samt | skibsfartsafdelingen på udstillingen. | Af Fredrik M. Wallem. | Kand. jur. Rapporter for Norge ved verdensudstillengen i Paris 1878. | Christiania, | 1880. | Translated by Herman Jacobson.

SORTING AND PACKING.—On reaching the packing room the fish are emptied upon long zinc-covered tables, with sides sloping toward the center, in order that any oil that may drain from them or that may be spilled in filling the boxes may collect and pass out through a small opening into a receptacle to be again used in the frying process. The table is surrounded by a number of girls and women who sort the herring into sizes, packing the smallest in the small-sized cans, and the larger ones in those of proportionately larger size. All of the fish having been treated exactly alike there is no difference in quality between the large and small, the rule for sorting being simply that those of like size shall be placed together in cans of suitable dimensions.

Nearly all of the smaller fish are packed in oil in small-sized cans, known to the trade as "quarter cans." These are 4½ inches long, 3 inches wide, and 1 inch deep, and hold from 9 to 12 herring, according to their size. The fish most suited for this purpose measure about 6 inches when whole, and when cut they have a length of from 3½ to 4 inches.

Fish measuring 8 to 9½ inches in length when whole are usually cut so that they shall have a length of 4 to 4½ inches. A small percentage of these are canned in oil; but by far the greater portion are put up in mustard, spices and vinegar, tomato sauce, or other condiments. The cans used for these fish are known as "half cans," usually holding from 10 to 16 fish each. They are 4½ inches long, 3½ inches wide, and 2 inches deep.

A few full-grown herring, measuring from 10 to 12 inches in length, are put up in vinegar and spices in large oval cans and sold under the names of brook-trout, sea-trout, or ocean-trout. There is only a limited demand for these fish, however, and the quantity packed is usually very small. Under these brands the canneries utilize the few large fish that may be found among the others, though they seldom purchase any lots of uniformly large herring for canning purposes.

As the fish are being sorted they are packed in boxes of proper size. The oil in which they are packed is usually flavored to the taste by adding lemon, sugar, and various spices. Some canneries adopt the practice of supplying the cans with a definite quantity of oil before the fish are introduced, while others pack the fish first and then pour the oil over them until the box is completely full. Some of the firms which have adopted the latter method immerse the cans in a bath of warm oil as soon as they have been filled and the cover has been placed in position, allowing them to remain until they go to the solderers in order that they may be completely filled; others do not consider it necessary that the can should be absolutely full. As the price of the oil is usually greater than that of the fish there is no disposition to pack light-weight goods, but the cans are filled as full as possible without subjecting the herring to too much pressure.

KIND OF OIL USED FOR FILLING THE CANS.—The oil used for canning varies greatly in quality in the different establishments. Occasionally the best olive oil is used. This usually comes from Bari, Italy, and costs about $1.40, with $1 additional duty, per gallon. A common practice among the packers is to mix a small quantity of olive oil with a larger amount of cotton-seed oil; and for several years, since the competition has been considerable, the use of olive oil has been largely done away with, and cotton-seed oil has been secured from the manufacturers at Providence, R. I., and Cincinnati, Ohio, at a cost of about 52 cents per gallon. Some of the canneries are now using other oils made from various seeds and nuts of foreign countries. The question of the quality of oil used is one of growing importance, and it seems likely to seriously affect the trade in the home-made products. We are not prepared to discuss the relative merits of the different oils or even to say that cotton-seed oil, carefully prepared from the best material, is inferior to the average grades of imported oils; but when so much depends on the flavor of the oil used, and the tendency to reduce the cost of the manufactured products under the pressure of competition is so great, it seems highly important that some parties shall take a decided stand in

this matter and put up a superior quality of goods which shall be sold upon their merits. The use of poor oils is perhaps the greatest drawback to the extension of the sardine business in the United States; but we are treated little better by the French canners, who have for a number of years been using the cheaper grades of oil in the preparation of those goods that are intended for exportation. Nearly all of the larger French establishments have certain brands which are put up in the very best quality of olive oil, but most of them also put up inferior and cheaper brands in which they use only the poorer grades of olive oil, and others pack in oil from the seeds of plants of that and other countries. Very few of the best brands of French sardines are imported into the United States, so that the fish obtained from abroad are little, if any, superior to the average grades packed in this country.

SARDINES IN VINEGAR AND SPICES.—Besides oil sardines a large quantity of herring are put up in vinegar and spices under the name of *sardines royales* and *sardines marinés*. Before the vinegar is poured on the fish it is boiled with spices of various kinds. In addition to the liquid, mustard seed, cloves, peppers, bay leaves, and frequently a small piece of lemon, are placed in the can. A good many fish are also put up in mustard, which is mixed with the best quality of vinegar that has been spiced to suit the taste. The spiced sardines and those put up in mustard are received with great favor by the trade and are coming into general use in certain portions of the country. By many they are preferred to the ordinary oil sardines. They are usually sold at a much lower figure for boxes of the same size. A few herring are also packed in tomato sauce, but thus far the demand for them has been very limited, and as there has been some difficulty about their keeping qualities the dealers and even the manufacturers are a little shy of them.

BONELESS SARDINES.—Thus far no one in this country has attempted to put up boneless sardines after the French method, though the imported goods are said to find ready sale in the American markets. We see no reason why some enterprising firm should not begin experiments in this line, as there would probably be no more, if indeed as much, difficulty in removing the bones from the herring than from the smaller fish used by the French. The method of preparation after the bones have been removed is exactly similar to that to which the ordinary sardine is subjected, and it will only be necessary to describe the boning process. Mr. Wallem gives the following account of the method employed by the French in this work:

"The so-called boning process, which by many people is considered very difficult, is, in reality, very easy. When the sardines are about half dried in the sun (if dried in an oven they can only be boned with great difficulty and loss), they are subjected to the following treatment. With one crack the backbone is broken close to the root of the tail. Then, by evenly and tightly squeezing it with the fingers it is loosened along its entire length. During this manipulation the whole bone system is loosened, and, commencing at the neck, the backbone and all the bones with it can be pulled out with two fingers or with a pair of small pincers. For breaking the backbone near the tail a pair of pincers is also sometimes used. When the bone has been taken out the sardines are set in the sun to dry in the usual manner."

THE SOLDERING PROCESS.—After the cans have been filled with fish and the proper condiments, and the cover has been inserted, they are sent to the soldering-room, where they are hermetically sealed by men who make a specialty of this work. In the Eastport canneries each man has a small revolving stand, which is turned by means of a treadle and leather belt. The top or surface of the stand has a small groove for holding the box, and as the soldering proceeds the whole is gradually turned so that the work may be more conveniently done. Soldering-wire is used for this purpose. In other places the revolving stand is entirely done away with, and a large board with longitudinal strips for holding the cans is substituted. This, when filled, holds 100

cans. By the use of the board it is thought that the work can be done more rapidly, as the men do not have to lay aside their iron and wire, as soon as a can has been sealed, for the purpose of removing it and inserting another, but they can continue their work without interruption, stopping only occasionally to change irons and, again, when all have been sealed, for the purpose of emptying and refilling the board.

The sealers working on wages receive from $1.50 to $2.50 a day, while those working by the piece usually get about forty cents per hundred cans for their work. At Eastport the ordinary workmen will seal from 500 to 600 small cans, or about 400 of the larger ones, in a day of ten hours. At Lamoine it is said that 1,000 cans is considered a fair day's work.

Great care must be taken that the cans are perfectly tight, as any leak causes no little trouble and often occasions considerable loss. Where the men are doing "piece-work" they often work so hurriedly that many of their cans are not properly sealed. To guard against loss from this source most of the firms hold each solderer responsible for his work and require him to scratch his number upon the cans which he has sealed. In case of leakage he not only does not receive any pay for the faulty can but must pay two cents to make good the loss occasioned by his negligence.

There are several methods of heating the irons, the principal ones being the ordinary charcoal pot and the gasoline burner. By both of these methods the iron must necessarily be quite large in order to retain a high temperature for any considerable time. But in the sealing process, where a large iron is used, especially if the work is slowly done, the sardines are frequently considerably heated, and in this way, it is said, their keeping qualities are affected to a greater or less degree, and their flavor is often considerably impaired. The methods employed in the French canneries are much superior to those adopted by the American packers. There the irons are heated with gas supplied by means of a rubber tube which passes through the handle and is introduced into the inside of the iron near its pointed extremity. Another tube connected with a bellows furnishes air to the flame. By this arrangement the heat is rendered very intense, and, as the flame is kept constantly burning at the exact point where it is needed, the tip of the iron is always very hot and the other parts are proportionately cooler. The iron can thus be used continuously, and the heat being applied to so small a surface the fish are only slightly heated during the soldering process.

BATHING AND VENTING.—When properly sealed the cans are sent to the bath-room, where they are placed in small iron frames or baskets, which are lowered into and lifted out of the bath by means of ropes and pulleys. The time required in boiling varies considerably, according to the size of the cans and the kind of bath used. Other things being equal, small cans are cooked more quickly than those of larger size. A good deal depends, however, upon the contents; for fish prepared with spices require considerably more cooking than those put up in oil, in order that their keeping qualities may be the same.

The common method of boiling is by means of the "open bath," or by ordinary boiling water in an open vessel. This is the oldest and by many it is considered the best method, the principal objection to it being that by it a considerably longer time is required than by the other methods. The medium-sized cans are subjected to the influence of boiling water in the open bath for from one and a half to two hours, while the larger ones must be boiled considerably longer.

Another method of boiling recently adopted is that known as the chemical bath. This consists simply in the raising of the boiling point by the use of chloride of lime or other chemicals, and if a proper quantity is used water can be heated to upwards of 250° in the open air. By subjecting the fish to this increased heat they are cooked much more quickly and considerable time is saved, while any life-germs that might remain to pollute the mass are more easily destroyed. Another way of accomplishing the same results is by means of the closed bath. In this case the

steam is confined in a tank, and the fish are subjected to any temperature desired by its pressure upon the surface of the water, which raises the boiling point. By these last-named methods the time of boiling is reduced to about half an hour.

When the can comes from the bath its sides are usually bulged out by the pressure of the expanded air within. A small hole is at once made through the tin for the purpose of allowing this super-heated air to escape, after which it is immediately closed by a drop of solder, and the process of bathing and venting is completed. If the can is perfectly tight the sides become concave as soon as it has cooled. The fact that the can does not "concave" is considered sufficient evidence that there is a defect in the soldering, and it goes at once to the mending room for examination. When the hole is found it is closed, after which the can must be reboiled and vented before it can be packed. Where the bathing is not properly done a can will keep but a short time, and it often happens that many swell and spoil within a few months. Those properly packed, however, should keep for three or four years at least. Some of the importers of French sardines claim that the loss from "blowers" or spoiled cans received direct from the French canneries is very considerable, showing that they are as careless in their work as the Americans.

CLEANING AND BOXING.—After the fish leave the bath-room they must be carefully wiped and cleaned, to prevent them from rusting before they are boxed. In some canneries each can is handled separately, being first rubbed in sawdust and then wiped dry with a cloth. In other canneries the work is satisfactorily accomplished by inclosing the cans in a large barrel, which has been partially filled with sawdust. The barrel is fastened to a frame, and is made to revolve on a longitudinal axis by means of a crank. In this way the cans are thoroughly dried by contact with the sawdust as they are tumbled about by the motion of the barrel. They are then packed in common wooden cases, the size of which varies with the different brands of fish. For the small sizes cases holding 100 cans are invariably used, but for the medium size 50-can cases are employed. A case differing in size from either of the others is made for the sea-trout and other brands that are packed in the larger cans. These usually hold about two dozen cans each.

As soon as the cans have been properly packed with a quantity of sawdust in properly-branded cases they are shipped at once to New York parties, who handle them on commission for the canneries. The object in sending immediately is that the agents may be drawn upon for a portion of the value of the shipment. An arrangement of this kind between the agents and the canners enables the latter to carry on their business with much less capital than would otherwise be required.

RUSSIAN SARDINES AND ANCHOVIES.

DEVELOPMENT OF THE AMERICAN RUSSIAN-SARDINE INDUSTRY.—The various brands of sardines already mentioned are the only ones put up in cans in the United States; but another grade of goods referred to by Mr. Sellmann as Russian sardines, under which name they are known to the trade, are extensively packed by the Germans, and fish prepared in a similar way are put up in France, England, and other countries. As will be seen by referring to Mr. Sellman's account of the origin of the sardine industry in the United States, the entire business as it at present exists in this country is the outgrowth of experiments to find a fish that would answer as a substitute for the Russian sardines that were being imported in large quantities from Hamburg. From the time that the home-made "Russians" were first well introduced, they have grown in favor among the foreign population residing in the United States, and the trade has increased so rapidly from year to year that the importation has long since entirely ceased. As has already been mentioned, the first herring used for this purpose were salted at Eastport and shipped to New York, where they were packed in kegs for distribution to the trade. As the trade increased it was decided to transfer the business to Eastport, since it was found necessary to select a certain grade of fish for the purpose,

and a considerable saving could be made in the shipment of the manufactured goods instead of the raw material. When this change was first made the herring were put up in small kegs ready for the trade, after which they were packed in crates and shipped to New York for distribution. Later it was found desirable to simply salt and cut the herring at Eastport and to pack them in barrels for shipment to the dealers in New York, who in turn should repack them in small kegs before they were put upon the market. This method has given excellent satisfaction, and has been universally adopted.

METHOD OF PREPARATION.—The manner of preparing the Russian sardine is very simple. The fish utilized for this purpose are similar in size to those packed in mustard and spices, under the name of *marinés*, *royales*, and sardines in mustard. They vary in total length from six to nine and a half inches, and when cut measure about five to six inches. Being of proper size for canning, and having a greater value for this purpose, they are, of course, canned when practicable; but when the catch is too large for immediate use at the canneries the surplus must necessarily be salted at once if they are to be preserved; and after a sardine has been salted for any length of time it becomes unfit for canning. The natural result is that nearly all of the surplus fish are prepared as Russian sardines.

As soon as they have been landed from the weir they are at once salted in large butts or hogsheads, where they are allowed to remain in strong pickle for several days or until they are thoroughly "struck," after which they are taken out and their heads and entrails are removed by children employed for this purpose, in a manner exactly similar to that employed in the preparation of sardines for canning. This method has already been described and need not be repeated. After the fish have been cut they are thoroughly washed in fresh water, and are carefully packed in fish barrels, each layer being well sprinkled with dry salt. After the barrels have been filled new brine is added and they are set aside and allowed to remain for several days, in order that the fish may settle. More fish are then added in order that the barrels may be well filled, after which they are headed up and are ready for shipment. In shipping long distances it is found desirable, especially during the summer months, to remove the pickle from the fish, because, when this becomes heated, it often sours and injures their flavor.

After reaching their destination the barrels are at once opened and the fish are then packed in kegs of uniform size. These are neatly made of a good quality of poplar or bass-wood, each holding about four or five quarts. As the fish are being packed each layer is well covered with a variety of whole spices, including cloves, peppers, mustard seed, and allspice, together with a quantity of bay leaves, to give them a rich flavor. When the keg has been filled a pickle of vinegar is added, after which the package is headed up and is ready for the trade. It is desirable to have the fish prepared some time before they are eaten, in order that they may be well flavored by the seasonings with which they are packed. For this reason old stock is preferable to that recently packed.

THE USE OF HERRING AS ANCHOVIES.—As soon as it had been ascertained that the herring could be utilized in the preparation of Russian sardines, certain houses who had been engaged in this line of trade thought it possible to prepare anchovies from the smaller individuals of the same species, and for several years many of the small herring were utilized for this purpose. The first fish that appear in the spring, locally known as brit, are usually too small for canning purposes, and as many of these are taken in the weirs each season, considerable numbers of them have been salted from time to time to be prepared as a substitute for the anchovies that had been formerly imported from Sweden and Norway.

After numerous experiments, it is said that the business is not as successful as had been

expected, and most of the firms have already given up the idea of utilizing the herring in this way. Very few fish are now put up, and during the season of 1880 the total quantity did not exceed 200 barrels, many of these being spoiled in preparation. This business, however, should not be pronounced a failure until it has been more thoroughly tested, and future experiments may prove that under proper treatment the herring may be used for this purpose and that the anchovy trade of the United States may become an important one.

5. EXTENT OF THE BUSINESS.

STATISTICAL RECAPITULATION OF THE INDUSTRY FROM ITS ORIGIN TO THE PRESENT TIME.—From the time of the first experiments in 1875 the American sardine industry has gradually increased in importance, though, as has just been stated, it was confined within comparatively narrow limits till 1880. At this time many of the Eastport merchants went into the business and canneries were built at various other points along the eastern coast of Maine. By the close of the season there were 18 canneries in operation, with a total capital of $484,950 dependent on the business, including that invested in fishing apparatus by the New Brunswick weir fishermen, who market their catch at Eastport. The business furnished employment to 1,328 factory hands, and to 196 American and 372 Provincial fishermen.*

The following list of the sardine canning establishments in the United States in 1880, with their location, date of establishment, and city agents, has been carefully corrected by correspondence with Mr. Sellmann and Mr. Wolff, who have added a list of some of the new canneries that were to engage in the business in 1881:

Name of firm.	Location.	Date.	Agents.
Eagle Preserved Fish Company	Eastport, Me	1875	Wolff & Reessing, New York City.
P. M. Kane	do	1876	Hansen & Deickmann, New York City.
Warren Brown	do	1877	Wolff & Reessing, New York City.
Hansen & Deickmann	do	1878	Hansen & Deickmann, New York City.
American Sardine Company	do	1879	Rosenstein Brothers, New York City.
C. H. Dyer	do	1880	Wolff & Reessing, New York City.
F. S. Buck	do	1880	Do.
McLean & Abrams	do	1880	Do.
H. Blanchard	do	1880	Do.
R. C. Green	do	1880	Rosenstein Brothers, New York City.
Young & Stimpson	do	1880	Hansen & Deickmann, New York City.
Thomas L. Holmes	do	1880	Do.
E. A. Holmes	do	1880	Do.
Frontier Packing Company	Robbinston, Me	1880	Rosenstein Brothers, New York City.
Lubec Packing Company	Lubec, Me	1880	Wolff & Reessing, New York City.
William Underwood & Co	Jonesport, Me	1880	William Underwood & Co., Boston, Mass.
Lamoine Packing Company	East Lamoine, Me	1880	Hansen & Deickmann, New York City.
Union Fish Company	Camden, Me	1880	Rosenstein Brothers, New York City.
Wolff & Reessing (2d cannery)	Eastport, Me	1881	Wolff & Reessing, New York City.
George O'Grady	do	1881	Do.
McCulloch & Co	do	1881	Hansen & Deickmann, New York City.
A. W. Brown	Lubec, Me	1881	Wolff & Reessing, New York City.
Pike & Gillis	do	1881	Do.
Cumstock & Co	do	1881	Do.
George W. Capen	Jonesport, Me	1881	Do.
Young & Stimpson	do	1881	Hansen & Deickmann, New York City.
Wolff & Reessing	Millbridge, Me	1881	Wolff & Reessing, New York City.

*A petition from the sardine packers of Eastport and Lubec to the Secretary of the Treasury, praying for relief from certain customs duties, under date of May 28, 1885, states that this industry employs an invested capital of not less than $1,000,000, of which a large proportion is in factory buildings, machinery, fixtures, tools, and implements. There are said to be 18 factories in Eastport and 4 in Lubec now wholly engaged in sardine packing, and employing several thousand operators.—A. H. CLARK.

Mr. Wolff, who, from his intimate knowledge of the business from its beginning to the present time, is peculiarly fitted to do so, has kindly furnished an estimate of the quantity of sardines put up in the United States from 1875 to 1878 inclusive, which, though only as an estimate, is sufficiently accurate for all practical purposes. Adding to this the amount packed during the two subsequent years we have the following table showing the extent of the business from its origin to the year 1881:

	Size of can.	1875.		1876.		1877.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Sardines in oil.....cans	¼	50,000	$5,000	500,000	$50,000	1,000,000	$90,000
Do.....do	½			10,000	2,800	25,000	6,500
Sardines in spices.....do	¼	5,000	800	25,000	4,000	75,000	10,500
Sardines in mustard.....do	¼	5,000	800	25,000	4,000	75,000	10,500
Sardines in tomato-sauce.....do	¼					10,000	2,200
Brook-trout (large herring).....do	2 lb					12,000	4,000
Sea-trout (large herring).....do	*3 lb*			*4,800*	*1,400*	*12,000*	*3,000*
Mackerel (prepared by a similar process).....do	3 lb						
Russian sardines.....barrels		3,000	9,600	4,000	12,000	5,000	17,500
Anchovies.....do		200	600	200	600	300	900
Total.....cans		60,000	6,600	564,800	62,200	1,209,000	126,700
Total.....barrels		3,200	9,600	4,200	12,600	5,300	18,400

	Size of can.	1878.		1879.		1880.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Sardines in oil.....cans	¼	1,500,000	$135,000	1,468,500	$132,165	6,141,400	$552,726
Do.....do	½	25,000	6,500	39,500	5,135	142,900	18,577
Sardines in spices.....do	¼	100,000	14,000	180,850	27,143	579,850	86,978
Sardines in mustard.....do	¼	100,000	14,000	96,700	14,505	538,650	80,797
Sardines in tomato-sauce.....do	¼	25,000	5,500	22,250	4,450	22,700	4,540
Brook-trout (large herring).....do	2 lb	24,000	8,000	9,680	2,800	24,000	6,500
Sea-trout (large herring).....do	3 lb	12,000	3,000	16,440	5,137	50,584	22,056
Mackerel (prepared by a similar process).....do	3 lb					50,784	16,400
Russian sardines.....barrels		7,000	28,000	4,400	17,600	8,165	28,578
Anchovies.....do		500	1,500	265	795	200	500
Total.....cans		1,786,000	186,000	1,833,940	190,535	7,550,888	788,576
Total.....barrels		7,500	29,500	4,665	18,395	8,365	29,078

Messrs. Wolff & Reessing, Rosenstein Brothers, and Hansen & Deickman have thus far, with a single exception, handled the products of all the canneries in the country, and have also supplied a greater part of the capital. These parties have kindly furnished full and accurate information of the business from their books. Many of their statements have been given in detail; but, as there are good reasons why the business of individual firms should not be made public, it has been thought best to include all of the facts in one general table, which shall represent the entire sardine industry of the United States as it was in 1880. This table, though it exposes no private interests, will be found to answer all purposes for which it is intended.

THE DANGER THAT THE SUPPLY MAY EXCEED THE DEMAND.—Some of the manufacturers are already becoming alarmed at the future prospects of the industry on account of the large number of new canneries that are being erected and the enormous extent of coast-line along which it has recently been found that small herring may be taken. Mr. Sellmann writes: "There is much danger that the business may be greatly overdone. A considerable portion of the goods put up in 1880 remained unsold on January 1, 1881, and the combined capacity of the various canneries is already much greater than the present demand. Under the strong competition that must neces-

sarily follow, many of the smaller firms must go under, margins of profit will be reduced to a minimum, while the investment of capital under an accumulation of stock will involve much risk. As a result of this condition the standard of excellence will be lowered and many worthless goods will be placed upon the market at a low figure, and it will become simply a question as to the brands of one cannery or another." The above view of the situation is perhaps a trifle overdrawn, but it is still quite certain that the time has arrived when something must be done to increase the demand for the home production.

That the people of the United States have consumed large quantities of sardines and anchovies yearly for many years is clearly shown by the following table, kindly furnished by Mr. C. W. Smiley, under whose direction it has been compiled from the annual reports of the Bureau of Statistics:

Table showing the yearly importations of sardines and anchovies from 1858 to 1880.

For the year ending June 30—	Value of those brought from France.	Value of those brought from all other countries.	Total value.	For the year ending June 30—	Value of those brought from France.	Value of those brought from all other countries.	Total value.
1858	$273, 109	$1, 028	$274, 137	1872	$252, 612	$370, 923	$623, 535
1859	245, 090	6, 188	251, 278	1873	617, 359	555, 345	1, 172, 704
1860	293, 434	6, 245	299, 679	1874	804, 052	126, 978	991, 030
1861	222, 767	3, 867	226, 624	1875	445, 022	81, 157	526, 179
1862	170, 594	15, 823	186, 417	1876	498, 804	97, 037	595, 901
1863	368, 745	14, 478	383, 223	1877	685, 164	88, 167	773, 331
1864	472, 122	31, 957	504, 079	1878	587, 834	90, 076	677, 910
1865	257, 497	9, 975	267, 472	1879	796, 706	115, 685	912, 391
1866	744, 439	193, 481	937, 920	1880	786, 890	315, 520	1, 102, 410
1867	454, 149	24, 470	478, 619	Total	9, 487, 016	2, 169, 510	11, 656, 526
1868*	450, 577	21, 130	471, 707				

* Kinds and quantities of fish not given from 1869 to 1871.

From this table it will be seen that the United States imported from 1858 to 1880 $11,656,526 worth of sardines and anchovies exclusive of those received between 1869 and 1871, of which we have no record. It is further noticeable that though the quantity has varied considerably from year to year yet it has gradually increased; the value of those received during the year ending June 30, 1880, being considerably greater than that of the goods put up in this country during the same period. Even if we place the total products of the American canneries for the entire season of 1880 against those imported for the year ending June 30, it will be seen that the imported goods exceed those of home manufacture by $284,756. It will be further seen that of the entire importation of sardines and anchovies during the period covered by the above table, over 81 per cent. came directly from France, and without doubt a considerable portion of the remainder were put up in France and sold to other countries, which, in turn, sent them to America. If we consider only the sardines put up in oil it may be safe to say that over 95 per cent. of the entire quantity are prepared in France.

RELATIVE MERITS OF THE DIFFERENT SPECIES FOR CANNING PURPOSES.—It is often claimed that the American manufacturers are imposing on the people by putting up the common herring under the name of sardines, and that they are concealing the fact by using French labels. It is true that the fish commonly used in France are not the same as those used by Americans, but the two species are closely related to each other, and though they differ in many points, each having a flavor peculiar to itself, we are by no means willing to give the preference to the foreign fish. The mere fact that the French were the first to utilize small fish for this purpose, and that

they have always used a particular species simply because it chanced to be abundant in the waters contiguous to that country, is no proof that it is the only, or even the best, fish for the purpose.

Mention has already been made of several different species of fishes of even widely separated families, that have been prepared in this way, and some of them are considered superior to either the herring or the sardine. This is particularly true of the mackerel, which has a peculiarly rich and delicate flavor. But mackerel are usually too large for canning in oil, and, though prepared in a somewhat similar manner, the products are so different as to answer a very different purpose, and their manufacture will interfere but little with the demand for fish preserved in oil.

In order that a fish may be suitable for use in the sardine industry, it is only necessary that it should be of small size and of tender flesh; it should also be destitute of thick scales or of a tough skin. Little account need be taken of the natural flavor of the fish, unless this be much stronger than is usual with small fish, as the methods adopted in the preparation of oil and spiced sardines are such as to impart an artificial flavor, the quality of which depends in a great measure on the quality and kind of materials used, and the treatment to which the fish is subjected in canning.

THE QUALITY OF SARDINES LARGELY DEPENDENT ON THE OIL USED.—That French sardines of certain brands are superior to those put up in this country cannot be denied, for a few of the French manufacturers refuse to use inferior oils and take particular pains that their goods shall be first class in every respect. Many others, on the contrary, buy inferior and cheaper grades of olive oil, or are even doing away with this altogether and substituting in its place oil made from various indigenous seeds and nuts.

For some time the American packers used only the best imported oils, but on account of the cost of the same they soon came to use cotton-seed oil for cooking the fish. A saving of 80 per cent. on their oil bills was no small matter, and in a short time some of them, like their French brethren, began using the cheaper oils for packing also, and the quality of their goods has been proportionately impaired.

The average brands of imported sardines are in no way superior to those put up at Eastport, but there is a large class of consumers who insist on using only the best goods, and they are willing to pay the extra price charged for certain well-established French brands. In this way the importation of these goods continues, and with them come a large quantity of the cheaper grades, which find a ready market simply because they come from France.

AMERICAN PACKERS NOW IN CONDITION TO COMPETE WITH THE FRENCH NOT ONLY IN THE UNITED STATES BUT IN OTHER COUNTRIES.—Thus far the American goods have been put up with a French label, but the people are coming to learn that they are not only put up in this country but that when properly prepared they are equal in every respect to the best imported ones. The use of French labels might have been a help to the first introduction of the goods, but the time has now unquestionably arrived when the manufacturers should come out boldly with English labels, and, by the use of superior oils and additional care in preparation, win for their own brands a reputation that cannot but result in an increased demand. By adopting this course the imported goods can soon be driven from the American market, and when the supply shall have exceeded the demand there will be little difficulty in establishing a trade with other countries.

The question of our ability to compete with the French for the trade of other countries is one in which our packing-houses are especially interested. We are placed at a great disadvantage on account of the higher wages paid to American laborers. In the United States the sealers and can-makers receive $50 per month, and the average factory hand is paid $20. France also has an advantage in the saving of duty and freight on the olive oil used, while she is much nearer the principal markets for the manufactured products. The American packers, on the other hand,

have a decided advantage in the abundance of fish and the inexpensive methods of catching them. In France the fish are taken chiefly in gill-nets, which necessitates the handling of each fish separately, and in addition a large quantity of bait must be used in "tolling" them to the surface and in keeping them near the nets. The cost of the bait used for this purpose is equal to a large percentage of the value of the catch, and the price at which the fish sell is necessarily much greater than that paid by American packers. Again, the supply of fish on the French coast is by no means regular, and there are seasons when the fishing is a failure. Such was the case in 1880, when all parties interested in the business lost heavily.

That we may easily have the home market wholly to ourselves without fear of competition, provided our packers put up a quality of goods equal to the best French brands, seems quite certain, for our Government has levied a duty of $4 per case on all sardines brought into the country. It also seems quite probable that we will be able to compete with the French for the trade with other countries. At present the packers must pay $1 per gallon duty on all olive oil imported by them; but it may be possible that in the hope of benefiting a large number of its people, and of placing our sardine interests on a more substantial footing, the Government may be induced to remit the duty on that part of the oil used for the preparation of sardines, as they have already done on the salt to be used in the curing of fish in the cod and mackerel fisheries.

PART VII.

THE SHORE FISHERIES OF SOUTHERN DELAWARE.

By J. W. COLLINS.

1.—THE SQUETEAGUE OR "TROUT" FISHERY.

1. The fishing grounds.
2. The fishermen.
3. Apparatus and methods of fishing.
4. Disposition of the catch.
5. Financial profits and share.

2.—THE SPOT FISHERY.

1. The fishing grounds.
2. The fishermen.
3. Apparatus and methods of fishing.
4. Disposition of the catch.
5. Financial profits and lay.

3.—THE ROCK AND PERCH FISHERY.

1. General review.
2. Fishing grounds and fishermen.
3. Apparatus and methods of fishing.
4. Disposition of the catch.

4.—THE STURGEON FISHERY OF DELAWARE BAY.

1. Sturgeon fishery at Bowers' Beach.

PART VII.

THE SHORE FISHERIES OF SOUTHERN DELAWARE.

By J. W. Collins.

I.—THE SQUETEAGUE OR "TROUT" FISHERY.

Squeteague or "trout" (Cynoscion regale and C. maculatum) are taken along almost the entire length of the Delaware coast, between Little Creek Landing on Delaware Bay and Fenwick's Island at the southern extremity of the State, but the special fishery for this species is confined to the locality between Cape Henlopen and Mahone's Creek light. South of the cape there is no organized fishing for trout, the few that are taken being captured incidentally in the seines and gill-nets of the fishermen which have been set for other kinds of fish. Thus we find that, in 1880, while only 10,000 pounds were caught south of Cape Henlopen, 2,608,000 pounds were taken by the fishermen along the shores bordering Delaware Bay. The trout fishery begins from the 20th of April to the first of May, and is generally pursued with great ardor for five or six weeks; in some places it is continued until the first of July; and at Lewes it is carried on to a greater or less extent until August, when the spot makes its appearance along the shores, and the fishermen then turn their attention to the capture of the latter species. Toward the latter part of June the schools of fish, which, previous to that time, have remained close to the beach, begin to move off into the deeper waters of the bay, where the temperature of the water is not so high as it is close to the shore. After this time the trout seldom approach close enough to the beaches to be taken in seines except at Lewes, and in consequence comparatively little is done after the first of July; occasionally a few fishermen go out in the bay in July, August, and September to fish with hook and line; but it rarely happens that many trout are taken. During the height of the fishing season the farmers of this region, as well as the professional fishermen, resort to the beaches nearest their homes to engage in the work, which is carried on both during the night and day, as circumstances may demand. With the trout are taken, in the seines and nets, more or less perch, rock, mullet, and flounders, and occasionally other kinds of fish, though it may be said that all of these form only a small portion of the sum total of the fish captured during the months of May and June, since it is estimated by the most competent authorities that from 90 to 95 per cent. of the fish taken at the various beaches along the Delaware Bay at this season are trout. The importance of this fishery to the State is considerable, a large portion of the farmers and laboring classes being thus supplied with food which is both cheap and wholesome.

1. FISHING GROUNDS.

The fishing grounds are the shoal waters bordering the numerous sandy beaches along the shores of Delaware Bay. These beaches are ridges or hammocks, varying from one half to two miles or more in length, slightly elevated above the surrounding and intervening swamps, and

with shores sloping gradually down to the water of the bay. The slope is so gradual in many cases, as, for instance, at Bowers' Beach, that the depth of water does not exceed 6 feet even at a distance of a mile from the shore. The different species of fish found in this locality approach close to these beaches in the spring, and can easily be taken by the fishermen, who set their haul-seines and gill-nets in depths of 6 to 8 feet of water.

The most important of the upper fishing stations are Kitt's Hammock, 25 miles northwest of Cape Henlopen (and 4½ miles south from Mahone's Creek light), and Bowers' Beach, situated between Murderkill and Jones' Creeks, some 2½ miles farther down the bay. Between Murderkill and Mispillion Creeks are the fishing stations of Shirley's Bar, the "Pier" and "Big Stone," while near the mouth of Broadkiln Creek is Slaughter Beach, another excellent fishing ground, 4½ miles distant from Lewes. The beach at Lewes, though secondary in importance as a fishing ground, so far as trout-fishing is concerned, is, nevertheless, taken altogether, the principal station along the bay, since the fisheries are carried on during the entire summer and autumn for the various species which can be found in this locality. The fishermen usually resort to the beaches nearest to their homes, all other things being equal. Thus, Kitt's Hammock is the favorite place for the Dover fishermen, as well as a portion of those from Lebanon and Magnolia. A few men from the two last-mentioned places, however, generally go to Bowers' Beach in the fishing season, which is also resorted to by the fishermen from Frederica; these, together with the local residents at the beach, making up the sum total of men employed in trout-fishing at that point. The residents of Milford Neck divide themselves between the two stations of Shirley's Bar and the "Pier." Some of them formerly carried on fishing at the "Big Stone," but so few fish have been caught in late years at this station that it was abandoned in 1880, no seines being set from the beach. The chief part of the fishermen from the village of Milford resort to Slaughter Beach, where also may be found, in the fishing season, the men who belong at Milton; the residents of Lewes, of course, being near one of the best fishing grounds in the State, have no occasion to go elsewhere to pursue their work. By this arrangement the men are enabled to go to their homes during the "slack spells," and when the weather is unfavorable for fishing operations. As a rule, they visit their homes at least once a week. After the trout leave the shoal water bordering the beaches and strike off into the bay, on Oyster Rock, so-called, the outlying shoals are the fishing grounds, where a limited number of this species is taken with hook and line, though it is but fair to say that no systematic fishery is carried on after the end of the seining season.

2. THE FISHERMEN.

The fishermen of Delaware are principally men who engage in other pursuits during a large portion of the year. Among their other employments agriculture may be reckoned as the chief. They engage in fishing, as a rule, only when it offers better returns than can be obtained elsewhere; but when the fish grow scarce, or the market dull, they return to their farms; or if they have no farms of their own they hire out with some one else, unless, indeed, they may be mechanics, in which case they seek such employment as they are best fitted for. Many farmers of this section own boats and fishing apparatus with which they procure supplies for their own tables, and frequently secure a surplus, which they sell; others belong to crews or gangs regularly organized for seining. These are the men who manage the large drag-nets. During the fishing season it is not at all an uncommon thing for the farmers to hire colored men to work on their land while they themselves engage in fishing. We are told by Mr. Hill, of Milford Neck, that many farmer-fishermen of that section make it a rule to do their planting first, after which they engage in fishing for trout, thus filling up the time which otherwise might be unoccupied. According to Mr. M. S. Van

Burkalow, of Magnolia, many of the fishermen at that place and adjacent towns work in the fruit-canning establishments from July to September, but in the spring nearly all of the farmers in that section catch fish, at least for their own use. At Milton, says Mr. J. D. Morris, the trout fishery lasts about five weeks, and during this period the men pursue it with ardor, devoting all their time to handling seines. Those who own farms hire some one, generally a colored man, to do the farm work while they are fishing. At Lewes thirty men make a business of fishing for trout from May 1 to July; in addition to these there are fifty others, one-fourth of whom are colored, who fish for pleasure or profit at odd jobs. Taking them altogether these semi-professional fishermen are employed about one half of their time in catching trout, using for this purpose seines, gill-nets, and, rarely, hook and line. Those fishing with hook and line in the spring do this only for pleasure, or to secure a supply for their own table. After the rush of the trout fishery is over the semi-professional fishermen, as we have seen, engage in other pursuits, leaving the professional fishermen to continue the work on a more limited scale. The latter, as a rule, peddle their fish in the villages and surrounding districts during the period between the 1st of July and November. The catch of trout, however, as has been previously stated, is very small after the 1st of August. A few colored men are engaged in the trout-fishery in the towns above Lewes. So far as we learn it would be a liberal estimate to say that more than five or ten per cent. of the fishermen were colored.

3. APPARATUS AND METHODS OF FISHING.

BOATS AND THEIR FITTINGS.—The ordinary sharp-bowed, wide-sterned, flat-bottomed skiff, or battean, known in other sections of the country as the sharpie, is the style of boat almost universally used in the Delaware Bay fisheries. These vary in length from 12 to 20 feet, and in value from $10 to $20. They are almost exclusively built by the fishermen themselves, with few exceptions propelled by oars, and are employed both in the gill-net and seine fisheries, the larger ones being used for carrying out the haul-seines. At Bowers' Beach, however, there are a few round-bottomed boats, such as are elsewhere described as the "gill-net shad-boats;" and at Lewes, also, there are a few of these, as well as a limited number of the New Jersey surf-boats, such as are in use at Long Branch. A full description of the various forms of boats may be found in the report on fishing vessels. It may, however, be well to say here that the sharp-bowed boat is propelled both by sails and oars, but the New Jersey surf-boat rarely has a sail.

SEINES, NETS, AND LINES.—There are several kinds of seines used in the trout-fishery by the fishermen of Delaware Bay, differing principally in length. They may be classified under three general heads: First, the large haul-seine, ranging from 75 to 150, or more, fathoms in length, chiefly employed in the trout-fishery, and managed by a crew of four to seven men. Second, the small haul-seines, from 40 to 70 fathoms long, frequently used both in fresh and salt water fishing, and managed by a crew of two to four men. Third, the "wade-seines," 30 to 40 fathoms long, operated by one or two men who have no boat, but wade out to the depth of 3 to 5 feet, setting the seine as they go, after which it is hauled on the shore. The large seines range from 6 to 9 feet in depth, while the smaller ones are rarely deeper than 7 feet. The mesh varies from 1½ to 2 inches.

According to Mr. D. R. Tomlinson, of Dover, the fishermen of that place use small seines, 40 to 45 fathoms long and 6 to 7 feet deep, for the capture of various species of fish, such as trout, shad, herring, rock, and perch. For the management of these seines they are each provided with a "shore-line" 50 fathoms long, and a "water-line" 100 fathoms in length. In addition to these nets the fishermen use, during the trout season, from May 1 to July 1, a number of large seines which are 150 to 175 fathoms long, 7 feet deep, having 2-inch mesh. These nets are provided with

a "shore-line," 75 to 100 fathoms long, and a "water-line," 200 fathoms in length. The average length of the seines used by the Dover fishermen is 75 fathoms, and the average value $50. We are told by Mr. Samuel Wyatt that the large seines used at Bowers' Beach are 150 fathoms in length, 100 meshes deep, the mesh being 2 inches in length, and that they cost about $150 each. For the management of these a crew of seven men is required. A smaller net is used in the trout fishery, averaging about 50 fathoms in length, and costing from $50 to $60; these have a crew of four men. At Milford the large seines average 100 fathoms in length. There are, however, here, fifty small seines, averaging 30 fathoms in length, and requiring from two to four men to handle them. Many of these are of the kind known as "wade-seines," and are owned chiefly by the farmers who use them to procure a supply of fish for themselves, selling any surplus they may obtain. The trout-fishermen of Milton, however, we are told by Mr. James D. Morris, of that place, rarely use a net larger than 60 fathoms in length, 100 meshes deep, the mesh being 2 inches, while the small seines are 25 fathoms long, 80 meshes deep, and cost $20, and the larger ones are valued at $60. The swiftness of the current at the lower end of Slaughter Beach, near the mouth of Broadkiln Creek, where the men from Milton carry on their fisheries, prevents them from using so large a seine as is employed by the fishermen farther up the bay. The largest haul-seines used at Lewes, according to Mr. J. A. Marsh, a fisherman of that port, are 65 fathoms long, 100 meshes deep, the mesh being 2 inches in length. The average value of these nets is $40, the small nets varying in length from 20 to 30 fathoms, and are worth about $40 each.

Gill-nets are used for the capture of trout along the shores of Delaware Bay, though very much less so than drag-seines. Mr. Tomlinson tells us that the Dover fishermen have (stake) gill-nets for the capture of trout, pike, mullet, catfish, perch, and rock. These nets are 25 fathoms long, on the average, about 6 feet deep, the mesh varying in size from 2½ to 3 inches. At Lewes, gill-nets are used quite extensively during the first weeks of the trout fishery. These are the same kind as those employed for the capture of spot, being from 13 to 20 fathoms in length (mostly 15 or 16 fathoms long), 15 to 40 meshes deep, the mesh measuring 2½ inches. A more detailed description of these gill-nets is given in the chapter on the spot fishery.

It has been stated that trout are only taken incidentally south of Cape Henlopen, principally in gill-nets. These nets, which are used chiefly for the capture of perch, bluefish, menhaden, spot, and other species, are from 15 to 40 fathoms long, about 4 feet deep, and usually a mesh of 3 inches. The hand-lines used in Delaware Bay for the capture of trout are exceedingly simple in construction. A small sinker of 2 to 4 ounces in weight is fastened to the end of a small line of suitable length; above the sinker are attached to the main line, at distances varying from 8 to 10 inches apart, two or three gangings about a foot in length; fastened to their outer ends are small-sized hooks similar to those used for catching mackerel.

METHODS OF FISHING.—The appearance of the trout is the signal for the assembling of the fishermen at the different fishing-stations to engage in the capture of this species of fish. This fishery, beginning, as has been mentioned, about the first of May, is actively prosecuted until the end of June, and in some localities continues until August. It has been stated that from four to seven men are required to manage a large seine. When the seine is to be set one of these men stands on the shore holding the end of a rope—the "shore-line"—which is attached to the end of the net that is first thrown overboard. The remainder of the crew go out in the boat with the seine to a distance equal to the length of the line, which may vary from 50 to 100 fathoms. They then set the seine in a semicircle, working down stream and gradually keeping farther away from the land. By this means the end of the seine farthest down stream is gradually reached. From this lower end a rope is run ashore and then the men land on the beach, dividing themselves into

two gangs, each hauling on a line until the seine is drawn to the shore and the fish are landed. The smaller-sized nets are set in a similar manner, though fewer men, of course, are required to handle them. The small "wade-seines" are usually set by a single man (sometimes by two), who wades out from the shore to a depth of three to five feet and places the net in a semicircle around the place where he supposes the fish to be, and then returning to the beach, draws the net to the shore, securing such fish as may have been encircled by it. As a rule, the fishermen set their apparatus by guess, rarely, if ever, seeing the fish in the water before putting out their seines. This is especially the case, perhaps, with those who use wade-seines, since they can be employed to advantage only when the water is turbid or after nightfall. According to Mr. James Lowry, of Milford, many of the farmers of that town who own seines go out in the evening, after finishing their work on the farm, and make a set with a wade-seine for the purpose of catching a supply of fish for themselves; though, in the event of their obtaining any more than they need for their own use, they usually sell them either to their neighbors or to parties who come from a more remote distance to supply themselves with this fish. The method of handling the seine all along the shores of Delaware Bay is essentially the same, though, owing to the strong current in some localities, the fishermen are obliged to use shorter nets than are employed at other places. Captain Fowler says that at Lewes three or four men compose a seine-gang, and usually these at the same time have both seines and gill-nets, working with the former during the day or when circumstances are favorable, and setting the gill-nets at night. In the vicinity of Kitt's Hammock the nets are "staked out," but farther down the bay, at Lewes especially, where gill-nets are principally employed during the first weeks of the trout fishery, they are set in a peculiar manner, which will be fully described under the head of the spot fishery. According to Mr. William T. Gray, of Blackstone, a common way of setting gill-nets for trout and other species in Indian River is to fasten their ends to stakes, which are driven in the muddy bottom of the river. The nets are separated from each other 15 to 20 fathoms, and are placed longitudinally to the stream. They are overhauled each morning. In fishing for trout with hook and line the fishermen usually anchor their boats on some favorite spot in the bay; and, having baited their hooks with soft crabs, which are very attractive to these fish, they lower the lines to the bottom, and, if the trout are at all abundant, it is but a little while before the fish begin to bite rapidly, and of course are quickly pulled in.

At Kitt's Hammock, Bowers' Beach, and contiguous fishing stations the large seines are put away after the last of June, though the smaller nets are occasionally used for the capture of trout, but at that season most of the fishermen are at work at other employments and there is but little systematic fishing done.

Mr. J. A. Marshall, of Lewes, says that the trout fishery begins there about the first of May, being carried on with gill-nets for nearly a month. At the beginning of June, and sometimes sooner, the fishermen commence hauling trout with seines, carrying on their operations principally during the night, though more or less fish are taken in the daytime, especially if the water is muddy or turbid. The principal part of the fishing is over by the beginning of July, though occasionally hauls are made with the seines until August, at which time the spot fishery begins, and trout are rarely taken thereafter. Large numbers of trout were caught in the pound which was built at Lewes in 1873–'74, but as a rule the fish were either let out or else thrown away after the sounds or air-bladders had been removed.

4. DISPOSITION OF THE CATCH.

At the beginning of the trout season many of the farmers from the interior of the State, residing in some cases a distance of 30 or 40 miles from the nearest fishing stations, drive to the villages nearest the shores of Delaware Bay, and frequently even to the beaches where fishing is being carried on. Here they remain until they are able to purchase a supply of trout, which they buy fresh as the fish are taken alive from the water. Having obtained a sufficient amount for their purposes at least for the day, they proceed to dress and salt them. In doing this they cut off the heads and tails; the viscera and air-bladders are removed, and the fish are then split, washed, and salted.

It is estimated by Mr. M. S. Van Burkalow, of Magnolia, who is interested in the fisheries and is an extensive buyer of trout sounds or air-bladders, that three-fourths of a pound of dried sounds may be obtained from a bushel of trout, and as sounds sell at a price ranging from 75 cents to $1 per pound, it is evident that the cost of the fish to the farmer is merely nominal, since he rarely pays more than 50 cents a bushel for the fish.

Having secured enough fish to last through the year, the farmer packs them on his cart and hauls them away to his home. In addition to the trout that are sold in the manner above described, many are disposed of to peddlers who resort to the fishing-stations to purchase their supplies, which they hawk about through the villages and adjacent farming districts.

Mr. Samuel Wyatt, of Bowers' Beach, says: "In the spring the fishermen sell their catch of trout to farmers from the interior towns, who, after buying their fish, dress and salt them for their own use. There are also twelve peddlers who buy trout and hawk them about the villages and farming districts. The average price for which the fish are sold is 40 cents per bushel."

It is estimated by a number of the most intelligent observers at the fishing stations that about three-fourths of the catch of trout is sold in a fresh condition to the farmers, and it is said that this species of fish constitutes an important part of the food supply of the rural population of Delaware. A comparatively small amount of trout is shipped to Philadelphia and other large towns, and a considerable percentage of the fish which are not sold in a fresh condition to the farmers and peddlers are salted by the fishermen and retailed to the country trade during the fall and winter. According to Mr. Tomlinson, 60 per cent. of the trout taken by the Dover fishermen are salted and disposed of in this manner at prices averaging $6 per barrel. Those that are sent away are generally packed in boxes with ice. In some of the larger villages ice is put up in winter if any can be obtained. At Milford, Mr. J. Lowry has two ice-houses, with a capacity of 1,000 tons each. In 1879 50 tons were sold to fishermen and fish peddlers, but in 1880 no ice was obtained.

Mr. Van Burkalow says nine-tenths of the trout are sold to farmers and peddlers, mostly in a fresh condition, and one-tenth shipped to Philadelphia.

Mr. J. A. Marshall, of Lewes, estimates the catch of trout by the fishermen of that place at 250,000 pounds for 1880. Of this amount, he says three-fourths are sold fresh to peddlers and farmers, and one-fourth salted by the fishermen, being afterwards sold to residents of the interior towns.

He also tells us that the men employed on the railroad at Lewes buy a good many fish, which they sell at the towns along the route. The price received for the fish is variously stated to be from 25 to 60 cents a bushel for those which are sold in a "lump" to farmers; but for such as are retailed by the fishermen themselves in the villages near the fishing grounds, the price is frequently 4 or 5 cents a pound.

5. FINANCIAL PROFITS AND SHARE.

As a rule, large seines are owned by the merchants of the different towns and by the wealthy farmers, but in some cases belong to the captains of the fishing gangs. The crews are shipped to manage these seines and receive a certain share of the profits, which vary considerably in the different localities, and also with the size of the seine. Mr. Van Burkalow tells us that the largest seines used at Kitt's Hammock and Bowers' Beach draw 40 per cent. of the gross proceeds. According to Messrs. Samuel Bethards and J. W. Sparry, of Frederica, one-half of the proceeds of the catch goes to the boat, seine, and captain of the seine gang, while the remainder is divided among the rest of the men, who, from the amount thus received, provide themselves with food. The average share of a man engaged in seine-fishing for trout for the four weeks between the middle of May and the 15th of June is $32. The average stock of one of the large seines at Kitt's Hammock and Bowers' Beach, during the trout season, is about $500, according to Mr. Van Burkalow; though we are told by Mr. Wyatt, who is engaged in fishing with a seine at Bowers' Beach, that the average stock of a seine is $800, of which the net draws two-fifths, and the remainder is divided among the captain and crew, who "find" themselves. There is usually no rule for the division of the catch of the smaller nets, since the men fishing with them share the proceeds equally, though in most cases a certain percentage is paid for the use of the net. At Milton the seine draws an equal share with the men; that is, if there is a crew of four men, the usual number fishing with a net, the owner of the latter, who is usually the captain of the gang, receives for its use one-fifth of the proceeds of the catch. Mr. A. Hill, at Milford Neck, informs us that the fishermen rarely make more than $18 in the four weeks during which they are employed in trout fishing, and thinks they have not exceeded that for the past ten years. This estimate, however, is so much smaller than that of the men actually employed in the fisheries that it is altogether probable it is far below the actual facts.

2.—THE SPOT FISHERY.

The second sea fishery in importance in Delaware is that for the capture of spot (*Liostomus xanthurus*), which are found along the entire coast-line from Dover to the southern limit of the State, though in some localities they are rarely taken. Mr. Van Burkalow, of Magnolia, states that spot have occasionally been caught as high up Delaware Bay as Kitt's Hammock, though never do they appear there in abundance, nor are they found at all plenty anywhere in the waters bordering the bay shore above Slaughter Beach. The fishermen of Milford, Milton, and Lewes engage in this fishery to a considerable extent from the first of August until the last of September, and, in some instances, we are assured that small numbers of this fish have been caught at Lewes even as late as the 10th of November. Farther south the spot are, as a rule, taken incidentally in the apparatus which is set in those waters for other species. An exception, however, may be made of the spot fishery of Ocean View, which, next to Lewes and Milton, has the largest catch of any town in the State. This place is favorably situated for the capture of this fish, which appears to be quite abundant from July to November in the lower part of Indian River. Though no systematic fishing is carried on at this season, there are still a number of men who go out with haul-seines once or twice a week, and nearly all the residents of the town find time for more or less fishing.

1. THE FISHING GROUNDS.

It has already been stated that spot occur in greater or less numbers along the Delaware coast from Kitt's Hammock to the southern limit of the State, but the fishing grounds proper for this species may be confined to narrower limits. Slaughter Beach, the beach at Lewes, the waters of Rehoboth Bay, Indian River and Bay, and the Isle of Wight Bay, may be said to constitute the fishing grounds where spot are taken by the residents of Delaware, though it may be here mentioned that the fishermen living in the southern part of the State sometimes go farther south, to Sinnepuxent Bay, or even, perhaps, to Assateague Bay. The fishing grounds north of Cape Henlopen have already been described in the discussion of the trout fishery. It needs, therefore, only to add here that south of Cape Henlopen the Delaware coast is composed of low, narrow, sandy beaches, which inclose the shoal-water of the lagoon-like bays, the names of which have already been given. But little fishing is done in Rehoboth Bay, though it is the largest in the State, being about 4 miles in the direction of the shore-line, and having an average width of 3 miles. Just south of Rehoboth Bay, however, and connected with it by a channel, is Indian River Bay, which is 6 miles long, east and west, and has an average breadth of 1 mile. A narrow inlet, having a depth of 6 or 7 feet, connects these sheets of water with the Atlantic, and through this opening large quantities of anadromous fishes and a somewhat smaller number of sea fish annually pass to and from the shelter of the bays.

2. THE FISHERMEN.

The fishermen who engage in the capture of spot are generally the same men who have been employed in the trout fishery in the spring, though the numbers are perhaps less. In the vicinity of Lewes and Milton a considerable portion of the men are professional fishermen. This is especially the case at Lewes, while at Milton, we are told by Mr. J. D. Morris, that of the forty men engaged more or less regularly in catching spot at Slaughter Beach one-half of them are farmers, who fish only for their own use, as a rule, selling any surplus they may obtain, while the remainder of the men fish rather irregularly, being employed alternately in fishing and other pursuits. The summer fishermen, south of Cape Henlopen, are usually semi-professional, or farmers, the latter fishing, as a general thing, only to obtain a supply for their own tables, while the former carry on their work in a somewhat erratic manner, engaging in fishing once or twice a week, or perhaps for one or two weeks in succession, and then being occupied the remainder of their time in other employments. According to Mr. William J. Parkhurst, of Dagsborough, all of the fishermen of that place engage in fishing at "odd jobs" during the summer, catching trout, spot, and other less common species, which they peddle through the towns in the immediate vicinity. We are told by Mr. H. H. Hickman, of Roxanna, that many of the farmers of that town own small "wade-seines," and that whenever they have time in the summer they go down to Indian River and catch some fish for their own use. If, however, they succeed in getting more than they need for themselves they load the surplus on a team and peddle it through the rural districts. Although there is a considerable quantity of fish taken in this manner by the twenty-eight men from Roxanna, who are thus occasionally employed, nevertheless they can hardly be considered as fishermen in the strict sense of the term, especially spot fishermen, since we are told that the latter species is not taken by them in large quantities, but rather incidentally with other fish in gill-nets and wade-seines. The same may be said of spot fishing at Williamsville, in the lower part of the State; a few are taken during the summer by the fishermen who follow gill-netting, and who are generally such men as depend wholly on fishing.

3. APPARATUS AND METHODS OF FISHING.

THE BOATS.—The boats used in the spot fishery are essentially the same as those used in the trout and other fisheries of the State, being almost wholly of the flat-bottomed sharpie pattern, varying in length from 12 to 20 feet, and almost without exception propelled by oars alone. These boats are simple in construction, and are usually built by the fishermen themselves at little cost.

SEINES AND NETS.—Wade-seines, varying in length from 16 to 25 fathoms, are used by the farmer-fishermen of Milford for the capture of spot. The haul-seines used at Millsborough, and in which spot are taken in connection with various other kinds of fish, range in length from 45 to 75 fathoms, are 12 feet deep in the bunt and 8 feet deep at the wings, and have a 2¼-inch mesh. The average length is about 50 fathoms, and the average value of nets in use—estimated by Mr. G. W. Johnson, of Millsborough—about $30 each. The largest seines used at Ocean View for the capture of spot and other fish are from 40 to 50 fathoms in length, while the wade-seines are from 15 to 20 fathoms long, 5 feet deep, and 2-inch mesh. The nets used for the capture of spot at Slaughter Beach by the Milton fishermen average 15 fathoms in length and 50 meshes deep, the mesh being 2¾ inches stretch-measure. We are told by Mr. J. A. Marshall, of Lewes, that during the season in which the fishery is carried on, there are in use at the Beach 250 gill-nets. These, as a rule, are about 15 or 16 fathoms long when hung, though a few of them are 20 fathoms long. The depth varies from 35 to 50 meshes, the latter being 2½ inches. The average cost of these is about $3. Mr. C. T. Burton, of Lewes, says: "We use white Northern pine floats on the spot gill-nets, these being placed 6 feet apart on the cork-line; the lead sinkers, which are attached to the foot of the nets, average 1 ounce in weight, and are placed 16 inches apart." The spot fishermen use two nets at a time, but they usually have four nets or more during a season, as one "fleet" of two nets will last only about a month.

The nets are injured very much at Lewes by crabs during the month of August. These crustaceans, known locally as the "cushion crabs," are very abundant at that season, and frequently become so badly entangled in the fine twine of which the nets are composed that the latter are often badly damaged and torn in the process of removing the crabs. The fishermen of Blackstone use gill-nets ranging from 15 to 40 fathoms in length, 4 feet deep, and a mesh of 3 inches. Various species of fish are taken in these, among which is the spot. The gill-nets in use at Williamsville for the capture of the various species of fish taken in that locality, among which a small quantity of spot are found, are 25 fathoms long, from 3 to 6 feet deep, and have a mesh varying from 3 to 6 inches; only the smaller-meshed nets are used in summer, principally for the capture of mullet and spot.

METHODS OF FISHING.—The methods of fishing with gill-nets for spot at Lewes and Slaughter Beach, 4½ miles farther up the Delaware Bay, are quite novel, and so far as we have been able to learn are not practiced in any other part of the United States. At Slaughter Beach stakes are driven into the muddy bottom of the bay at a distance of about 65 to 70 yards from low-water mark; these stakes being long enough so that their tops are above water even at high tide. To the upper end of each stake is fastened a single block through which is rove a line, the ends of the latter being bent together so that it will not unreeve. When the fisherman desires to set his net he bends one end of this line to the outer end of the apparatus and the other end of the rope is made fast to the opposite end of the net. By pulling on the rope the net is hauled out from the shore into the water until it reaches the stake, and the line now being hauled taut and fastened the net remains secure and straight in its proper place. When the fisherman desires to take the net on shore he simply slackens away on one part of the rope and hauls in on the other, thus

dragging the net to the beach and with it whatever fish may have been caught in its meshes. As soon as one net is taken in another is hauled out to take its place, unless, indeed, owing to the presence of daylight or other causes, it should not be necessary to continue fishing any longer. The same result is arrived at in a different manner by the fishermen at Lewes, who make use of an anchor instead of a stake for fastening their block to, but who haul their nets to and from the beach in precisely the same manner as here described. According to Mr. Morris, of Milton, the men fishing at Slaughter Beach with gill-nets join together in gangs of two for mutual help. When fish are abundant one of the men spends a considerable portion of his time in peddling the catch, which he carries in a wagon to the rural districts and villages, while the other man stays at the beach to prosecute the fishery, which he carries on night and day if circumstances are favorable, though, generally speaking, but little is done in the daytime. The nets are set on the fall of the tide, being put out three times before low water, on an average, but if fish are plentiful they are sometimes set as many as four times; if a scarcity of fish prevails, not more than once. The spot during its season is the principal fish taken, though at the same time bluefish, perch, and several other varieties of fish are caught, but usually in small quantities. At Lewes the fishermen generally form themselves into parties of four or five for mutual assistance. During the night they will go back and forth along the beach, from station to station, hauling in regular rotation the nets of each one of their number. When the net at one station has been drawn ashore, another set in its place, and the fish removed from the first and cared for, the men then move on a short distance to the next fishing berth, where the operation is repeated. When there is good fishing, and it is possible to do so, the nets are hauled every half hour or thereabouts. It frequently happens, however, during the month of August, that large numbers of crabs get entangled in the meshes of the nets, compelling the fishermen to spend hours in clearing these crustaceans from the fine twine, which is often much injured during the operations.

According to Mr. C. T. Burton, the best results are obtained immediately after easterly winds, which usually disturb the water sufficiently to make it thick and turbid with mud and sand; when it is in this condition the fish can be more easily captured than at other times. The fishery with gill-nets is carried on even when there is a strong wind and considerable surf on the beach. The nets are set chiefly at night; the first of the ebb tide being a favorable time for putting them out. The fishermen, having no camps or shelter of any account on the beach, when not busy in hauling and setting their apparatus, generally build a fire on the sand and lie down beside it. When the tides are not favorable for fishing or when the fish are scarce, the fishermen sleep by their fires, awakening whenever the proper time arrives for prosecuting their labors to advantage. Each man is provided with two nets for the "fleet," one of which is set in the water while the other remains on the shore to take its place at the proper time.

Some seven or eight of the Lewes fishermen, after spending the night in fishing for spot on the beach, frequently go to the breakwater and other parts of the bay where they catch blackfish, sheepshead, trout, and occasionally bluefish, with hook and line. For these fish they usually obtain a high price. South of Cape Henlopen the common method of setting gill-nets for spot and other species of fish is to "stake them out"; that is, to fasten them between stakes which have been driven into the muddy bottom of the bays and rivers. The nets are usually separated 15 to 25 fathoms from each other, and are set parallel to the course of the stream or current. They are overhauled each morning and the fish removed, though they may be left for days or weeks together to continue fishing. Excepting at Lewes and Slaughter Beach this style of setting gill-nets is quite general throughout the lower part of Delaware, from Dover down to Fenwick's Island. Nearly the same result has been obtained, so far as fastening the net is concerned, by the method adopted by the spot fishermen, though the details of handling the net differ very radically.

The method of setting the haul-seines in Indian River and Bay is as follows: The end of the first line, the "land rope," is left with one man on the shore and run out its entire length by the men in the boat, two of whom pull away with the oars, the other one paying away on the rope, which is from 150 to 200 fathoms in length. After the line is out the seine is set in a semicircle up or down the stream or bay as the tide happens to run; the last end of the seine being always carried out somewhat farther from the land than the end first set. The net being out, the "water-line" is then run to the shore and the men divide themselves up, two pulling away on the "land-rope" and two on the "water-line." After the ends of the seine have been drawn to the shore, two men take hold of the lead-line and two others pull in on the cork-rope. The net is then gathered in slowly, the foot-rope being hauled in more rapidly than the cork-line; hence when it reaches the dry beach the fish are finally turned out on the sand. The fish are rarely if ever seen before the seine is set, the fishermen putting their apparatus where they think the best results may be obtained. The wade-seines are set in precisely the same manner as has been described in the notes on the trout fishery.

4. DISPOSITION OF THE CATCH.

The fishermen of Milford occasionally take the spot, principally for their own use, but when a larger quantity than they need is caught they peddle them through the villages and rural districts in their immediate vicinity. The fishermen of Milton, who engage regularly in the spot fishery, as has been stated in another paragraph, form themselves into gangs of two each, one of these men making a specialty of peddling the fish which are caught by his partner. In this way two-thirds of the fish taken are sold in a fresh condition, while one-third is salted. According to Mr. Morris, the average price of the fresh fish at Milton is two cents per pound, while those which are salted bring $10 per barrel. All of the latter are sold to the country trade. It takes about 600 of these fish to make a barrel when they are salted. They are dressed in much the same manner as our common mackerel, being first split and then soaked in water for a considerable length of time until all the blood is removed, after which they are salted. At Lewes, Mr. Burton tells us, the fishermen take their catch to the village in the morning and peddle the fish out during the day, selling as many of the fresh ones as they can. When they get a surplus and cannot sell them fresh, the fish are salted down. Mr. Marshall, of Lewes, estimates that one-third of the catch at that place is shipped in a fresh condition to New York and Philadelphia, one-sixth sold fresh at Lewes and adjacent towns, and one-half salted and sold to the country trade. He gives the average price as eight cents per pound. The spot which are taken in the towns south of Cape Henlopen are either consumed by those who take them or are sold to the residents of the region near which they are caught. A small quantity are sold to the summer residents at Rehoboth Beach. The chief part of those which are peddled are disposed of in a fresh condition, but most fishermen and farmers salt down a quantity sufficient for their own use, which may vary from one and one-half to three or four barrels.

5. FINANCIAL PROFITS AND LAY.

The financial profits of the fishermen engaged in the spot fishery are difficult to determine, since the capture of the different species is so interwoven with each other that no reliable or accurate data could be obtained. We are told by Mr. Marshall that the average yearly stock of the professional fishermen at Lewes is about $175, and that of a man fishing at "odd jobs" would average about $50. It is perhaps safe to say that one-half or one-third of this amount would be earned in the spot fishery. As the fishermen own their nets, that is, those who use only gill-nets in

this fishery, they, of course, receive all the money which their fish may bring; therefore there would be no "lay" in the matter. Those, however, who employ seines, as some of the men do in Indian River and Bay, go on a lay something similar to those who engage in the trout fishery. In this case the seines are generally owned by merchants or by one of the fishermen, and the owner receives one-fifth of the proceeds for its use.

3.—THE ROCK AND PERCH FISHERY.

1. GENERAL REVIEW.

The fishery for rock and perch in Delaware, between Dover and the southern limit of the State, though unimportant in comparison with the great commercial fisheries of the other sections of the country, is, nevertheless, one of considerable consequence to the residents of this region, since this fishery is carried on almost wholly in the winter season, when the men who engage in it would otherwise be unemployed.

In former times, both rock and perch were much more abundant than at present; and above all, the fishermen, while agreeing in a general statement as to the abundance of fish in other days, look forward to the future with considerable apprehension, predicting a still greater decrease in the number of the fish than has already taken place.

Mr. G. W. Johnson, of Millsborough, says that about 1840 the fishermen used to haul large quantities of rock and perch in their drag-seines, frequently getting more than they could possibly find sale for. In such cases pens were built of pine logs on the banks of the river, in which the fish were kept alive until they could be sold. When a purchaser could be found, the fish were disposed of for any price that could be obtained. He also says that, about the year 1860, he has seen 7,000 pounds of these fish taken at one haul of the seine, the net being of the same size as those now in use by the fishermen at Indian River. The average winter's catch for a gang of four men, at that time, he thinks, would have been about 20,000 pounds.

Mr. E. W. Houston, also of Millsborough, states that there has been a decided decrease in the abundance of rock and perch in Indian River. In the winter of 1868 he knew of a catch of 20,000 pounds of these fish being made in one day.

Mr. Johnson tells us that weirs were formerly used to some extent on Indian River, for several years previous to 1873, but since that time there have been none built. These were made by weaving oak splints through stakes, forming a sort of basket-work when completed; the stakes were driven into the mud, thus forming a weir. These weirs were placed in about 6 feet of water at their outer ends, and the fish caught in them—among which perch and rock formed a considerable part—were taken out with a dip-net.

The catch of rockfish from Dover to Williamsville, in 1880, was 147,000 pounds, this amount being pretty evenly divided between the section bordering Delaware Bay from Dover to Cape Henlopen and that situated south of the cape between the latter and the boundary of the State. The total catch of perch in this region was 326,500 pounds, and of this quantity there was little difference in the catch between the two sections named above, there being, however, a few more taken south of Cape Henlopen than north of it. With the exception of Dover, the catch of rock and perch north of Cape Henlopen is comparatively small, these fish being taken incidentally in the seines and nets, which are also used principally for the capture of other species.

The season at which these fish are most abundant is from November to May, though there seems to be a considerable difference in regard to this between Delaware Bay and the region south of Cape Henlopen.

We are told by Mr. Tomlinson, of Dover, that rock and perch are taken there chiefly in the season from the middle of November to the 20th of March, but only few perch are caught in the early winter.

According to Mr. Houston, of Millsborough, the season for rock and perch begins in Indian River about the last of November and continues until the first of March, at which time, or soon *after, herring "strike in," and the fishermen turn their attention to their capture. He says that* rock and perch can be caught only during the most severe winter weather, at which time they move in bodies up the rivers and creeks; and, in consequence, the fishermen take them in considerable quantities.

Mr. D. B. Wilson, of Magnolia, says that perch come about the first of November and "school up" the creeks as soon as the weather gets cold.

2. FISHING GROUNDS AND FISHERMEN.

FISHING GROUNDS.—The fishing grounds for rock and perch are along the shores of Delaware Bay and the numerous streams emptying into the same below Dover, the waters of Rehoboth Bay, Indian River and Bay, and Isle of Wight Bay.

THE FISHERMEN.—As a rule, the majority of the fishermen are semi-professional, men who are employed in agricultural pursuits during the greater portion of the year, and who find time in the winter season to engage in this fishery. One authority tells us that the fishermen are nearly all farmers, who are engaged but very little in fishing during the spring and summer, simply to obtain a supply for their own use, but in winter they are more steadily employed in catching rock and perch, and also herring in the early spring. Mr. D. B. Wilson, of Magnolia, says that when there is a good prospect for catching fish the farmers go out on the river with their seines and nets, which they set as circumstances may determine. At other times they are idle or employed in working on their farms.

Five professional fishermen from Lewes go to Rehoboth Beach in the winter and fish in Rehoboth Bay for rock and perch, as well as eels, shipping the entire catch to New York.

3. APPARATUS AND METHODS OF FISHING.

BOATS.—*The boats—of the ordinary flat-bottomed type—employed in the rock and perch* fishery are the same as those which have been mentioned in the preceding chapters.

NETS AND SEINES.—The nets and seines in which rock and perch are taken having been fully described in the notes on the fisheries for spot and trout, *it seems unnecessary to repeat the* description here. It need only be said that rock and perch are taken in the same apparatus that is used for the capture of various species of fish which frequent this region.

METHODS OF FISHING.—The methods of setting and hauling the seines described in the notes on the trout and spot fisheries are essentially, in almost all cases, the same as are practiced in fishing for rock and perch. There seems, however, to be sometimes a slight difference made when the fish are found in narrow streams. In such cases the seine is stretched across the creek, from bank to bank, one end being somewhat farther up the river than the other; the ends of the net are then fastened to stakes on the banks of the river, and the fishermen go up stream, "whipping the fish" down by splashing with oars, and using other means of frightening them. When they have *succeeded in driving the fish down against* the seine the end farthest up stream is

loosened from the stake and carried to the opposite bank, and whatever fish have been inclosed are hauled to the shore.

The almost invariable rule for setting gill-nets has also been described in the notes on the spot fishery. When setting the seines it rarely, if ever, happens that the fishermen see the fish schooling. Long experience has taught them where and when it will be most desirable to use their apparatus. It frequently happens, therefore, that they make "water-hauls," but at the same time they are liable to obtain a considerable capture.

4. DISPOSITION OF THE CATCH.

North of Cape Henlopen a large percentage of the rock and perch taken are sold locally or disposed of by peddlers, or by the fishermen themselves to the inhabitants of the interior towns; the remainder is shipped to Philadelphia and New York. In the region south of Cape Henlopen, however, the reverse is the case, a large percentage being shipped to the city markets. At Millsborough, Williamsville, and some of the other towns, the catch is bought up by local dealers, who pack the fish in boxes, and send them away by rail to their agents and commission merchants in New York and Philadelphia.

Mr. E. W. Houston, of Millsborough, in 1880, handled 2,000 (?) pounds of rockfish, and 1,000 pounds of perch; all of which he shipped by rail.

Through the kindness of Mr. Custis Burton, the railroad agent and express agent at Millsborough, we have been enabled to state the exact amount of fish sent from that station for the different months, from December 1, 1879, to December 1, 1880:

Dates of shipment.	Pounds.
December, 1879	5,715
January, 1880	4,075
February, 1880	4,130
March, 1880	5,755
April, 1880	8,020
October, 1880	175
November, 1880	9,137
Total	37,007

The first shipment in the fall of 1880 was made October 28. The fish thus sent to market are rock, perch, herring, and eels. From October to March they were nearly all rock and perch, and in March and April mostly herring. No shipments of any kind of fish are made from April to October, as a rule. Sometimes the people send a small lot by express to their friends in the cities and towns along the line of the railroad, but none go to the markets. The shipments in winter are pretty equally divided between Philadelphia and New York, and a smaller amount goes to Wilmington and Chester.

4.—THE STURGEON FISHERY OF DELAWARE BAY.

1. STURGEON FISHERY AT BOWERS' BEACH.

According to Mr. Samuel Wyatt, a resident of Bowers' Beach, there is no one engaged in fishing for sturgeon from that place. There are, however, during the month of April twelve or fifteen vessels, ranging from 15 to 20 tons each, employed in the sturgeon fishery in that locality.

Five of these vessels, he says, belong to Philadelphia, four to Chester, and two to Penn's Grove. The hailing ports of the others are not known.

The sturgeon fishery off Bowers' Beach usually begins about the 1st of April, and continues until May, after which the vessels move farther up the bay. Each one of these vessels carries a crew of about six men, who, as a rule, live on board of their crafts, although some of them live in rough cabins built on the shore. The fishery is carried on wholly with gill-nets, which are set out in the bay across the tide, and allowed to drift with the current up and down the stream, as seems most desirable.

The average catch, Mr. Wyatt thinks, is about 1,000 fish to a vessel for the month of April. These are dressed, iced in boxes, and shipped in boats to Philadelphia, or sent across to Bayside, in New Jersey, where they are shipped by rail to New York. The roe is prepared on the vessels.

Blank page retained for pagination

PART VIII.

THE SPANISH MACKEREL FISHERY.

By R. EDWARD EARLL.

1. The fishing grounds.
2. Apparatus and methods of capture.
3. Fishing season for the different localities.
4. Disposition of the catch.
5. Statistics of the fishery.

Blank page retained for pagination

PART VIII.

THE SPANISH MACKEREL FISHERY.

By R. Edward Earll.

1. THE FISHING GROUNDS.

Spanish mackerel may be taken with trolling-hooks along almost any portion of the Atlantic coast between Key West, Florida, and Long Island, New York; but as this method of fishing is practically restricted to a few localities the troll-line catch is quite unimportant. Enough are caught, however, to show that the species occurs, and to indicate that the fishing grounds may be considerably extended in the future.

Professor Goode states, upon the authority of Thaddeus Norris, that in the Gulf of Mexico they are sometimes taken by means of hook and line with shrimp bait, at the ends of the long piers where the steamboats land in going from Mobile to New Orleans, and that they are so abundant on the Gulf coast of Florida, as to be shipped in considerable numbers from Cedar Keys. Since the statement by Mr. Norris, a careful study of the fisheries of the Gulf has been made by Mr. Silas Stearns, of Pensacola, Fla., under the direction of the United States Fish Commission and the Census Office. The reports forwarded by him lead us to believe that, whatever may have been the catch of the past, that of 1880 was so small as to be of little commercial importance, though this is perhaps due to a lack of suitable apparatus of capture rather than to any scarcity of the mackerel.

Off the eastern coast of Florida a few are landed by a smack fishing for the Savannah market. Off Charleston small numbers are secured by the crews of the vessels employed in the blackfish fishery, who claim to see occasional schools of mackerel, and think that in case they should make a practice of fishing for them considerable quantities could be secured.

On the North Carolina coast there are no summer vessel fisheries, and but few boats fish along the outer shore, none using methods suited to catching the mackerel. Parties fishing with seines along the inner bays caught few of these fish prior to 1879. During this season they are said to have been quite plenty for a short time, and many were taken by the fishermen, who, being unacquainted with the species, did not recognize its value, and, instead of saving their mackerel, threw the greater part of them away. Some, however, were taken to Wilmington, but the dealers refused to purchase them, thinking them to be a species of horse mackerel, which they supposed to be of little value for food.

Chesapeake Bay has by far the most extensive fishery for Spanish mackerel in the United States; the other fisheries, in order of importance, being those of Sandy Hook, Southern Long Island, and Narragansett Bay. Few are taken on the southern coast of New Jersey, as little fishing is done along the outer shore. Some are, however, secured by the vessels trolling in the

vicinity of Barnegat Inlet, and the menhaden fishermen of Tuckerton occasionally catch them in their purse-seines.

The commercial fishery is of recent origin, and it is only within the past few years that any considerable quantities have been taken for market. The fishery practically began off the New Jersey coast in 1873, and the mackerel were first extensively taken in Chesapeake Bay in 1875. This fact has little or no significance in its bearing upon the abundance of the fish, for the increased catch is almost wholly accounted for in both localities by the change in the methods of fishing.

2. APPARATUS AND METHODS OF CAPTURE.

Three kinds of apparatus are used in the Spanish mackerel fishery, namely, the troll-line, the gill-net, and the pound-net. The troll-line is more extensively employed off the Long Island coast and along the shores of Northern New Jersey than in any other locality. It was introduced into the region at an early date, and for some time was the most important method in the fishery. It has been less extensively used during the past ten years, and is now chiefly employed by parties fishing several miles from the shore. Large open boats and small sloops, carrying from two to five men each, are used for trolling. The trolling-hooks, or "squids," as they are frequently called, differ greatly. Some are made of bright metals in the form of a fish, while others more nearly resemble the body of a squid, these being usually painted in brilliant colors. The number of hooks varies from one to three according to the kind of squid used. In the absence of a manufactured squid the fishermen frequently improvise very good ones by attaching a piece of red or white cloth to ordinary fish-hooks. In fishing, the hooks are attached to lines several fathoms in length, four or five of these being towed behind the boat, which spreads enough canvas to drag them through the water at a speed of two to four miles per hour. The fishermen are often successful in catching large numbers of mackerel in this way.

At Sandy Hook gill-nets were first employed in the capture of mackerel in 1866, but being "set taut," they were not very successful, the fish usually detecting their presence and refusing to enter them. When it was found that, although abundant, the fish did not gill readily, schools of them were often surrounded by the nets, after which the fishermen attempted to frighten them into the meshes by splashing with oars in the center of the circle. The majority, however, would pass under the lead-lines, or jump over the cork-lines, and escape, so that comparatively few were taken. Still the nets continued to be used with varying success, though the bulk of the catch was taken by trolling. About 1872 or 1873 it was accidentally discovered that the mackerel would gill more readily in nets set in such a way as to present sharp angles, quite a number having been secured in a net that had become twisted and tangled by the currents. This fact suggested a change in the manner of setting, and various experiments were made by the fishermen of Seabright with good results. The first "sets" were somewhat crude, but experience enabled the fishermen to improve upon them from year to year.

The figures in the accompanying illustration represent the principal methods of setting the gill-nets for the capture of Spanish mackerel off Sandy Hook from 1866 to the present time. Fig. 1 shows the first method, locally known as the "straight-set." The other figures represent, in their order, the more important methods that have since been introduced. At the present time the nets are set in pairs, and the three "sets" shown in Figs. 6, 7, and 8 are most commonly employed.

These are locally known as the "square-set," "T-set," and "harpoon-set," the names describing, to a certain extent, the shape of the nets as they appear in the water. In the square-set, Fig. 6, one of the nets is placed perpendicular to the shore to form a leader, while the other is set in the form of a square at the outer end, openings of 3 or 4 feet being left on either side of the

leader to allow the fish to enter. The T-set, shown in Fig. 7, somewhat resembles the one already described, the chief difference being that the ends of the outer net, instead of being bent at right angles, are turned inward to form a triangle at the outer extremity of the leader. In the third set, Fig. 8, the two nets are so arranged as to form a harpoon, from which the set takes its name.

The gill-nets of this region are worth from $90 to $100 apiece. They are about 100 fathoms long and 100 meshes deep, the size of the mesh varying from 3½ to 4 inches. The men fish in "gangs," one net being owned by the crew of each boat. The nets are set on the best fishing grounds at daybreak, and are left for several hours, while their owners fish with hand-lines in the vicinity. The catch is divided equally, the share for a single net being sometimes as high as $1,000 for a season, which lasts from six weeks to two months.

Gill nets were introduced into the Spanish mackerel fisheries of Chesapeake Bay in 1877, and proving fairly successful, they soon came into general favor among the fishermen of the Eastern Shore, though they are even now seldom employed by those living on the opposite side. There are at present about one hundred and seventy-five men engaged in "gilling" for mackerel between Crisfield, Md., and Occohannock Creek, which is 30 or 40 miles from the capes. The nets were at first set only in the night, but during 1880 the fishermen of Tangier Island obtained the best results by fishing from the middle of the afternoon until midnight. The nets range from 75 to 100 fathoms in length, and have a similar mesh to those already mentioned. The catch varies considerably, as many as 500 mackerel having been taken at one set, though the average is only 20 to 40 to the net.

The pound-net is now the principal apparatus for the capture of mackerel in all localities where the fishery is extensively prosecuted. According to Mr. R. B. Chalker, of Saybrook, Conn., pound-nets were first used in the fisheries of New England at Westbrook, Conn., in 1849, and from that locality they spread rapidly to other portions of the coast. They were first introduced at Sandy Hook, N. J., by Mr. George Snediker, of Gravesend, Long Island, about 1855. Mr. Snediker has probably done more to develop the pound-net fisheries of the United States than any other man in the country. It was from him that the fishermen of New Jersey, as well as those of Chesapeake and Delaware Bays, obtained their first idea of pound-nets, he being the first to introduce them into the fisheries of each of these regions. He has also engaged in the pound-net fisheries of Albemarle Sound, though he cannot claim the credit of introducing the net into those waters.

The first pounds fished in New Jersey were very small, and, being placed along the inner shore of Sandy Hook, they were hardly a success, as the fish are much less abundant there than along the outer shore. The same style of pounds were, however, fished with varying success until about 1873, when larger ones were placed along the ocean shore; and then, for the first time, their importance in connection with the Spanish mackerel fishery was discovered. The majority of the mackerel secured about Sandy Hook are now taken in this way. One hundred fish in number was considered an average daily catch for the fishing season of 1879, and 100 to 140 for 1880, though much larger catches were occasionally secured. The best day's fishing for a pound-net in that locality occurred in the summer of 1879, when Mr. Robert Potter took 3,500 pounds, valued at $700, at a single lift.

An effort was made as early as 1858 by Captain Henry Fitzgerald to introduce the pound-net into the waters of Chesapeake Bay, but his net was not properly constructed, and was so unsuccessful that it was soon taken up. No other attempt was made to fish with pound-nets in this region until about 1870, when Mr. Snediker and Charles Doughty, of Fairhaven, N. J., came to the region, and located on the banks of the James River a few miles above its mouth. They fished chiefly for shad and alewives, continuing their work for about three years, after which they

disposed of their property and returned to the North. In 1875 Mr. Snediker went to New Point, Va., and built a large pound in the waters of Mobjack Bay for the capture of shad and other species. The fishermen of the neighborhood, being wholly unacquainted with the pound-net, were very jealous of the stranger that came among them with such destructive apparatus. They watched Mr. Snediker's movements closely for several weeks, and, after seeing the enormous quantities of fish taken by him, at once informed him that he must take his "traps" and leave the country. Refusing to comply with their demands, a number of them sawed off the stakes of the pound even with the water and carried the netting to the shore, assuring Mr. Snediker that if he attempted to put it down again they would destroy it. Seeing it was useless to continue the fishery here, he decided to seek some more favorable locality. Before leaving he sold the stakes that remained in the water to a resident fisherman, who obtained from them a pattern of the pound, and in a short time had one properly arranged for fishing. This was also destroyed by the fishermen, but not until enough had been learned to convince them that pound-nets could be used with great profit, and within a year from that time 12 pounds were fished in Mobjack Bay. In 1879 the number had been more than doubled, and on our visit to the region in 1880 we found that every available site was taken up, and often three, or even four, nets were placed in line, the leader of one being attached to the outer end of another, for the purpose both of economizing space and of securing the fish that chanced to be passing at a distance from the shore.

Mr. Snediker, on leaving New Point, proceeded to the eastern shore of the Chesapeake, and associated with himself one of the most popular fishermen of the region, hoping in this way to prevent any organized opposition on the part of the resident fishermen against the use of the pound. By this means he was successful in avoiding any open hostilities, and it was not long before others became interested in the use of pounds. Though the pound-net was introduced into the Chesapeake against the prejudice of the fishermen, it has entirely revolutionized the fisheries of Virginia. Prior to 1870 the fisheries of the region were of little importance, the business being largely in the hands of the farmers, who fished with hand-lines and drag-seines for a few weeks in the spring and fall, their chief object being to secure a supply of fish for themselves and their neighbors; while to-day the Chesapeake is the center of one of the most important shore fisheries in the United States. The pound-net has not only more than doubled the catch of ordinary fishes, but it has brought to the notice of the fishermen many valuable species that were previously almost unknown to them, the most important of these being the Spanish mackerel. In 1880 162 pounds were fished in Virginia waters, with two others located at Crisfield, Md., just above the Virginia line.

As the pound-net is such an important apparatus in the Spanish mackerel fishery, a brief description will not be out of place. In the accompanying diagram, Fig. 9 represents the particular kind of net used on the shores of Northampton County, Virginia. All pounds are constructed on a similar principle, though they differ considerably in size and shape in different States. Few are provided with pockets, and many have only one heart.

The leader and hearts are vertical walls of netting, extending from the surface to the bottom, and simply answer the purpose of directing the fish into the pound, which has not only sides, but also has a bottom made of netting, there being but one opening (A B) through which the fish can enter or escape. This opening is rectangular in shape, it is about 3 feet wide, and extends from top to bottom, the netting being so arranged that the aperture can be entirely closed before the pound is lifted. The poles M, N, A, C, D, &c., to which the netting is attached, are from 4 to 8 inches in diameter, each being driven from 5 to 8 feet into the mud or sand of the bottom by means of a maul or pile driver.

The hearts and bowls are placed in water 15 to 18 feet. From these the leader extends to within a few yards of the shore. It varies greatly in length, according to the slope of the bottom, the average being about 150 fathoms. The netting is of ordinary material, with a 3-inch stretch-mesh. The hearts are made of stouter twine, having a mesh of 2½ inches. The opening to the "Big Heart" is 25 feet across, while that to the "Fore Bay" is only 8 feet. The pound or bowl is a rectangular inclosure 45 by 60 feet. The netting of which it is composed is of heavier material than that used for either the leader or the hearts, the mesh being an inch from knot to knot. The pocket is simply a bag of netting, 15 to 30 feet square and 6 to 8 feet deep, in which the fish are placed when, for any reason, it is found desirable to keep them alive for some time before marketing them. In many localities where the bottom is level or slopes very gradually two, three, or even four pounds are placed in a line, one outside of the other, in order to intercept any fish that may be swimming beyond the reach of the first one. The fish, striking the leader in their migrations along the shore, at once attempt to swim around it by going into deeper water, and are naturally lead through the hearts into the pound, their habit of moving in curves rather than by angular turns making their escape quite difficult. If, however, the pound becomes well filled with fish and they are allowed to remain in it for a considerable time some of them succeed in finding the opening A B, and others soon follow them into the inner heart, from which they find less difficulty in escaping. It is known that many fish pass out in this way, for large quantities are sometimes seen in the pound before the hauling time arrives, which, when the net is lifted a few hours later, are found to have made their escape. Another proof that the fish often escape from the nets is found in the fact that nets fished twice a day will stock a third or a half more than those that are visited but once in twenty-four hours. In properly constructed pounds, however, only a small percentage of the fish are successful in reaching the outer waters; for even though they may pass out of the bowl, they are apt to be led into it again before they succeed in running the gauntlet of both hearts.*

The pound, as described, costs about $1,000, if we include the second set of netting, which must be used when the first is taken out to be dried and repaired. In the warm waters of this region the netting cannot remain down more than two or three weeks without being seriously injured.

* The nets are usually fished at slackwater, as at this time they are more easily lifted. As the hour of low water approaches, a boat with a crew of three or four men is rowed out from the shore to the pole P. One man at once unfastens the line that holds the bottom of the pound to its base; after which the boat is pulled to the poles G, Q, R, F, K, E, &c., until a circuit of the pound has been made and the lines that hold the bottom of the net in position have been loosened. The top of the net at C is then lowered into the water and the boat passes over it into the pound, after which the netting is again raised and fastened. The boat then proceeds to the mouth of the pound, and two men, by means of ropes attached to the lead-line at the bottom of the opening A B, raise this portion of the net entirely out of the water, placing the weighted line, which forms the lower side, over the gunwale of the boat, thus effectually cutting off all means of escape. The men then take position in either end of the boat, and gradually raise the net toward the poles P and C, driving the fish around toward G and D. This work is continued in the same manner until the fish have been driven past Q and I, when the netting is pulled up on the opposite side of the boat and the fish are thus confined in the small basin between it and the outer side of the pound. The weighted line at the bottom of A B is now thrown off, and the boat is gradually pulled towards the outer end, the basin growing constantly smaller until the fish are brought into a limited space at K, when they are at once transferred to the boat by means of dip-nets. When there is a large run of "scrap-fish," or when the catch is large, a signal is given and a flat-boat or scow is sent out from the shore to receive the surplus. It is taken to the point K on the outside of the net, and the worthless fish are thrown into it as fast as the marketable ones are sorted out. Frequently both boats are loaded and the fish are culled after reaching the shore.

After the fish have been secured the netting is thrown off, and the fishermen proceed to re-set the pound, drawing the bowl into place by means of ropes which extend from the top of the stakes through rings at their base to its lower corners and sides. The boat first proceeds to the opening A B, and after this has been properly secured it passes out of the pound and visits the different stakes in their order until all the lines have been fastened. The pound is now ready for fishing, and is left to itself until the next slackwater, while the fishermen are icing and boxing their catch.

Three or four men are required for fishing a pound-net, though by adding one or two to the force several nets are frequently tended by the same gang. The average stock for marketable fish during the season for this locality is about $4,200 to the net; the species, named in order of value, being Spanish mackerel, tailors, trout, sheepshead, porgies, and mixed fish. If the value be neglected and the number of individuals taken be considered, the order should be changed so as to read: trout, tailors, mackerel, mixed fish, porgies, and sheepshead; in addition to the refuse fish, which are either thrown away or used for fertilizing purposes.*

On the western shore of the Chesapeake the pounds are much smaller and the catch is proportionately less, while the fishing season is also different. Here the pounds are put out in time for the run of shad, which begins early in March and continues till the last of May. After the shad season is over many of the nets are taken up. Almost none remain down throughout the summer, though a number are fished in the fall for trout and other species. On the eastern shore the law allows pounds to be fished only between the 25th of June and the 1st of October, during which time they are lifted regularly every day when the weather will permit.

3. FISHING SEASON FOR THE DIFFERENT LOCALITIES.

Owing to the enormous extent of sea-coast over which Spanish mackerel are taken and to the variation of the fishing season with the locality, these fish may be seen in the New York markets during a greater part of the year. According to the report of the Fulton Market dealers, their first appearance in 1879 occurred in April, when 98 pounds were received. The quantity gradually increased till July, during which month 114,309 pounds were handled. From this date the catch fell off rapidly until in November only 657 pounds were received, and in December but a single mackerel was seen in the market.

The fishing season for Long Island and New Jersey extends over several months; but the bulk of the catch is taken between the 20th of August and the 20th of September; and, allowing for Sundays and stormy weather, there are ordinarily only 20 good fishing days, though small quantities are taken almost every day during the stay of the fish on the coast.

In the Chesapeake the fishing season is somewhat longer, owing perhaps to the warmer temperature of the water in the early spring. It begins late in May, and is at its height from the 10th of June to the 1st of September, when the mackerel start for the ocean.

4. DISPOSITION OF THE CATCH.

Almost the entire catch of Spanish mackerel is consumed in a fresh state. A few are salted by the fishermen of North Carolina, who, owing to their ignorance of the value of the species in the Northern markets, as well as to the lack of suitable shipping facilities, seldom market their catch in a fresh state. Those salted are not considered very valuable, and the inhabitants are seldom willing to pay more than $5 or $6 a barrel for them, placing them on a par with the bluefish and other common species. It is doubtless true that the fine flavor of the mackerel is very much impaired by salting, and that as a salt fish it is inferior to the common mackerel (*Scomber scombrus*), with which every one is familiar.

In 1879 the cannery at Ocracoke Inlet purchased small quantities of mackerel and put them up in two-pound cans, but the business was very limited, and no extensive trade was developed,

*According to the best-informed fishermen, 100,000 trout, 40,000 bluefish, locally known as tailors, 30,000 Spanish mackerel, 10,000 mixed fish, 3,000 porgies, and 1,000 sheepshead represented the catch of the average pound for 1879. The money value of the catch was estimated as follows: Mackerel, 36 per cent.; tailors, 24 per cent; trout, 21 per cent.; sheepshead, 6 per cent.; porgies, 5 per cent.; mixed fish, 8 per cent.

only a few hundred cans having been prepared. Recently, at the suggestion of Professor Baird, experiments were made in canning the Spanish mackerel at Cherrystone, Va., for the purpose of ascertaining their relative value as compared with other kinds of canned fish. The report from the canneries is to the effect that they were no better than fish of ordinary grades, though there seems to be a difference of opinion on the subject. However this may be, there is certainly no prospect of an extensive business either in the salting or canning of the species, as the demand for the fresh mackerel is sufficient to offer an outlet for all that can be secured; while the price ranges so high as to make their canning or salting entirely impracticable.

As a fresh fish, the Spanish mackerel has few equals. It is one of the most valuable species taken in the United States, and is a great favorite with epicures. The price paid for the species in the different markets is often extravagant. Instances are not uncommon where the wholesale price has exceeded $1 per pound. The first fish sent to New York in the spring usually sell as high as 75 cents a pound, and the price does not fall far below 60 cents for some time; but as the quantity increases the price is gradually reduced, until, at times of oversupply, when the market becomes glutted, they occasionally sell as low as 6 or 7 cents a pound. The average wholesale price in New York in 1880, for all grades, is said to have been about 18 cents a pound. Mr. C. W. Smiley, who has made a careful study of the Philadelphia market, puts the average price for that city at 10½ cents per pound during the same period. The fish taken in the northern waters reach the market in much better condition than those shipped from a distance, and for this reason they sell more readily and at better figures. They are, as a rule, much larger and fatter than those taken in Chesapeake Bay; this fact alone making considerable difference in their value. While the Virginia fish are selling in New York at 15 cents, the larger ones from Sandy Hook and Long Island frequently bring more than twice as much.

Many of the fishermen of the lower Chesapeake do not ship their own fish, but sell to the dealers in Norfolk and other places at 7 to 10 cents apiece. Others pack in ice and ship directly to Baltimore by steamer, but as their facilities for packing and shipping are limited, the amount realized, after deducting the numerous expenses, is little, if any, in advance of that received by parties selling in Norfolk.

The principal markets, in their order of importance, are Baltimore, New York, Norfolk, and Philadelphia; from these points the catch is distributed to the larger cities of the country, where the fish are consumed by the wealthy classes, few going into the country towns of the interior. Few cities keep any accurate statistics of their fish trade, and for this reason it is impossible to give the quantity of mackerel handled by their dealers. No figures can be given for the Baltimore trade, though it is safe to say that the dealers of that city handle fully three-fourths of a million pounds annually. The report of the New York Fish-Mongers' Association shows that 274,913 pounds were handled in that city in 1878. This quantity, according to the same authority, was increased to 309,168 in 1879, and to 390,000 pounds in 1880. Mr. Smiley, in his report on the Philadelphia market for 1880, places the quantity of Spanish mackerel handled at 65,880 pounds, valued at $10,870. Mr. W. A. Wilcox, secretary of the Boston Fish Bureau, estimates the quantity handled in Boston in 1879 at 15,865 pounds, while that in 1880 was about 20,000 pounds.

5. STATISTICS OF THE FISHERY.

It is not possible to state the exact quantity of Spanish mackerel taken by the fishermen of the United States during any season, but a careful study of the fisheries in the interests of the Fish Commission and Census enable us to give the following table, compiled from the preliminary statistical reports prepared by Col. Marshall McDonald, Mr. A. Howard Clark, and the writer, for

publication by the Census Office. The catch for New York is obtained from the manuscript notes of Mr. Fred Mather, while the figures for the Gulf of Mexico are gathered from data forwarded by Mr. Silas Stearns.

Table showing by States the quantity of Spanish mackerel taken in 1880, *and the total catch for the United States.*

State.	Pounds of mackerel taken.
Massachusetts	60
Rhode Island	2,000
Connecticut	1,200
New York	25,000
New Jersey	200,000
Maryland	18,000
Virginia	1,602,663
North Carolina	10,000
South Carolina	1,000
Eastern Florida	500
Gulf of Mexico	20,000
Total	1,887,423

From the above table it will be seen that Virginia produces 85 per cent. of all the mackerel taken, and that New Jersey fishermen catch over two-thirds of the remainder. This, as has already been remarked, is largely due to the ignorance of the fishermen of many localities, both as to the abundance of the species and to the proper methods of catching them. That the fishery will soon be extensively developed in other places seems quite certain.

PART IX.

THE MULLET FISHERY.

By R. EDWARD EARLL.

1. Distribution and habits of the mullet.
2. Origin of the fishery.
3. Fishing grounds.
4. The fishermen.
5. Apparatus and methods of the fishery.
6. Lay of the fishermen.
7. Disposition of the catch.
8. Extent of the fishery.
9. Markets.
10. Possibilities of the future development of the mullet fishery.

Blank page retained for pagination

PART IX.

THE MULLET FISHERY.

By R. Edward Earll.

1. DISTRIBUTION AND HABITS OF THE MULLET.

In Section I of this report may be found a discussion of the natural history of our east coast mullets, *Mugil albula* and *M. brasiliensis*. In the above-mentioned article much valuable information is given regarding the mullet fisheries from notes taken by Professor G. Brown Goode during a vist to Florida, and the statements of other observers from different portions of the coast are added, so that all localities where mullet occur are fairly represented. The main object of the article, however, is to put on record what is known of the distribution and habits of the species, and much material on the mullet fisheries was omitted as irrelevant. Having visited the various localities along the Atlantic coast where mullet are extensively taken, I have been requested to prepare an account of the mullet fisheries, and in doing so find it necessary to repeat much that has been already said in the article referred to in order that the account of the fisheries may be complete. I am under obligations to Professor Goode for many of his original notes on the fisheries and for placing in my hands the replies to the circular of inquiry regarding the habits of the mullet sent out by Professor Baird in 1875. I would also express my thanks to Mr. Silas Stearns, of Pensacola, Fla., to whom I am indebted for all facts of whatever kind bearing on the mullet fisheries of the Gulf of Mexico.

On the coast of the United States one or both species of mullet are found in all localities between Cape Cod and Texas, but in most places the fishermen fail to recognize the difference between them, calling them simply mullet, and supposing the two kinds to be identical. In describing the fishery, then, no attempt will be made to separate the species, for their habits are quite similar, and, where both occur, they are taken by the same apparatus and in a similar manner. The *Mugil albula* is much the larger and more important of the two, and the statements may be considered as referring chiefly to this species.

In the district north of Sandy Hook, N. J., large individuals are rare, but small ones are quite abundant at certain seasons. According to Professor Goode, great numbers of mullet about an inch in length have been observed along the Connecticut shores, where they are known to the fishermen as "bluefish mummichogs."

Along the New Jersey coast they are more plentiful and of larger size. The majority of them measure from 5 to 6 inches in length, but late in the fall larger individuals, weighing about a pound, make their appearance. These are called "bull-mullet," and are highly prized for food. Along the ocean shores of Delaware, Maryland, and Virginia, and in the lower waters of Chesapeake Bay, individuals of similar size are quite abundant.

At Oregon Inlet, in North Carolina, there is a perceptible increase both in the number and

size of the fish. In the waters of Core and Bogue Sounds, 50 to 75 miles farther south, they are more abundant than any other species.

The sounds and bays along the entire coast from Cape Hatteras (which seems to be the northern limit for the mature fish or roe-mullet, as they are called) to Texas have been visited annually by immense schools of mullet for many years. Early voyagers refer to them as occurring in almost inconceivable numbers, and the records from that time to the present warrant us in assigning to the species the first place on the list of edible fishes of the South.

A large majority of the fishermen consulted report that the species has not decreased in numbers during their recollection, though several think the reverse to be true for the localities in which they live, where they claim that the catch is much smaller than in former years. These assign various causes for the decrease, chief among which is the excessive use of seines or nets.

Mr. Moore, of Swansborough, N. C., thinks only one-third as many are taken now as ten years ago in that locality, owing to the small mesh of the nets used; while Mr. Masters, of Saint Augustine, attributes the decrease at his home to the use of gill-nets in the Saint John's River. There is no evidence, however, to show that a general decrease has occurred, though for various reasons the catch fluctuates within certain limits from year to year.

MOVEMENTS OF THE MULLET.—Probably no species is so little understood as the mullet, and the greatest confusion exists concerning almost every phase of its natural history. This is especially true of the migrations of the fish and the causes that govern their movements in different localities. Some of the most intelligent fishermen claim that they spend the summer months in the fresh and brackish waters of the bays and rivers along the coast, and go to the ocean in the fall for purposes of reproduction. Others insist that they sometimes spawn in fresh water, though as a rule they visit the large lagoons along the coast for this purpose, and that they seldom, if ever, deposit their eggs in the ocean. Again, it is asserted that they are present in any given locality during a portion of the year only, and that in the early winter they leave the northern waters, passing southward to their winter quarters, where they remain till the following spring. Others believe that their migrations are merely local, and that they stay in the same locality throughout a greater part of the year, accounting for their seeming absence by the supposition that they remain in the deeper holes of the creeks and marshes until the spawning time arrives.

From a careful study of the subject, we are led to believe that the young fish, at least, are present in all localities between Beaufort, N. C., and Texas throughout the entire year, though they are unquestionably more abundant from August to December. As a rule, the large fish are seen only at this time, and with the exception of the Saint John's River, Florida, we know of no place where large mullet are taken in any considerable numbers at other seasons.

During the spring and early summer the schools seem entirely broken up, but small-sized individuals are scattered about on the feeding grounds in the grassy bays and marshes bordering the coast. Here they remain till late in July, when they proceed to the deeper channels of the larger bays, where they gather in schools of small size. Little is known of the whereabouts of the large mullet at this season. Later the migrations begin, the fish of medium size moving southward. Their places are soon filled by large fish known to the fishermen as "fat mullet," the reproductive organs of these gradually developing until the fish come to be known as "roe mullet," when it is claimed that immense quantities are taken with the eggs and milt running freely from them. These remain until the first cold storm occurs, when they start for the south, moving rapidly along the outer shore, or through the inland passages, as is most agreeable. They probably spawn on the journey, and entirely disappear as soon as the eggs have been deposited. These fish are fol-

lowed by smaller individuals known as "frost mullet," which remain throughout the greater part of the winter. The movement seems to be general along the entire coast, all fish along the Atlantic seaboard being reported as traveling southward, while those rounding Florida Keys continue their coastwise migrations, gradually working northward and westward towards the Texas line. No return movement is reported at any season along the Atlantic, though in the Gulf, after the spawning season is over, the fish are said to return toward Key West.

The movements of the fish are thought to be considerably affected by tides, currents, and storms; and in many localities the fishermen assert that the schools often remain in considerable numbers about the inlets of the bays on the flood-tide and pass out on the ebb. This is doubtless true to a considerable extent before the migratory season begins, but when this occurs the mullet seldom remain long in one locality.

During stormy weather, when the sea is rough, the fish seek the inland channels for protection, but during pleasant weather they are equally or even more abundant along the outer beach. They are said to move most rapidly during the continuance of heavy northerly winds, the signal for a southerly movement being a cold storm from this quarter. When the weather moderates they slacken their speed and become more scattered, many of the fishermen contending that they are then swimming about in search of food. During pleasant weather they swim at or near the surface, when their presence can be readily detected by the ripple caused by their movement through the water, or by the constant splashing and jumping. Their approach is frequently heralded by the flocks of water-birds that hover over them, and by the sharks and porpoises that gather to feed upon and destroy them. Mr. Stearns, in referring to this subject, says: "During the fall they move in such immense schools that the noise of their splashing resembles distant thunder, and to persons living near the bay this noise, kept up day and night, becomes very annoying." "These schools," he continues, "are followed by large numbers of sharks, porpoises, and other destructive fishes, as well as pelicans and similar sea-birds, that eat mullet until they can eat no more and have to make way for fresh arrivals."

In New Jersey waters the mullet make their appearance in schools about the 1st of September, gradually working southward and entirely disappearing by the last of October. The same is true for the coast between Cape May and Cape Henry, including the waters of Chesapeake Bay.

The small fish are seen in June on the North Carolina coast, these gradually increasing in numbers until the first of August, when the schools have attained considerable size, but thus far no tendency to migrate is noticeable. A little later a southern movement begins, and school after school passes, the size of the individuals constantly increasing till the first of September, when the old or roe-mullet arrive. These often weigh from 3 to 4 pounds, and measure upwards of 20 inches. If the weather continues pleasant they remain about the shores until the eggs have become well developed before moving southward, but at the approach of the first cold storm they are off and other smaller individuals follow in their wake, so that by the first of January the greater part have disappeared. Comparatively few are seen from that date till the following June, though scattering ones may be taken at any time. They run best and most rapidly during stormy weather, but will not move much against a head wind or sea. The schools vary greatly in size, the average containing from 20 to 25 barrels of fish, though schools of 1,000 barrels are reported as not uncommon, and 600 barrels were landed at one haul of the seine, near Beaufort, in 1849.

At Wilmington small mullet are occasionally taken at any season, though they are abundant from June to September only, and large ones are seen only in the fall. As at Beaufort, the migrations begin about the middle of August. The first schools are composed of fish of medium size, known to the fishermen as "1¾ inch mullet," from the size of the mesh in which they are taken.

By the first of September these have entirely disappeared, and their places have been taken by the "fat mullet," which are said to weigh about a pound and a half. These are very abundant for several weeks, the roe mullet arriving about the middle of October, before they have entirely disappeared. The last-named are by far the largest fish that visit the coast, many individuals, according to the statement of the fishermen, attaining a length of 28 to 30 inches, some of the largest weighing from 3 to 5 pounds. These schools are made up of mature fish of both sexes, with the roe-bags well advanced; and it is reported that many are taken with eggs and milt running freely. "Frost" or "inch" mullet, as they are sometimes called, follow in large, compact schools, the last disappearing about the middle of December. Smaller fish, called "winter mullet," are abundant till spring, and are taken by means of seines and gill-nets in the inner sounds.

At Charleston the run is somewhat similar to that at Wilmington, though, for various reasons, the fishermen engage exclusively in their capture for only a few weeks, beginning about the last of August; most of them stopping before the roe mullet put in an appearance. The Charleston seine-fishermen secure considerable quantities of small mullet while fishing for "trout" and other species in the tide-channels and creeks of the locality during the winter months. Fully one-third of the seine-catch between December and March is composed of this species.

In Eastern Florida, especially in the Saint John's River, fish of all sizes may be seen at any time. They ascend the Saint John's to Lake Monroe, a distance of 240 miles from the sea, and small specimens are taken even beyond this point. At Lake Monroe the fishing interests are limited, as the resident population is small and the demand for fish is proportionately light. This demand is supplied during the winter months by three or four Northern fishermen, who haul a seine for shad at one end of the lake, selling their catch to the hotels that are for several months filled with Northern visitors. Two gill-nets are owned by residents of Melonville for the capture of mullet, the catch in these being sufficient to meet the demand. Lake George, situated 150 miles above the sea, is the prettiest and clearest expansion of the Saint John's River. It is 12 miles wide by 16 to 20 long, and abounds in fish of various kinds, being seemingly the summer home of immense quantities of mullet. Several salt springs open into the lake, and the local fishermen think that many of the mullet enter them to deposit their eggs instead of taking the long trip to the sea. It is known, however, that many of the fish make yearly trips to the ocean, thus affording excellent mullet fishing along the entire course of the stream. The first fish arrive at Jacksonville from the upper waters early in June, the number gradually increasing till the middle of August, when the fishing becomes extensive, continuing till December, the size of the individuals increasing until the close of the season. The fishermen of Mayport, at the mouth of the river, claim that the spawning fish pass out into the ocean and proceed southward along the shore to Matanzas and Indian rivers and Mosquito Lagoon (which are said to be the spawning grounds for these fish), and there deposit their eggs. The same theory is held by the fishermen of Saint Augustine, one of whom assigns as the cause of a supposed decrease in the catch at Saint Augustine the extensive *gill-net fishing of the Saint John's*.

In the Gulf of Mexico it is claimed that the mullet are even more abundant than along our Atlantic coast, though the statistics of the catch for North Carolina would indicate that they are nearly as plenty in that region. Mr. Stearns writes that these fish are more abundant in the shore waters of West Florida, Alabama, and Mississippi than any other species, and that they are about the only fish taken by the fishermen during several months of the year. They are never entirely absent; though, as on the Atlantic coast, they are much more abundant in the fall than at any other season. In referring to the Pensacola region, Mr. Stearns mentions a run of mullet in the spring, saying, "There is a spring run of mullet composed of various sizes of young, which are,

in part, no doubt of the previous year's hatching. The first school of this run appears on the coast in April or in the first part of May, and they continue to come for two or three weeks, when they are all inside and scattered about the bay shores. In September," he continues, "there is a run of large fish which come, as the young one does, from the eastward, swimming at the surface of the water and making considerable commotion. Some years there is but one large school in the run, and at others many small schools, and it is thought that the fish are more abundant when they come in the latter form. At Choctawhatchee Inlet, where the spawning grounds are near by, the fish come in with the flood tide and go out again with the ebb tide; and at Pensacola Inlet, where the spawning grounds are far away, they come into the bay and stay until the operation is over. * * * The many lagoons of Choctawhatchee Bay are almost blocked up with spawning mullet in October, and they are very abundant at the head of Pensacola Bay, near the mouths of the fresh-water rivers, at that time."

In another place, Mr. Stearns, in referring to the run of mullet, says: "In the latter part of October and November the mullet are running, and the fishermen are then busy. Sometimes two or three weeks are passed in watching for the fish to come along, but if the station is a good one the fishermen do not go away or lose confidence in their arrival sooner or later. When they arrive they sometimes come in such numbers that one or two hauls constitute the catch for a season. From 20 to 150 barrels are caught at one haul of the seine, and with larger seines twice or three times that amount could be taken, for the fish often come in schools 1 to 3 miles long and 400 to 500 yards wide."

From the evidence at hand it is clear that the mullet fisheries for different parts of West Florida continue from the middle of August to the first of January, though the height of the season for most localities is in October and November. Farther west there seems to be less tendency to migrate, the fish remaining more constantly in any given locality, and on the Texas coast it is said that there is no special time of abundance, but that mullet are equally plenty at any season.

2. ORIGIN OF THE FISHERY.

The mullet fisheries of the United States began with the first settlement of the country, and the early colonists of Saint Augustine took sufficient quantities for their own tables by means of the primitive cast-nets which they brought from their foreign homes. Later the residents of the Carolinas took and salted small quantities each season for family use, and ere long some began putting up a few barrels to exchange with their neighbors for produce. Thus the fishery has gradually increased to the present time, though it is still far below its natural limit. In the Gulf of Mexico small vessels have frequently been employed in the mullet fisheries, the crews being provided with seines with which to secure the fish, while the vessels served as homes for the fishermen, and were also of service in marketing the catch. Several New England fishing vessels visited the west coast of Florida for the purpose of catching mullet, groupers, and red-snappers forty years ago, and the fishing for the last named species has been continued to the present time. Several Gulf smacks, in addition to the large fleet belonging at Key West and other Florida ports, engage regularly in the grouper and snapper fishery each season. Mr. A. Howard Clark informs us that in the fall of 1842 the schooner Nautilus, of Gloucester, Mass., was fitted out with a drag-seine, and after shipping a crew of eight men started for Florida to engage in catching and salting mullet to be sent to Savannah. Mr. Charles S. Stewart, of East Gloucester, one of the crew, told him that the Nautilus, and the Yorktown, another Gloucester schooner that went to Florida the same winter, were the first vessels to engage in the mullet fisheries of that region. Mr. Stewart says: "The Nautilus proceeded to Apalachicola, and from thence to Saint Ann's Bay, where 40

barrels of mullet were secured and shipped by vessel to New Orleans, no returns ever being received for them. At this time the customs officer of Pensacola took the vessel's papers—regular fishing papers issued at Gloucester—claiming that they did not grant the privilege of fishing for mullet. These papers were kept for about two months, and when returned the fishing season was over, so that the vessel was obliged to set sail for the North, with nothing to show for her voyage. The Yorktown had secured 16 barrels of fish, when her captain, hearing of the action of the customs officers in regard to the Nautilus, was afraid to continue the work." Mr. Stewart further adds that there were no commercial fisheries on the coast at that time, nor had there been much fishing for any purpose except by the Indians. He says: "The winter fishing fleet of Apalachicola consisted of two small boats, manned by four resident fishermen." There were certain places, however, in Eastern Florida where the mullet fisheries were of considerable importance, and parties at the mouth of the Saint John's River and elsewhere were engaged in drying and salting the species for shipment to the West Indies.

3. FISHING GROUNDS.

Owing to the peculiar habit of the mullet of following the shore in their migrations, it may be said that the fishing grounds extend without interruption throughout the entire range of the Atlantic species, with a limited fishery for the *M. mexicana* at San Diego, Cal. The fish are present in all bays and coves along the outer beach from Sandy Hook, N. J., to Mexico. From North Carolina to Mississippi they are peculiarly abundant, and within these limits they could undoubtedly be taken at almost any point, in case suitable apparatus was used, during the proper season. There are, however, certain regions or stretches of coast which, owing to their physical characteristics, are the natural feeding and spawning grounds of large schools of mullet, and when these chance to be near settled districts the fisheries are always developed to a greater or less extent. When in addition the region has rail or steamboat communications with the larger markets, or when it is tributary to a thickly-settled agricultural region, the fishing becomes extensive, and many persons devote their entire attention to the fishing for several months.

In New Jersey there are no important mullet grounds, though about Sandy Hook limited quantities of small fish and "bull-mullet" are taken for home use and for shipment. A few are taken at various points between Long Island Sound and Pamlico Sound, North Carolina, the latter being the most northern fishing ground of importance on the coast.

The fish are found in the mouths of all the rivers of Pamlico Sound, and indeed they often ascend well up into fresh water. They are not uncommonly seen a few miles above New Berne, on the Neuse. They are often taken at Blount's Creek, 8 miles below Washington, in the Tar, and occasionally at Leedville, at the head of navigation on the Pungo River. They are also found in considerable numbers along "The Banks" as far north as Oregon Inlet. The waters above this point are usually quite fresh, and no large mullet enter them; but the young are seen in the lower portions of both Albemarle and Currituck Sounds, while specimens are occasionally taken at Edenton and Poplar Branch, near the head of these respective waters. The fishing for the species is wholly to the southward of Roanoke Island. Oregon Inlet is thus practically the northern limit of mullet fishing for profit in the United States. All portions of the coast between Ocracoke Inlet and Little River, the southern boundary of the State, are visited by numerous fishing crews, who spend several months each fall in catching mullet, which they salt for shipment to the interior. Some crews have no regular fishing station, but move about from day to day, hauling their seines at any point along the inner channels or on the outer beach, where the fish chance to be most abundant. Along certain portions of the coast, however, especially in the waters of Core and

Bogue Sounds, there are regular seining beaches that have been visited each season for many years. These are fished by the parties owning the land, or are rented out to fishermen, the price paid for the privilege depending largely upon the record of the shores in the past.

Charleston, S. C., is the next point where mullet are extensively taken. Here during the migrating season the fishing is chiefly along the southern shores of Sullivan and Long Islands, but when the weather is rough the fish seek the inside passages, and the seines are hauled at any point where the character of the bottom will admit. In winter smaller individuals are taken in the deep holes of the numerous creeks, some miles from the ocean.

Though the fish are taken in considerable numbers farther south, there are no important mullet stations until the Saint John's River is reached. Here, as already stated, the fish ascend to Lake Monroe, 240 miles from the sea, and their yearly migrations to and from the ocean give opportunities for extensive fisheries along the entire course of the stream, though, owing to the swampy character of the banks and to the limited population of the region, comparatively few are taken except at and near the mouth of the river, where the fishermen of Jacksonville, New Berlin, and Mayport secure large numbers. In the Matanzas, Halifax, and Indian Rivers, still farther south, the fish are abundant, and many are taken for local supply. In the Gulf of Mexico, according to Mr. Stearns, the fishing grounds are confined largely to the Florida coast, comparatively few mullet being taken elsewhere. Within the limits of this State the fisheries are widely distributed, though the bulk of the fish are taken by the fishermen of Apalachicola, Pensacola, Cedar Keys, and Saint Marks, in the larger bays of central Florida.

In California, according to Prof. D. S. Jordan, the only fishing grounds are at San Diego.

4. THE FISHERMEN.

Along the New England coast we find a class of professional fishermen who follow fishing for a livelihood, deriving their entire support from this source. These parties, being wholly dependent upon the fisheries, which they follow during a greater portion of the year, naturally take a deep interest in their work, and give considerable thought to the apparatus and methods for catching the fish, as well as to curing and marketing the products. In order that a man may be successful in the fisheries of this region it is necessary that he be fully equipped with the apparatus best suited to that particular fishery in which he is engaged. New kinds of apparatus are frequently introduced, and if these are found to be more suitable than the old they are soon quite generally adopted. In this way the fisheries are being rapidly developed, and they become more profitable to all concerned. Many of the fishermen of the Middle States also may be regarded as professional fishermen, and, though they are decidedly below the New England fishermen in the amount of energy and skill displayed, many of them are provided with the most modern apparatus and manifest considerable energy in their work, and are rewarded by large profits. Along the southern coast for half a century prior to 1870 the fisheries remained almost stationary; but with the change wrought by the Rebellion they have more than doubled in importance. Even now, however, if we except the States of Maryland and Virginia and the shad and alewife fisheries of Albemarle Sound, the increase is due rather to the greater number of persons engaged than to any improvement in the apparatus employed in fishing or to improved methods for the preparation of fishery products. With a few notable exceptions, as at Beaufort, Charleston, Key West, and Cedar Keys, the coast fishermen of the South make fishing a secondary matter, some fishing merely a few months each season, and others only when necessity compels. At Saint Augustine, Fla., the primitive cast-net introduced by the early Spaniards is still used, to the exclusion of all other methods except the hook and line. Thus waters that, if properly fished, would

yield abundantly, furnish scarcely enough fish to supply the local demand. In most localities, owing to the peculiar abundance of the mullet at certain seasons, the farmers and laborers engage in their capture long enough to secure a supply of fresh and salt fish for their own tables. These usually have little idea of conducting the fishery on business principles, and take little pains in preparing the products. They are often provided with only the crudest apparatus for the capture of the species, and many fish are lost for lack of salt and packages for curing them, while a large percentage of those dressed are so poorly salted as to render them almost unfit for food.

The mullet fishermen, then, are, with few exceptions, farmers or laborers, who, after arranging with the owner of a seine and boat, go to the fishing grounds in the fall, assisting in the work of catching, dressing, and salting the fish, receiving in pay a certain percentage of the products. The owners of some of these seines are experienced fishermen, and, as such, are quite successful in directing the labors of the "green hands," so that the fishery is carried on quite systematically. In many cases, however, the men in charge are farmers, with no better knowledge of the methods of fishing than the landsmen whom they employ. Where the former condition exists the fisheries are often quite remunerative and are carried on with commendable energy; but where the latter occurs a shiftless set of men gather at the fishing stations, idling about the beach, living in the most uncleanly and disgusting manner, greatly preferring the idleness of camp life to the activity of the industrious fisherman.

Along the Atlantic coast a majority of those engaged in the mullet fisheries are resident whites, though a good many negroes are also employed. On the Gulf coast, according to Mr. Stearns, a majority of the fishermen are foreigners, the crews being made up of Cubans, Spaniards, Bahamans (called Conchas), and Creoles. Some of these visit the region for the express purpose of fishing, returning to their homes when the season is over, while others have settled in the locality and content themselves by eking out a miserable existence, working just enough to supply scanty food for themselves and their families. In speaking of the fisheries of La Fayette, Taylor, and Jefferson counties, Mr. Stearns says: "The men who carry on the fishery—owning the boats, nets, salt, and provisions—are the most thrifty class of planters living along the rivers. They fish throughout October, November, and part of December. Their object is mainly to get a good supply of fish for their own use and a few over for sale. The crews are of the poorer classes, generally white, these being quite ready to work a couple of months to secure a small supply of salt fish for their families."

In referring to the Ocklockonee Bay district, Mr. Stearns says that a number of sponge fishermen engage in the capture of mullet for a few weeks, and that many of the farmers of the region also give considerable attention to the fishery. "These farmers," he says, "are the genuine 'Florida Crackers,' and, with but few exceptions, are a wretched lot of men. They are lazy, ignorant, and unhealthy, not having proper food or taking proper care of their persons."

5. APPARATUS AND METHODS OF THE FISHERY.

The mullet are taken in various ways along different portions of the coast. Large quantities are captured in haul-seines wherever the fishing is extensive. In many localities gill-nets, or "drift-nets," as they are sometimes called, are used to great advantage, while cast-nets, both of the Spanish and American patterns, are used for local supply from North Carolina to Texas, the fishermen of Florida employing them more extensively than those of any other region. These three kinds of apparatus are the principal ones employed in the fishery, and by means of them the great bulk of mullet are taken. Small quantities have been secured in a pound-net in the Gulf of Mexico, and we are informed by various parties that they are occasionally tempted to take a baited hook, though no one thinks of fishing for them regularly in this way.

FISHING WITH SEINES.—Seines are perhaps more generally used than any other apparatus. These vary endlessly in size and arrangement, and the fishermen of the different localities have peculiar methods of shooting and hauling them. Some are but a few yards in length, and are easily handled by two or three men, while the largest are 300 or 400 yards long, requiring a crew of twenty or thirty men to handle the net and care for the catch. Most of the fishermen purchase their twine from some local dealer, and tie their own nets during their leisure hours, which, by the way, are very numerous. Others send to Boston and New York for the prepared webbing, hanging the nets and supplying them with such floats and sinkers as they may think proper.

As has already been stated, the mullet fishermen are mostly farmers, who devote a greater portion of the year to agricultural pursuits, turning their attention to fishing for a short time only. Many of the farmers interested in the fall fishery live some miles from the salt water; but when the fishing season arrives they leave their homes and proceed in gangs of four to thirty men to the seashore under the leadership of a "captain," who controls their movements. A seine 75 to 100 fathoms long, two or three boats, material for splitting tables, barrels, salt, and a limited amount of provisions, with the necessary cooking utensils, constitute the outfit. On reaching the shore they at once build rude huts or cabins, in which they eat and sleep until the close of the season. The most rigid economy is practiced during their stay on the beach, and no outlay of money is made unless absolutely necessary. This economy is especially noticeable in the style of buildings which are erected for their own use as well as in those used for salting and storing the fish. It is again noticeable in the food with which the men are supplied, the average fisherman bringing simply a few pounds of meal, some salt pork, and a supply of sweet-potatoes, his chief food during his stay at the shore being composed of fish caught from day to day.

When a suitable location for the fishing station has been selected, which, as a rule, is on some sandy beach, or at some prominent point where the fish are known to pass in considerable numbers, all hands turn their attention to erecting the necessary shanties or huts. These differ considerably, according to the locality. In the vicinity of Beaufort, N. C., they are usually built of rushes and poles, and are, indeed, strange-looking pieces of architecture. When a building site has been selected, some of the men start for the woods in search of poles, which are to answer as a framework, while others go to the marsh to gather rushes, which are to serve as a covering. The ridge-pole is first placed in position, its front end resting in the crotch of a forked stick, while the other is supported by two poles that cross each other at the proper height, their bases being imbedded in the ground, to locate the corners of the building. Smaller poles are now placed in rows at an equal distance on either side of the ridge-pole. These answer the purpose of studding, each being notched at the point where the eaves should come, that they may be easily bent inward to the ridge-pole to support the roof. In some cases spikes are used to fasten the ends of the poles, but, owing to their cost or to the difficulty of obtaining, they are frequently dispensed with, strings of bear-grass being substituted in their stead. "Laths," consisting of small poles or sticks, are now tied to the studding in horizontal rows about 18 to 24 inches apart, and the framework is complete. A ditch is then dug along the outside of the frame, into which the base of a thick layer of rushes, is placed. Other long sticks, called "liggers," are now placed on the outside of the rushes, directly opposite the laths, the two being sewed or fastened together by means of threads of bear-grass, in order that the rushes may be held in position. When the bottom tier has been fastened another row of rushes is placed higher up, overlapping the first like shingles on a roof. These in turn are fastened to the laths in the same manner, care being taken that the line formed by their lower ends may be even. The same process is continued until the ridge-pole is reached and the entire structure has been inclosed. The layers of rushes are sufficiently thick to shed water and to break the force of

the wind, though for better protection against cold the fishermen frequently "bank" their houses with sand. The only openings in the house are a small hole at the rear gable, to allow the smoke from the camp-fire to escape, and a square aperture 2 or 3 feet in height at the front, which serves as a door. Two tiers of berths are now put up on either side of the shanty, and each fisherman gathers grass or leaves, out of which he makes his bed. During pleasant weather the cooking and eating is usually done outside, each man keeping his supply of food separate, though four or five usually mess together, taking turns in preparing the food, which consists largely of corn meal and fish.

About Wilmington the fishing districts are more thickly settled, and many of the mullet fishermen return to their homes every night; but those coming from a distance are obliged to build shanties of rough boards or rush houses similar to those already described.

According to Mr. Stearns, the buildings used by the mullet fishermen on the Gulf coast vary considerably. Some are well built and nicely arranged for the purposes for which they are intended, while others are of a low grade, being rude palmetto-thatched huts. In speaking of the fisheries of Sarrasota Bay, he says: "The building in which the fish are cured and stored is about 30 feet long by 12 feet wide, and is built out from the shore on pilings. There are two other buildings; one, made of boards, is used as a kitchen and dining-room and dwelling for the captain's family, and the other, a palmetto-thatched shanty, is used by the men as a sleeping apartment. Amongst the apparatus owned here are seines, reels, frames on which to dry mullet roes, and machinery for hauling up the boats from the water." In speaking of the mullet fishermen of Ocklockonee Bay, Mr. Stearns remarks: "These fishermen live in small, roughly-made sheds, occasionally provided with a chimney and fire-place, with no other floor than the dirty sand on which it is built, no table on which to eat, no bunks or other arrangements for sleeping, no dishes or other conveniences which give the slightest suggestion of comfort. These dwellings are merely shells in which there is a confusion of barrels of salt, barrels of fish, fishing gear, and a lot of uninviting-looking men. The fleas can be both seen and felt. The food of the men is of the poorest quality, and not as abundant as they desire." He has seen them "take a few raw sweet potatoes out in the boat with them as a luncheon."

When the camp has been put in order, the seine is "stowed" in the boat, which is placed in position on the beach just out of the reach of the surf. In order that the fish may not pass unnoticed, and that sufficient time may be given before their arrival for setting the seine, it is necessary that a lookout station be established. This is usually located on the top of some sand-dune about a quarter of a mile above the camp. In case the shore is level, a frame-work is built to a height of 20 or 25 feet, on the top of which the fisherman on watch remains for the purpose of discovering and announcing the approach of the mullet. At Beaufort the frame is simply a tripod composed of two medium-sized and one large pole, the last-named having pegs inserted by means of which the man climbs to the crow's-nest in the crotch. On the Gulf-coast, a rectangular frame is built, the top being covered by a platform on which the lookout stands, while on one side is a ladder by means of which he ascends. The various members of the crew take their turns at the lookout station, though some are "ruled out," as they have "no eye for mullet" or, in other words, do not readily detect their presence, and thus often allow schools to approach unnoticed.

The presence of a school is usually detected by the ripple on the water or by the jumping and splashing of the fish, though they sometimes "swim deep," being detected only by their dark color contrasting with the lighter sand of the ocean. When a school is seen it is carefully watched by the lookout, who leaves his post, walking down the beach toward the camp, keeping directly opposite to the fish, and indicating their movements to the other members of the crew by a

peculiar motion of his arms. Many schools pass the camp at so great a distance from the shore as to be beyond the reach of the average net, and, for this reason, no attempt is made to catch them, but when running close to land the fishermen, at the proper signal from the lookout, proceed to launch the boat. This, along the outer beach, is not always an easy task, for, owing to the bar which skirts the shore in most localities, there is usually considerable surf. The fishermen, however, watch their chance and shoot out between the breakers, returning in the same way. The work is not only difficult but very dangerous, requiring the utmost dexterity and unity of action, and the men must spring into their places at once when the boat reaches the water and hold themselves in readiness to obey the captain's orders. Often several trials are made before the boat is gotten out through the surf and not unfrequently it is capsized or filled with water in the attempt. When the seine has been shot the same care is taken in landing, and as the boat grounds the crew jump into the water, and, seizing it by the gunnels, carry it beyond the reach of the waves. Five men constitute a crew, four manning the oars, while the other, usually the captain of the gang, does the steering. One end of the net is connected with the shore by means of a rope, and as the fish approach this end is drawn rapidly to land by men on shore to prevent them from passing. Even if not quite in, the fish are readily turned back by a rapid movement of the line. The boat at this time brings the other end of the net to the shore and the movement of the fish in this direction is thus shut off. When they find themselves surrounded, the mullet usually sink and make a circuit of the bottom for an opening through which to make their escape. When a large school is inclosed the pressure of the fish against the seine often lifts it from the bottom, and many pass under the lead-line; but failing to get out at the bottom, they rise to the surface and begin to jump over the cork-line with a rapidity that is truly surprising. Frequently a larger part of the fish escape in this way, the air being at times completely filled with mullet. When the water is calm, boats are placed behind the seine to catch the "jumpers," these often being completely filled in a few moments. As soon as shoal-water has been reached, some of the fishermen wade out to hold up the back of the seine and thus keep the fish from escaping. They are obliged to turn their backs to the fish that pelt against them in such numbers as to make their position anything but a pleasant one. In some instances a second seine is hauled behind the first to secure the runaways. The method of using a second seine, or of placing boats behind the first to intercept the escaping fish, is called "backing" the seine; and men frequently agree to assist in the regular work of cleaning and salting for the privilege of keeping such fish as they may take in this way while the water is still too deep to permit the men to wade out and hold up the cork lines.

At the permanent fishing stations along the gulf coast the method is somewhat different. Here, during pleasant weather, there is little surf to interfere with the shooting and hauling of the seine, and better arrangements can be made. In Ocklockonee Bay only one seine is used at a station, and that is so arranged as to be hauled directly in front of the fish-house. "This hauling place," writes Mr. Stearns, "is called a 'seine-yard,' and in fine weather, when the fish may be expected to move in the shoal water along the shore, the seine is kept half set in the water, the netting being shot straight out from the shore until the bag is reached and the boat containing the other half is fastened to the buoy which is moored there for the purpose. When a school of mullet approaches and comes within reach of the seine, the seine-boat is quickly unmoored and rowed around them to the shore. If the 'throw' is successful the next operation is that of hauling the net and fish upon the beach."

The seines used are somewhat similar to the large ones employed for shad and herring in the northern waters. They are, necessarily, made of heavy twine on account of the strain to which they are subjected when a large school of fish is being landed. Those employed along the outer

shore of the North Carolina coast range from 150 to 200 fathoms in length, and are from 12 to 18 feet deep. The mesh varies somewhat, the bar averaging about 1½ inches. Nets of this size cost from $150 to $200, from 15 to 20 men being required to handle them. Those used in the inner waters on the Carolina coast are a trifle smaller, averaging perhaps 100 fathoms in length, being manned by 8 to 12 men, according to circumstances.

Some of the nets used along the gulf coast, according to Mr. Stearns, are made in Boston and New York of strong cotton twine, and shipped by freight to merchants living in the vicinity of the fishing grounds. Each fisherman prefers to hang his own net, the manner of mounting and forms of floats and leads being similar to those in use along the Atlantic coast. These seines are from 100 to 120 fathoms long and 16 to 20 feet deep at the bunt, the wings at their extremities being, of course, much shoaler. One of these nets, when complete, costs about $1.20 per fathom, and if properly cared for will last from three to four seasons.

Seine-boats are sometimes made expressly for the mullet fishery, though ordinarily any boat large enough to hold the seine answers the purpose well enough for fishing in sheltered bays. Along the outer coast, however, a strong and seaworthy boat is necessary. But even here the size and shape varies considerably. The style having the preference in the Carolinas is known as the "pilot skiff," which may have either a square or sharp stern. These skiffs are round bottomed, lap-streaked keeled boats, from 25 to 28 feet long, 4 to 6 feet beam, and 20 inches deep, costing from $100 to $150. They are steered by means of oars rather than rudders, as they can by this means be more readily handled in the surf. The men engaging regularly in the fishery become very expert in the use of these boats, and are among the best surf-men along the entire coast.

On the Gulf coast the boats differ greatly according to locality. In some places excellent boats made of light but very durable material are used. These are about 26 feet long and 7 or 8 feet wide, and though still retaining the form of round-bottomed boats, they are quite flat, in order that they may not ground in shoal water. The bow is, as a rule, very sharp, while the stern is wide and overhanging, the shape being calculated to give great carrying capacity, making them especially adapted for the work for which they are intended. In other localities the boats are of inferior quality, somewhat smaller, and so roughly built that they last but one or two seasons. These are usually made of pine or spruce boards and are neither calked nor painted, a coating of tar taking the place of both. They cost, when new, from $10 to $12.

Another class of boats is used by the Apalachicola fishermen for marketing the fish after they have been properly salted. These, according to Mr. Stearns, are similar to the dinghy boat used in the sponge fisheries, but are much larger, being often 20 to 22 feet long, with 6 or 7 feet beam. The forward part is decked over, and washboards are run aft to the stern on either side to keep out the water. These boats are propelled by oars or sails, as is most convenient. The sail used is a triangular one of the lateen pattern, arranged with a long yard and a very short, stubby mast. Rigged in this manner the boats are very fast sailers and are easily managed.

Small vessels also are employed, to a limited extent, in the Gulf fishery, these enabling the fishermen to visit the more distant grounds and affording shelter to the crews during the fishing season. They are, however, more frequently used as freighting vessels, to carry the salt fish to market. Quite a number of fair-sized vessels are employed in this way, some of them running to the larger markets of Florida, while others go directly to Havana and other points in the West Indies.

The catch for the season, which usually lasts during two or three months, ranges from a hundred to a thousand barrels. In some localities the fish usually move in small schools, and consequently only a few barrels are taken at a time. In others the schools are often of enormous size, and the

bulk of the catch for the season may be taken in a few days. Along certain portions of the Gulf coast there are weeks together when the mullet do not come into shoal water, and not unfrequently two weeks pass at the height of the season without any considerable number of fish being taken; again, with a change in the weather they come within reach of the seine in such numbers that, owing to the limited facilities for handling them, only a small percentage of the fish that could be taken are preserved. This large run usually lasts for a short time only, and when it is over the fishing season may be said to have closed.

At Beaufort, N. C., the catch varies according to the location of the fishery and the energy of the fishermen. Some crews stock large amounts, while others realize almost nothing for their season's work. A fair average catch to the seine between Beaufort and Wilmington would be from 300 to 350 barrels, containing 100 pounds each of salted fish.

At Charleston the seines are considerably smaller than those in use further north, and the fish, being sold fresh, are never reckoned in barrels. The catch for the average seine in this locality is about 2,500 strings, or 11,250 fish in number. In Sarasota Bay, Florida, 10,000 pounds were taken at one haul, and the catch is frequently so large that all of the fish cannot be saved. In one case so many were inclosed that the fish carried away the seine, the men being unable to hold them. At Robert's fishery, in the same locality, as Mr. Stearns informs us, "several hauls have proved larger than 22 men could split, in consequence of which large numbers were spoiled. One haul contained at least 20,000 fish in number." Mr. McIlvaine reports a single catch of 40,000 mullet in number at Cedar Keys, and 200 to 500 barrels are said to be an average catch for a seine manned by 8 to 10 Apalachicola fishermen, in a season which practically lasts from the middle of October to the last of November. These are, perhaps, exceptional instances, as they occurred upon the best fishing grounds. In other localities less frequented by the mullet the catch will average less than 50 barrels to the seine during the season. The average catch to the seine for the entire Gulf is placed by Mr. Stearns at about 250 barrels of 200 pounds each.

FISHING WITH DRAG-NETS.—A peculiar form of seine, extensively used in the capture of trout (*Cynoscion maculatum*) at Beaufort, N. C., is employed to a limited extent in the mullet fisheries also. This seine, locally known as the drag-net, is found only in North Carolina. It is 80 to 110 yards long, 3-inch mesh, and from 6 to 12 feet deep. It is used only along the inner sounds, where the water is shoal enough to allow the men to wade about. Two men are required for fishing the net. On leaving the landing they usually proceed to some shoal-water bank along the main channel of the sound, when one jumps into the water, holding a shore-line attached to one end, while the man in the boat "shoots" the seine in the form of a semicircle, so as to inclose as much of the channel as possible, bringing the other end to the shoal at a point some rods distant from the first. The fishermen gradually bring the ends together, thus completing the circle and cutting off all means of escape for the fish. The staff of the first end is now securely imbedded in the mud to hold it in position, while the men gradually draw in the netting, thus lessening the circle and bringing the fish within narrower limits. When the circle has been considerably reduced the hauling proceeds more slowly, one man handling the cork-lines while the other pulls on the lead-line, passing it beneath his feet to keep it close to the bottom. The fish are thus forced into the "bunt" near the stationary end, when, by a quick movement on the part of the fishermen, the staff is pulled up, and the net, with its contents, is quickly transferred to the boat.

The channel fishing is carried on only when the mullet are more or less scattered. When they begin schooling the fishermen move about from place to place until a school of fish is seen, when they proceed to surround and secure them. In this case the fishing is necessarily confined to the flats, where the water is shoal enough to allow the fishermen to wade about.

FISHING WITH GILL-NETS.—Owing to the jumping propensities of the mullet, the drag-seines are little used after the fishing becomes extensive, and are gradually replaced by gill nets, which are much more successfully employed. Gill-nets are extensively used in all localities where the mullet are taken. The local name of the net for the different regions depends largely upon the form and methods of use. In many places ordinary floating gill-nets, or "drift-nets," are used. These are allowed to drift with the current, the fish entering them only when they happen to come in their path. In other regions "stake-nets" are employed, these being set across the principal channels and held in position by means of poles.

"Sweep-nets" have been quite generally introduced among the fishermen of the different States. They are in common use among the fishermen of North Carolina, and are found in considerable number along the Gulf coast. Those used in Carolina waters are 75 to 100 yards long and 4 to 6 feet deep, with a mesh varying from 2¼ to 4 inches. The twine of which they are made is purchased in Norfolk, at $1.20 per pound. The nets, which are tied by the fishermen and their families during their leisure hours, usually cost, when complete, from $12 to $30 apiece. Two men usually own a net in common, going out together in a small boat on their fishing trips. As soon as a school has been surrounded by the net, the fishermen proceed to the inside of the circle and, by pounding on the gunwale, splashing the water with oars, or, when shoal enough, jumping overboard and running about within the circle, drive the mullet into the meshes. If left to themselves, many of the fish would see the net and avoid it, but in their effort to escape from the noise and splashing they soon become entangled in the twine. When all have been gilled, the net is hauled into the boat and the fish are secured.

A common method is for three to six crews to join forces, setting their nets together in such a way as to include the largest possible area. This method is found much more profitable for all concerned than setting separately, as, owing to the increased number of nets and the greater dispatch in setting them, only a small percentage of the fish escape while they are being inclosed, and much larger schools can easily be surrounded. When a school of mullet is seen, two of the boats are brought together a short distance in front of them, and the others take their position a net's length apart. At the proper signal a man from each boat jumps into the water, holding the staff of one end, while the net is being shot toward the man who is holding the staff of the adjoining net. They are shot simultaneously, and when all are out they form a large circle, which completely incloses the mullet. The remaining men now get overboard, and after the ends of the adjoining nets have been properly secured the fishermen proceed to the inclosed area to frighten the fish and drive them into the meshes. Frequently the space inclosed is so large that it becomes necessary to lessen it, and the men take the ends of their respective nets and draw them toward the center of the circle, care being taken that no opening shall occur through which the fish may escape. In this way loops or pockets are formed, into which the fish are obliged to enter. When thus inclosed, if any are seen swimming about, the area is still further reduced by drawing in the nets until every mullet has been gilled. The nets are then taken into the boats, and after the fish have been removed are at once put in order, and the fishermen start in search of another school, which is surrounded and captured in the same way. At the close of the day they gather and divide equally the catch. The average yield to the net in this locality for the season, which lasts from June to November, is about 20 barrels of salted mullet, though the quantity could be greatly increased by diligence on the part of the fishermen.

The methods employed in the Gulf of Mexico differ only slightly from those already described. The gill-nets used in this region are said to have been introduced by Northern men about six or eight years ago. They are of Boston or New York manufacture, and are made of hand-laid, six-

thread cotton twine. They are from 50 to 100 fathoms long, 6 to 12 feet deep, and have a mesh varying from 2½ to 3½ inches. When properly hung they are worth about 50 cents per fathom. The fishing with gill-nets at Cedar Keys lasts about six months, beginning with September. The nets are usually set at high water, the night tide being frequently utilized. Two nets are usually fished in common. When a school of mullet is seen the boats take such a position as to bring the fish directly between them. The nets are then shot in opposite directions, the ends of one meeting or overlapping those of the other. The catch is equally divided.

A method known as "stop-fishing" is frequently employed in the small creeks tributary to the sounds and bays. The mullet frequently enter the creeks in considerable numbers on the flood-tide, and at high water the nets are stretched across the mouths to prevent their escape. As the tide ebbs, many, attempting to get out, are gilled in the meshes, while the others remain in the deeper holes and channels, where, at low water, they are easily secured by means of a small haul-seine. By this method all of the fish that chance to be in the creek when the net is set are easily secured.

The average catch to a gill-net at Saint Mark's, according to Mr. Stearns, is 100 pounds daily or 15,000 pounds per annum. At Ocklokony Bay he estimates the catch to be 100 to 300 fish at a tide, or 15,000 to 20,000 for the season.

FISHING WITH CAST-NETS.—Another kind of apparatus extensively used in the mullet fisheries of both Eastern and Western Florida, and to a limited extent by the fishermen of other States, is the cast-net. This is, perhaps, next to the hook and line, the apparatus earliest used in the fisheries of the United States. It is said to have originated in Spain, and was doubtless introduced into this country by the Spaniards who came to Saint Augustine in 1565, since which time it has been in constant use in that locality. A superficial examination of the cast-net by one who had never seen it in actual use would lead to the belief that it was a very crude affair, and could hardly be successful in the fisheries; but a more careful examination shows that it is fairly adapted to the fisheries in which it is employed, and that by long use the fishermen come to be very expert in handling it. The cast-net, briefly described, is a circular piece of netting, 8 to 16 feet in diameter, with a stretch-mesh varying from 1 to 2 inches. It has a hole at the center, through which pass 20 to 30 brails or cords, which are attached to the circumference at points equally distant from each other. The inner ends of these are secured to a long line, by means of which the fisherman handles the net. On every second or third mesh of the circumference is a sinker, usually of lead. The number of sinkers varies, according to the diameter of the net, from 100 to 200, each weighing about an ounce. During the fishing season the fisherman takes the net in his boat and starts for the shoal-water fishing grounds of the inner coves, bays, or lagoons, where the net is most successfully used. When a school of mullet is seen he at once rows or paddles up to it, and, after fastening the line to his arm, seizes in his left hand the ring which lines the aperture at the center, and with the other proceeds to throw the net over the fish. In throwing, one of the leads at the circumference is held between the teeth and a number of others are gathered in the right hand; then, by a swinging motion of the arms and body, the net is thrown to a distance of 8 to 10 feet from the boat, in such a way that it spreads out and falls flat upon the surface of the water. The leads at the circumference at once carry this to the bottom, the central portion of the netting forming a bag, into which the fish rise as they find themselves surrounded. The sinkers keep the rim of the net well down, and, by a slight jerking motion of the line which connects with the brails, the circumference is gradually drawn inward till the leads are together in one bunch at the center; and as they are raised from the bottom the netting drops over them, the fish being retained in the folds until they can be lifted into the boat.

Two styles of cast-nets are in common use, the Spanish, or "bag-net," as it is sometimes

called, differing from the English, or "brail-net," in that 8 inches of the outer part of the netting is doubled inward and upward, being attached to the body of the net at every eighth mesh, thus forming loops or pockets into which the fish drop when the net is being lifted. In these nets the sinkers are placed at the bottom of the fold, which thus really marks the circumference. Nets of this form cost about $7.50. They are preferred to the "brail-net" by the fishermen of Saint Augustine, Clearwater Harbor, Cedar Keys, and Saint Mark's, as well as by those of the entire coast between Apalachicola and the Mississippi River. In other localities the English net, which costs about $6.50, is more generally used.

Fifteen to twenty-five large mullet are often taken at a single throw of the cast-net, while twice that number of small ones are frequently secured. In 1876 Mr. H. S. Williams, a fisherman of Indian River, Fla., secured about 400 pounds from a single school in less than an hour.

POUND-NET FISHING.—The pound-net has not yet been fairly tested in the mullet fisheries. It is a form of apparatus used principally by the Northern fishermen, being almost unknown to those fishing south of Albemarle Sound, North Carolina. Two or three were set in the waters of Core Sound, near Beaufort, N. C., but not being properly arranged they took but few fish, and were soon taken up and transferred to the Neuse River. One can reach no definite conclusion as to their value for the mullet fisheries from these experiments, and must wait until they have been more thoroughly tested. Many of the Beaufort fishermen, however, state with a good deal of positiveness that the mullet will not enter them, assigning as a reason that on striking the leader they will turn directly back rather than attempt to get around it by following it into deeper water. This impression arises from the fact that the mullet are so readily turned from their course by the seine-rope, even before the netting has been drawn to the shore. Mr. Stearns, in his examination of the Gulf fisheries, found a crude trap somewhat resembling the pound-net in the waters of Tampa Bay, Florida. This was made of piles, small poles, and boards, the leader being 100 yards long, with a V-shaped bowl or heart 20 yards across and 30 yards long, having a small pocket at the outer corner. On consulting with the owner he learned that "when the pound was first set fish would not approach it, but after the stakes had become covered with barnacles and oysters the fish collected about it in considerable numbers." The owner assured him that "all the common fish in the bay now enter his pound." The largest catch made by him consisted of 300 mullet in one night, all of them being found in the pocket. An average night's catch brings him a dozen or two fish of various kinds. Sheepshead, redfish, and salt-water trout seem to be taken in greater numbers than any other species.

FISHING WITH HOOK AND LINE.—As already stated, mullet are occasionally tempted to take a baited hook, though no one fishes regularly for them in this way, the few secured being taken while fishing for other species. They are sometimes caught by parties fishing with hook and line in the deeper holes of the tide-creeks about Charleston, and we learn of other localities where they are occasionally secured. Professor Goode, in his article on the natural history of the mullet, says: "It does not readily take the hook, but is sometimes caught with a bait of banana, or one manufactured of cotton and flour."

LAY OF THE FISHERMAN.—The financial arrangement or lay of the men engaged in the mullet fisheries varies greatly. It depends somewhat on the locality, but more particularly upon the kind of apparatus used. The simplest arrangements are found among the gill-net fishermen who work together for the more successful prosecution of the fisheries. In such cases the men usually own their own boats and nets, and the fish are either divided equally among the different crews or each fisherman keeps the mullet taken in his net, be the quantity large or small. Exceptional cases occur where capitalists furnish the boat and net and take one-third of the catch. In the seine fisheries,

where the apparatus is expensive and the number of men interested is much larger, the lay system becomes much more complicated. It depends somewhat upon the financial condition of the fishermen, as affecting their relations with fishing capitalists; though in many localities the arrangements framed in early times have been handed down to the present generation with scarcely a change, for there is certainly no class of people that cling so tenaciously to the methods of their fathers as the fishermen.

We will consider the principal lays only, for these, though differing somewhat with the locality, vary only within narrow limits.

At Wilmington the average catch is about 350 barrels to the seine. Of this quantity the owner of the seine and boat draws one-third, the remainder being divided equally among the members of the crew, with the exception of the captain, who receives twice as much as any of the others. At Beaufort, where larger seines are employed, and the shores are owned by farmers, who exact a large price from the fishermen for the privilege of using them, the financial arrangement is as follows: The seine receives from six to ten shares; the boat takes one; the beach three to ten, according to its relative importance as compared to other shores in the vicinity; one share is given to the man who supplies the camp with wood; and the remainder is divided equally among the members of the crew, including the captain. We thus find the season's catch divided into twenty-two to forty shares, the average being about thirty. During the season of 1879, which lasted from the middle of August to the 1st of November, the catch for the different seines averaged about 300 barrels each, a share thus consisting of 10 barrels.

In certain parts of Western Florida the men, as a rule, own their own nets, but as the fishing stations are some distance from their homes, they usually provide themselves with salt and the necessary outfit and remain at the fishing shores during a greater portion of the season. Owing to a scarcity of money they are frequently obliged to obtain their outfits on credit, and the man who furnishes them agrees to take the fish at a stipulated price in payment for the goods. This arrangement usually works to the disadvantage of the fishermen, as they are thus largely under the control of the merchant, who often charges exorbitant rates for the outfits, while he pays a comparatively small price for the fish. In speaking of the fisheries of Hunter's Point, Fla., Mr. Stearns says: "At this fishery, as at all others engaged in supplying the Cuban markets, the lay arrangement, with slight variations, is as follows: After all bills have been paid, such as duties, tonnage fees, provision bills, salt bills, &c., the owner of the fishery apparatus receives 15 per cent. of the gross stock, the owners of the vessels employed in taking the fish to Cuba 20 per cent., and of what is left each fisherman receives one share, the boys, if any, being allowed only half a share, while the captain receives a share and a half. The general complaint is that there is no money to be made in the business and that the fishermen always come out in debt. The vessel's expenses are quite heavy and are paid out of the common stock, but unquestionably more profit is made by the vessel than by the men engaged in the fishery or by the owner or owners of the apparatus. The continued political troubles in Cuba have injured these fisheries, for the Cubans have no money, and so to save themselves from being worsted impose heavy duties upon all imports." Occasionally all of the gear and outfit and the vessels engaged in marketing the fish are owned by the same parties. Under such circumstances a slightly different lay is generally adopted. At Gasparilla all of the gear and the carrying vessels belong to one company, who, having provided the outfit, receive 35 per cent. of the catch and pay 35 per cent. of all the bills. The other 65 per cent. is divided equally among the two captains and the crew, who pay the remaining 65 per cent. of the bills.

Prior to the rebellion, farmers living along the Alabama coast frequently owned seines and hired

fishermen to handle them. Usually regular wages were paid, and the fishermen always succeeded in making more money than could have been made in the ordinary way. This system is now practically abandoned, as the division of the catch into shares is found to work more satisfactorily.

7. DISPOSITION OF THE CATCH.

METHODS OF PRESERVING THE FISH.—If we except Beaufort and vicinity, few mullet are salted along the Atlantic coast, as there is in the markets of the larger towns a fair demand for the fish in a fresh state, and the fishermen usually prefer to dispose of them in this way. In former years nearly all of the fish taken to Beaufort were salted and packed in barrels for home supply or for shipment to the interior. Within the past few years, however, the trade in fresh fish has opened a market for a small percentage of this catch, though the majority, especially of the large fish, are now salted as formerly. The same is true, to a certain extent, for the Wilmington district. Here the entire catch was formerly salted, but of late the fishermen prefer to sell their fish fresh when they can get 7 or 8 cents a bunch for them. Each member of the crew receives his share of a haul as soon as the seine is landed, and is, of course, at liberty to dispose of it as he may think proper. If in poor circumstances, he is usually anxious to turn his mullet into money at once, and he thus sells the bulk of his fish at Wilmington, regardless of the price paid by the dealers.

South of Little River, which marks the boundary between North and South Carolina, almost no mullet are salted for market, although each fisherman puts up a limited supply for his own use. The remainder taken by those fishing for the larger markets are at once sent to the principal fish-dealers. In the thinly populated regions any surplus is sold to farmers, who salt the fish for family use. Many of the fishermen of this region, especially those of Georgia and Eastern Florida, are wholly unacquainted with the methods of salting as employed in other localities, and owing to their ignorance of the proper methods of curing their fish they often lose most of those put up by them. This has led many of them to entirely discontinue the salting of mullet, and during our visit to the region we met quite a number who insisted that no mullet taken during the warmer weather could be salted so as to keep sweet for any length of time. About Charleston, S. C., and at Jacksonville, New Berlin, and Mayport, on the lower Saint John's, though considerable quantities of mullet are taken, the entire catch is sold fresh.

On the Gulf coast, where the fisheries are extensive, most of the mullet are salted. The methods vary considerably with the locality, some of the fishermen "kenching" or dry-salting their fish, while others salt in brine in the ordinary way. Kench-curing is, perhaps, more generally practiced in Southern and Southwestern Florida than elsewhere, and three-fourths of all the mullet prepared on the Gulf coast of that State are treated in this way, although in Apalachicola and vicinity salting in brine is the favorite method.

The method of dressing is similar to that employed for other species in the same localities. As soon as the boat containing the mullet arrives at the station the fish are carried to the salting-sheds, where suitable arrangements have been made for preserving them. The men are arranged in gangs, each having his particular work to perform. Several persons, known as splitters, take their positions on one side of the table, while the others, known as gillers, scrapers, and spawners, stand on the opposite side. The splitter takes the fish in his left hand, while in his right he holds a knife, with which he cuts it open from nose to tail along the back. It is then thrown to the giller, who removes the gills and entrails and cuts a gash along the side containing the backbone, in order that the salt may the more readily penetrate the flesh. This done, he tosses it to the scraper, who removes the blood and the black membrane that adheres to the nape. When roe-mullet are taken,

the giller, after performing his work, passes the fish to the spawner, that the roe-bags may be removed before it goes to the scraper. When the dressing process is complete the fish are thrown into a trough of clean salt water, in which they are allowed to remain and soak until all are split, after which they are thoroughly washed before salting. Much of the blood is taken out in this way, and the fish thus become lighter and of a more desirable color. Usually all the fish are dressed before the salting begins, but when the catch is large the dressing and salting are carried on at the same time, several additional men being employed for the work. As the salting requires care, the captain usually superintends the work in person, seeing that all are properly treated. After they have been washed they are rubbed in salt, and if they are to be pickle-cured they are at once placed in pork-barrels or other tight packages, with the fleshy side up, an additional quantity of salt being sprinkled between the alternate layers, the fish in each layer being placed at right angles to those in the layer next above and below. They are allowed to remain in this condition for several days, until they have been thoroughly struck and the moisture which they contain has passed out of the flesh to form a pickle, which nearly or quite covers them. They are then taken out, and the pickle, which contains considerable blood and dirt, is placed in large kettles and boiled, after which it is allowed to cool and carefully strained. The fish are then again placed in barrels with additional salt, and the clarified brine is poured over them. After a barrel has been headed an additional amount of brine is added through the bung-hole, so that the barrel may be entirely filled. In many localities the heads of the mullet are removed before the fish are split, but in a majority of cases they are left on. This latter method is commonly employed in preparing fish for the Cuban market, as the people of that island prefer mullet dressed in this way. Some of the fishermen have the habit of scaling their mullet and removing both head and backbone before salting them. Fish prepared in this way bring a little higher price than the others.

The kenching process, as already stated, is more extensively employed in Southwestern Florida than elsewhere. The fish are dry-salted and packed in boxes or tied up in bundles for shipment. They are dressed and salted in the ordinary manner, after which they are corded up in piles, an additional quantity of salt being introduced between each layer. The scaly surface of the fish is placed downward, to retain the salt that is dissolved by the moisture of the body. In some cases, after the fish have been split, they are covered with salt and the sides are again brought together, so that the body cavity is entirely filled. Mr. Stearns, in describing the kench-curing at the Hunter's Point fishery, says that the fish, after being cleaned, pass to "the salting-tables, where they are rubbed with Liverpool salt, after which the insides are filled with it and closed up, leaving the natural shape of the fish. Men or boys are employed in packing the fish away as soon as they have been salted. They are packed in rows or tiers, heads out, in one corner of the house, and when the pile becomes large they present a most peculiar appearance, resembling a work of masonry more than anything else. * * * The first fish thus carefully put up," he continues, "are in a first-class condition for any market; it is only in the warmest weather of August or September that the mullet are known to rust or turn red."

No uniform size or style of package has been generally adopted by the mullet fishermen, and considerable annoyance is experienced by the dealers from this source. In many places ordinary pork-barrels are used, while in others barrels, or in fact any water-tight packages, regardless of size, are utilized for packing and marketing the pickled fish. In North Carolina all kinds and sizes of barrels were formerly used indiscriminately, but the quantity of fish contained in them varied so much that no uniform standard of price could be adopted, and much hard feeling arose between the fishermen and the merchants. This led to the passage by the legislature of that State in 1879 of a law requiring that mullet should be put up in barrels having a stave 25 inches

in length and a head 13 inches in diameter. The capacity of this barrel is about half as great as that of the common fish-barrel, holding, when properly packed, about 100 pounds of mullet;* but, as the law does not specify the exact weight of fish, some of the fishermen who are inclined to dishonesty pack their mullet in such a way that the side of the fish containing the backbone shall come in the center. By packing in this way, 90 pounds of fish will fill a barrel. Mr. Stearns says that the packages now used for putting up pickled mullet at Apalachicola "are of white pine, either barrels, half-barrels, quarter-barrels, or kits. These come by freight from Boston. Formerly cypress packages were used, but they were discarded because they were not so neat or cheap as the ones just mentioned. With the freight included, those white pine barrels, half-barrels, quarter-barrels, and kits cost, respectively, $1, 65 cents, 45 cents, and 30 cents." In other portions of the Gulf home-made barrels are in general use, though a portion of the supply is usually obtained from the North.

In the shipping of kenched or dry-salted mullet ordinary wooden boxes are frequently employed. In many localities the fish are simply bundled up in such a way that the fleshy side of the mullet may be turned inward and kept clean while in transit, or, again, the outside of the bundle is covered by a single layer of matting or palmetto leaves.

As already stated, only young mullet are found in New Jersey; these being too small to sell when salted in the ordinary way, most of them are used fresh, though a few of the larger ones are sometimes salted for family use. We learn indirectly that a few of the small mullet are put up in vinegar and spices, though we have never seen any fish of this kind in the market.

At New Smyrna, Fla., and in a few other localities, according to Mr. J. F. McCarthy, mullet are smoked to a limited extent for family use, though none are prepared for market in this way.

METHODS OF PREPARING MULLET ROES.—The roe of the mullet, which consists of two cylindrical masses of eggs an inch or more in diameter and 4 to 8 inches long, is considered a great delicacy, and many are saved by the fishermen, who find a ready sale for them. They are obtained from the schools of roe or spawning mullet that are so abundant in all of the bays and coves along many portions of the coast between the middle of September and the 1st of December. The marketable ones are taken from gravid females which, though full-roed, have not yet begun spawning. At this time the ovaries, though large, are still compact, and the eggs are hard and firmly held together by means of a membrane that surrounds them. As the spawning season approaches, the eggs gradually soften and expand until they burst the membrane and fall into the ovarian duct, slowly passing toward the opening, through which they are excluded. When in this condition the roes are too soft to be of value, and are hence usually thrown away. At most of the larger fisheries one man usually gives his entire attention to gathering and preparing the roe.

Fresh roes are in good demand in the larger fishing towns, and they are highly prized by the fishermen, who consume quite a quantity of them during the season. A large percentage of those saved, however, are cured for shipment to the commercial centers. In some localities they are salted

---

*We publish the following letter received from Messrs. Hall & Pearsall, of Wilmington, N. C., in reply to our inquiry as to the quantity of mullet contained in a barrel of regulation size:

JULY 16, 1881.

R. E. EARLL, Esq., *Asst. U. S. Fish Com., Washington, D. C.:*

DEAR SIR: Yours of the 14th to hand. Having no good fish in stock, we took to-day a barrel of the regulation dimensions named and filled it with pickled fish which had partially dried. We then covered it with the usual quantity of salt pickle, and subsequently reweighed it, with the following result: Barrel, fish, and pickle (gross), 166 pounds; fish, 95 pounds; pickle, 41 pounds; barrel, 30 pounds. As these had lost some weight in partially drying, we estimate that a barrel of this size should contain 100 pounds net of pickled fish.

Yours, respectfully,

HALL & PEARSALL.

in kegs and kits in the ordinary way; in others they are slightly salted, after which they are thoroughly dried and packed in boxes for shipment. Along certain portions of the coast the practice of smoking them prevails to a limited extent.

If the roes are to be dried they are immediately on removal from the fish placed in brine, where they are allowed to remain for several hours, after which they are spread upon boards and placed in the warm sunlight until all or a greater part of the moisture has been evaporated. In some localities the roes are pressed, in which case the partially dried ones are placed between boards, where they remain, subjected to a slight pressure, until thoroughly dried. In pleasant weather the time required in drying and pressing is about a week; if cloudy or rainy, a proportionately longer time is needed. When properly dried and pressed these roes are from 2 to 4 inches wide and half to two-thirds of an inch thick. They vary greatly in color from yellowish brown to dark red, the shade depending largely upon the method of curing.

Some of the fishermen give special attention to the preparation of roes, and produce those that, in addition to being very palatable, are of excellent appearance. Others, on the contrary, bestow little care upon them, and as a result they produce an article which is always inferior and in many cases nearly worthless.

Mr. Stearns, after mentioning the excellent appearance of the roes seen by him at the Sarasota fishery, says that those noticed at a Spanish fishery near by "were maggoty, but the fishermen seemed to think they were all right, remarking that that condition was nothing unusual."

For many years the North Carolina fishermen have been accustomed to preserve the roes, either dry or in pickle, and ship them to Charleston, from which place they have been largely exported to the West Indies. At Saint Augustine, Fla., considerable numbers are dried for local consumption, though few, if any, are shipped from the region. Along the Gulf coast the fishermen make a regular business of saving and curing them. The majority are sun-dried for the Cuban trade, while a large percentage of those put up in kegs are shipped to the interior towns of Georgia and Alabama.

Both the dried and salted roes are sold by count, the price varying somewhat in the different markets, usually ranging from 60 cents to $1 per dozen. The price paid to the fishermen averages about 50 cents. When dried the roes are often sliced up and eaten raw, though they are occasionally cooked in different ways. The salt roes are usually fried, and when well cooked are exceedingly palatable.

8. EXTENT OF THE FISHERY.

Comparatively few mullet are taken north of Cape Henry, as they are not sufficiently abundant to warrant any one in making a business of catching them. The first important fishery as we proceed southward, is in the North Carolina waters between Roanoke Island and New Berne, where all of the local fishermen engage in their capture to a limited extent in the fall. The majority fish only for home supply, but several parties fish more extensively, selling their surplus catch to the farmers of the locality. The quantity taken in this region, if we exclude the 1,500 barrels taken by the "bank" fishermen south of Cape Hatteras, is 700 barrels of salt fish, valued at $2,500, and 20,000 bunches of fresh fish, having an equal value.

In the waters of Core and Bogue Sounds the largest fisheries on the Atlantic coast are found. The number of seines between Ocracoke Inlet and New River in 1880 was 37; 20 were fished in the sounds and 17 along the outer beach. In addition to these, a large number of drag-nets and upwards of 200 gill-nets were used; nearly all of the fishermen being extensively engaged in the capture of the species for two or three months, some of them continuing for a much longer period.

The catch for 1880 in this region amounted to 13,000 barrels of salt mullet and 40,000 bunches of fresh ones, having a value to the fishermen of about $45,000. In the Wilmington district, including the coast between New and Little Rivers, 48 seines, with 100 additional gill-nets, were employed, the catch amounting to 2,800 barrels of salt mullet, in addition to the large quantity sold fresh in the Wilmington market. The statistics for the whole of North Carolina show 1,500 men, with 450 seines and 700 gill-nets, employed in the fisheries; the total catch being 3,368,000 pounds of mullet and 2,000 dozen mullet roes, having a total value of $80,500.

At Charleston 12 mullet seines, manned by 72 men, are fished regularly for a couple of months in the fall, these landing during the season an average of 2,500 bunches each, or a total of 30,000 strings, equal to 135,000 mullet. In addition, the seiners that fish along the numerous tide-creeks during the winter months catch about 4,000 bunches, or 35,000 mullet in number, in addition to their other fish, making the total mullet yield for Charleston 34,000 bunches, or 170,000 fish, which, at an average value of 12 cents a bunch, would pay the fishermen nearly $4,000, while the retail value is nearly double that amount. In addition, not less than 5,000 bunches were secured by the fishermen of Winyah Bay, a large percentage of them being sent to Charleston. The statistics for the South Carolina waters show 80 men, with 15 seines and 10 gill-nets, regularly employed during the height of the season, marketing 232,000 pounds of mullet and 20 dozen roes, with a total value of $7,210.

The mullet fisheries of Georgia are quite unimportant, only 30 men, with 5 seines and 20 gill-nets, fishing extensively. The value of the catch was about $4,500.

At the mouth of the Saint John's River, and in the sounds further south, quite a quantity of mullet are taken, 181 men being engaged to a greater or less extent in this fishery. The total yield for Eastern Florida is 663,000 pounds, valued at, including the 500 dozen roes, $20,787. At Saint Mark's a large number of men are engaged in the capture of mullet for shipment to Savannah. Fully 90,000 pounds are sent fresh each season, and a quarter as many more are salted for local use and shipment. The fisheries of Cedar Keys and Apalachicola are perhaps more extensive than those of any other towns on the Gulf of Mexico, while those of Sarasota and Tampa Bays are also important. Mr. Stearns, who has collected the statistics for the Gulf coast, says that seven hundred and thirty-six men, with 85 seines and 125 gill-nets, are employed in the fishery for a number of months. The total catch for Western Florida he places at 2,831,333 pounds of mullet, with 13,325 dozen mullet roes, the total value to the fishermen being $102,721.

In Alabama, Mississippi, and Louisiana the catch is quite small, the men devoting only a few weeks to the capture of this particular species, though the mullet are present during the entire year, and are taken in greater or less numbers by the fishermen while seining for other species. The values of the products for these States, as given by Mr. Stearns, are $3,750, $60, and $1,650, respectively.

In Texas there are no regular mullet fisheries. The fish are present in small numbers, and, though not regarded with much favor for food, a few are taken by parties fishing for other species.

Professor Jordan, in his account of the California fisheries, says that 600 pounds of mullet (*M. mexicana*) are taken by the fishermen of San Diego during the average season.

The following table gives a condensed summary of the mullet fisheries of the United States, showing the number of persons and amount of apparatus employed, and the quantity and value of the products:

Table showing the extent and value of the mullet fisheries of the United States for the year 1879.

	Number of fishermen.	Fishing apparatus.						
		Number of seines.	Number of gill-nets.	Number of cast-nets.	Value of netting.	Number of boats.	Value of boats.	Total value of apparatus.
Total	3,101	658	966	285	$52,656	539	$57,108	$109,764
Long Island Sound to North Carolina	*120	50			900	45	1,450	2,350
North Carolina	1,500	450	700	20	31,000	775	36,500	67,500
South Carolina	80	15	10	10	1,200	20	1,000	2,200
Georgia	30	5	20	35	900	25	750	1,650
Eastern Florida	181	16	57	220	4,125	273	4,780	8,905
Western Florida	736	85	125		9,351	311	9,078	18,429
Alabama	100	15	20		1,620	85	1,000	2,620
Mississippi	22	4	7		410	10	750	1,160
Louisiana	332	18	27		3,150	45	1,800	4,950
Texas								
California								

	Products of the fisheries.								
	Pounds of mullet sold fresh.	Value of fish sold fresh.	Pounds of fresh mullet used for salting.	Pounds of salt mullet produced.	Value of salted mullet.	Total number of pounds of mullet taken from the water.	Number of dozen roes saved.	Value of roes.	Total value of the products.
Total	2,966,883	$87,168	5,270,422	3,872,250	$134,833	8,237,305	15,845	$7,127	$224,292
Long Island Sound to North Carolina	82,700	2,480	33,000	22,000	770	115,700			3,250
North Carolina	683,000	19,500	2,685,000	1,790,000	60,000	3,368,000	2,000	1,000	80,500
South Carolina	220,000	7,000	12,000	8,000	200	232,000	20	10	7,210
Georgia	100,000	4,000	6,000	4,000	100	106,000			4,100
Eastern Florida	633,000	19,337	30,000	20,000	700	663,000	500	250	20,787
Western Florida	1,058,083	28,891	2,504,422	2,028,250	73,003	3,562,505	13,325	5,867	102,721
Alabama	125,000	3,750	(†)	(†)		125,000			3,750
Mississippi	1,500	60	(†)	(†)		1,500			60
Louisiana	55,000	1,650	(†)	(†)		55,000			1,650
Texas	8,000					18,000			240
California	600					600			24

* *These fish only occasionally for mullet, and hence cannot be regarded as professional mullet fishermen.* † *Estimated.*

9. MARKETS.

A good deal has been said from time to time about the food qualities of the mullet. In all of the principal seaport towns between North Carolina and Louisiana it is an important article of food, and in many places a third, or even a larger percentage, of all the fresh fish consumed are of this species. When perfectly fresh, mullet are considered of excellent flavor and find a ready sale, but owing to their fatness they soon deteriorate in warm weather, and when stale have a rank flavor which is not at all pleasant. In cool weather, however, or in seasons when they are not particularly oily, they keep equally well with the other grades of fish. Many contend that salt mullet are of an inferior quality, and will never come into general favor. These insist that the fish are soft and of a rank and muddy flavor. Others, on the contrary, hold that they compare very favorably with the mackerel and with other pickled fish so frequently met with in the principal markets. Professor Goode, in referring to the subject, says: "I had an opportunity of tasting some salted by a negro at Mill Cove, and can bear testimony to their excellence. Their flavor is more like that of a salted salmon than of a mackerel, and they are hard, toothsome, and not at all muddy in taste." An examination of the evidence on both sides leads to the belief that where inferior grades of mullet are found the difficulty is to be attributed to the defective methods of

curing rather than to any inherent qualities of the fish. In many localities little care is bestowed upon them, and the fish are often allowed to become stale before they are salted. Again, they are frequently put upon the market in a half-cured and dirty state, so that their appearance will prejudice one against them, even though their flavor may not have been seriously impaired. When properly cured they are undoubtedly of excellent flavor, and we see no reason why they will not compare favorably with the Northern mackerel, of which several hundred thousand barrels are consumed annually.

Up to 1870 no fresh mullet were shipped from Beaufort, N. C., all of those taken, with the exception of the quantity used in the locality, being salted for sale among the farmers in the northeastern portion of the State. It seems that for many years the mullet fishermen of this region, after catching and salting their fish, have been in the habit of hiring vessel-owners to market them. As soon as the fishing season was over, the mullet were loaded upon these vessels, in charge of the captain, who was to exchange them for corn with the farmers living along the banks of the navigable streams tributary to the Carolina sounds. The captain was at liberty to make the exchange upon any basis that he might think proper, but as he was given a percentage—usually one-fifth of the corn received—for his services, he was apt to drive the best possible bargain. Five bushels of shelled corn for one barrel of mullet was considered a fair exchange, though the price varied somewhat from year to year. Having secured his cargo of fish, he usually set sail for some small town on one of the larger rivers, where he remained until all of the mullet were sold. The arrival of a "mullet-trader" soon becomes known among the residents of any locality, and the farmers of the region at once load their wagons with corn and start for the landing to secure their fish. This practice has continued to the present time, and even now a large percentage of the mullet salted by the fishermen of Core and Bogue Sounds are marketed in this way, only a small part of the catch being sold for cash at Beaufort and Morehead City, though the merchants and others are anxious to purchase at fair prices. Those marketed in Beaufort are usually shipped by rail to the larger cities of Eastern North Carolina or to Norfolk, from which points they are redistributed to the farming districts. Probably nine-tenths of the mullet taken in North Carolina waters are consumed in the eastern half of that State. When money is received, the price paid to the fisherman is $2.75 to $3.50 per barrel of regulation size, which is supposed to contain 100 pounds of fish.

In the spring of 1870 a small trade in fresh fish began. This business increased slowly at first, but of late it has grown with remarkable rapidity, and during the year ending with June, 1880, fully 40,000 bunches, equal to about 150,000 pounds, of mullet, in addition to large quantities of other fish, were shipped fresh to the larger cities of the Carolinas and Georgia. The price paid to the fishermen at Beaufort ranges from 2 to 4 cents per pound.

At Wilmington, as at Beaufort, nearly all of the mullet taken in former years were salted. The farmers of this region made a practice of driving down to the fishing shores each season to obtain their supply for family use. Many of them came a distance of 30 to 40 miles. Some brought corn and other produce to exchange for the fish, while others brought the money with which to purchase them. The price paid averaged about $3 per barrel, less the value of the package, which the farmer usually did not care to purchase. Of late years, owing to the large demand for fresh fish, few mullet are salted in this locality, and it is stated on good authority that during 1879 not over 50 barrels were put up for shipment within a radius of 15 miles of Wilmington, though at distances more remote, owing to a difficulty of marketing the fish fresh, many were salted. The "roe mullet" usually find ready sale at an average of 12½ cents each. The "fat mullet" are strung in bunches of from 2 to 4 each, according to size, and sold at from 15 to 20 cents. A bunch

of "finger-mullet," containing 5 to 10 fish, brings 7 or 8 cents, though at times of over-supply the dealers can often purchase them for half that amount.

Though so few mullet are now salted in the immediate vicinity of Wilmington, the city has long been, and still is, an important market for salt fish, the supply coming from various portions of the coast between Bear Inlet and Little River, the majority being received from the fishermen at New River, who divide their catch about equally between Wilmington and Beaufort. According to Messrs. Hall & Pearsall, the largest salt-fish dealers in Wilmington, the height of the business was in 1871, when about 6,000 barrels were handled. Since that time the trade has fallen off greatly, until in 1879, according to the same authority, only about 2,800 barrels were sent to the city. The average annual quantity handled during the last ten years is about 4,000 barrels. Two-thirds of those received are sold in the eastern half of North Carolina, the remainder being divided between the western portion of the State and South Carolina, where they are consumed largely by the farmers and laboring classes. The price paid to the fishermen at Wilmington has varied from $1.50 to $4.50 per barrel, the average being from $2.50 to $3.25; 50 to 75 cents more being paid for roe mullet, on account of their size, than for the other grades.

At Charleston the entire catch of mullet is sold fresh, at 6 to 15 cents per bunch. Owing to this demand for fresh fish the city dealers are obliged to send to North Carolina for their supply of salt mullet.

A large majority of the fish taken in the Saint John's river are sent fresh by rail or steamer to Savannah, from which point they are distributed to the larger cities of Georgia and the Carolinas. Almost no mullet are salted in this region.

On the Gulf coast, owing to a lack of shipping facilities, a majority of the mullet are salted; but where opportunities for shipment are found, as at Cedar Keys and Saint Mark's, nearly all of the fish are sold fresh. In some cases they are kept alive in smacks until the shipping time arrives, that they may reach the market in better condition. At Cedar Keys the demand for fresh fish is good, and the price is usually such that the fishermen are not warranted in salting them, though they frequently resort to this practice to keep their catch from spoiling when for any reason they cannot be shipped. Those sent fresh are first washed in ice-water, after which they are packed with ice in hogsheads, tierces, or barrels. After they have been thoroughly iced they are shipped by express to Savannah or to some of the larger towns of Florida and Georgia. The price at Cedar Keys has increased about 25 per cent within the last four or five years. At present the fisherman receives 2 cents apiece for fresh roe mullet and 2 to 2½ cents for salted fish of equal size. The prices charged by the dealers are 4 cents for fresh mullet and 3 to 3½ cents for those salted. All other kinds of fish are sold by the pound. In some localities where the fish are salted, as at Ocklokony Bay, they are bought by the farmers, who drive down to the shore to secure them. In other localities they are often peddled through the country by the fishermen after the fishing season is over. Mr. Stearns, in speaking of the Ocklokony region, says: "When the gill-netters begin fishing none of the planters have arrived, and all fish caught in October are dry-salted and carelessly packed dry in boxes for home consumption, or to be held until the customers arrive. The roe in these fish is undeveloped, and is therefore not often saved. A little later the farmers begin to arrive at the fishing station with their teams, and sometimes their families. Some of them bring 25 or 50 sacks of salt, to exchange for the fish or to use in preparing any fresh fish which they may purchase. Others bring country produce, and a few bring money. All have their favorite trading stations, at the most popular of which, it is said, 100 to 150 are often seen waiting their turn. When a seine is landed or when a gill-net crew comes in, all of these people flock down to the shore and buy the fish at so much apiece fresh, or make some arrangement for a certain number salted."

In referring to a locality where some of the fish are peddled, Mr. Stearns says that some of the fishermen prefer to carry their catch to market, though a majority sell at their own doors. Those who adopt the former plan load up their ox-carts and start for the interior, stopping at every small town and plantation along the road until all of their mullet have been sold. In case they have been preceded by other carts, they find it necessary to travel a good many miles, some of them going as far as Columbus before they have disposed of their entire load. This practice was more prevalent in *ante bellum* days than at present, and at that time the planters, who fed their slaves largely on fish and bacon, were the principal buyers.

For many years Cuba has been an important market for salted mullet. Thirty years ago the fishermen at the mouth of the Saint John's were extensively engaged in salting fish for shipment to Havana, and though the business has been discontinued in that locality, it is still kept up by the fishermen of the Gulf coast. A large percentage of the mullet taken in Southern Florida are dry-salted and sent to Cuba, many of the fisheries being provided with vessels that devote their entire attention to marketing the catch. These vessels make regular trips during the fishing season between Havana, Matanzas, Cardenas, and other ports, selling the salted mullet at 3½ to 4 cents per pound and the dried roes at 50 to 75 cents per dozen. The duty on fish imported into the West Indies amounts to $1.40 per quintal. Probably a majority of all the mullet-roes put up along the Gulf coast, as well as many of those prepared on the Atlantic seaboard, find their way to the Cuban markets.

POSSIBILITIES FOR THE FUTURE DEVELOPMENT OF THE MULLET FISHERIES.—Questions are often asked by fishermen and capitalists in different parts of the country concerning the abundance of the mullet along the Southern coast and the possibilities of a further development of the mullet fisheries. There seems to have been a wide difference of opinion on the subject, and the answers to the questions have been very conflicting. Some maintain that the species is now taken in as large numbers as practicable, and that as many fish are now placed upon the market as can be sold to advantage. Parties holding these views think the mullet not sufficiently abundant to warrant any extended commercial fisheries, and they further claim that the fish, owing to their inferior flavor, are not destined to be generally introduced. Others, on the contrary, insist that the prospects for an extended development of the fishery are very encouraging. They state that the fish occur in such numbers as to practically do away with the question of extermination from overfishing, and that the mullet when properly prepared compare favorably with any other species, and further that by a little effort they can be readily introduced into almost any portion of the country.

During our visit to the South we were unfortunate in that we did not see the fishery at its height, though in many localities considerable quantities were taken daily, thus enabling us to get a pretty definite idea of their relative importance as compared with other species. In addition to our own observations, we improved every opportunity for gathering, from the most reliable sources, such information on all points connected with the abundance of the species and the prosecution of the fishery as would lead to a better understanding of the subject.

After comparing these notes with our own observations, we are led to believe that the prospects for an extended development of the mullet fisheries are very favorable. The reasons for this view may be briefly stated as follows:

(1) *Abundance and extended distribution of the mullet.*—One or more species of mullet may be found in the waters of seventeen of our twenty-one sea-bordering States and Territories. In thirteen of these it is taken in greater or less quantities for food, and in seven States, covering a coast line of hundreds of miles, it is more abundant than any other species during six months of the year, while in some localities it is never entirely absent.

(2) *Peculiar abundance in the in-shore waters.*—The peculiar instincts of the mullet which draw them toward the shore are greatly in the fisherman's favor, for while the cod, mackerel, red-snapper, grouper, and many other important food-fishes remain in the deep water at a considerable distance from the shore, the mullet enter the shoal water in enormous quantities, and continue their migrations along the outer beach within a few rods of the land; and, indeed, they as frequently enter the inner bays and sounds, where they are readily taken by the fishermen, who are not obliged to endure the hardships and perils of the open ocean in the prosecution of the fishery.

(3) *Readiness with which the mullet can be secured.*—The gregarious instincts of the mullet bring them together in schools, which are often of large size and great density. Instances are on record where 600 barrels have been taken at a single haul of the drag-seine, and schools containing 200 to 300 barrels are not uncommonly seen. Again, in their migrations the mullet swim near the surface, where their presence is easily recognized by their continual jumping and splashing, and the fisherman is thus directed as to when and where to set and haul his nets. With bottom-swimming fish the conditions are much less favorable, for he is obliged to make "blind sets," trusting to chance to surround a school, much time and labor being lost in making "water hauls."

(4) *Its merits as a fresh fish.*—The fresh mullet is rapidly growing in favor among the fresh-fish dealers in the districts where it is known, and though somewhat inferior to several of the more highly prized species, such as the Spanish mackerel and the whiting, it is of firm flesh and excellent flavor. Formerly it was sold only in the markets of the seaboard towns, but of late it has been introduced into many of the interior cities, where it has met with a ready sale and is regarded with considerable favor. Its distribution, however, is still confined to a comparatively small area, though there seems little doubt that it will soon be much more widely known. The improved shipping facilities along the southern coast will aid greatly in the distribution of the fresh fish, and the demand, as well as the price, will undoubtedly be increased in proportion, and the time seems not far distant when the market will take much greater quantities than at present.

(5) *Its value for salting.*—The fishermen of many localities have little idea of the value of the mullet, and in many counties almost none are salted, as the residents do not know that they could find a market for them even though they might be able to catch and cure them. The business is thus confined within narrow limits, and there are stretches of coast 50 to 75 miles in extent where not a single barrel of mullet is put up for shipment, though the fish are present in immense numbers and would yield remunerative employment to the fishermen of the locality. Even in places not now accessible by rail or steamer the fisheries could be carried on with profit, as the products could be carted overland or boated through the inner tide-channels and lagoons to the nearest shipping point. In fact, we see no reason why the entire coast from Carolina to Texas should not be one continuous mullet fishing ground.

At present a large percentage of the Southern fishermen, even where salting is practiced, are unacquainted with the best methods of curing, and many of them are putting up mullet in so crude a manner as to greatly impair their flavor and to render them of little value. Such fish greatly injure the reputation of the species and do much to destroy the demand, for when a person in testing the mullet gets fish of an inferior quality he at once infers that all mullet have a similar flavor, and seldom cares to give them another trial. Some, however, are giving careful attention to the preparation of these fish, and are putting them up in a neat and attractive manner. When thus cured the mullet are held in much favor even by the epicures. It only remains for the fishermen to become familiar with the proper methods of curing, and to give more attention to cleanliness in the preparation of their fish, to have them meet with a ready sale.

(6) *The growing demand for fishing products.*—For many years prior to the rebellion the fishery

remained almost stationary, it being carried on largely by the planters for the purpose of supplying food for their slaves. During the war, and, indeed, for six or eight years thereafter, the fishery was greatly reduced, many stations being entirely abandoned. Of late, however, owing perhaps to the changed social condition of the people, there has been a growing demand for both fresh and salt fish in all portions of the South. In the Northern States, also, the demand for fishery products has greatly increased, and to day larger quantities of fish are consumed than ever before, while twice as many could be readily disposed of in case they could be obtained at reasonable rates. This growing demand is chiefly supplied in the spring and early summer by the large catch of shad and alewives in the larger rivers, and by the mackerel vessels fishing off the New England coast. In the winter the cod and haddock are peculiarly abundant off the northern coast, and many persons are engaged in catching them to supply this trade. During the fall, however, when the great run of mullet occurs, comparatively few other species are taken in any considerable numbers, and the market is quite bare of fresh fish. This gives an excellent opportunity for the development of the mullet fisheries, for it provides a sufficient outfit for almost unlimited quantities of mullet at a handsome figure. The salt-fish trade is also greatly increasing, and the supply of mackerel, though larger than for many years, does not equal the demand, and the prices are rapidly advancing, the figures in 1882 being several dollars more per barrel than for the same quality of fish in 1881, while those of the last-named season were considerably in advance of those of the year previous.

No systematic effort has yet been made to introduce salt mullet into the markets of the North or West, and they are little eaten outside of Florida, Georgia, and the Carolinas. Even in this region, owing to the poor quality of the fish, the demand is often limited. With well-cured fish it seems that little trouble would be experienced in extending indefinitely the territory over which they are eaten, and the better grades of mullet might be brought into competition with the mackerel and lake whitefish, when their relative merits would at once be recognized.

(7) *The profits to be derived by the residents from the mullet fisheries.*—Many of the residents of the sea-bordering counties of the Southern States own small tracts of land, on which they raise limited quantities of the various products commonly cultivated in those regions. From these they derive a moderate revenue, which is often quite insufficient to supply the wants of their families, and they are obliged to devote a portion of their time to other work. In the fall and early winter, when the mullet are most abundant, these men have little to occupy their attention, and they could, therefore, engage in the prosecution of the fishery with great profit to themselves and at the same time be increasing the food supply of the country, thus greatly benefiting the manufacturing classes. The present methods are fairly adapted to the capture of the species, though they could, perhaps, be somewhat improved upon by the exercise of a little thought and ingenuity. The purse-seine, now so commonly employed by the Northern fishermen in the capture of mackerel, might be introduced with advantage for use along the outer shore, where the fish are running too far from the beach to come within reach of the drag-seines. Other Northern apparatus might, perhaps, be introduced with advantage. Even with the apparatus now in use, however, we see nothing that offers greater inducements to active and energetic men during the months of September, October, and November than the mullet fisheries.

PART X.

THE RED-SNAPPER FISHERY AND THE HAVANA MARKET FISHERY OF KEY WEST, FLORIDA.

By SILAS STEARNS.

1.—THE RED-SNAPPER FISHERY.

1. The red-snapper fishery of Pensacola and the Gulf of Mexico.
2. The red-snapper fishery of East Florida.

2.—THE HAVANA MARKET FISHERY OF KEY WEST, FLORIDA.

Origin, present condition, and methods of the fishery.

Blank page retained for pagination

PART X.

THE RED SNAPPER FISHERY AND THE HAVANA MARKET FISHERY OF KEY WEST, FLORIDA.

By Silas Stearns.

1.—THE RED-SNAPPER FISHERY.

1.—THE RED-SNAPPER FISHERY OF PENSACOLA AND THE GULF OF MEXICO.

In the natural-history section of this report the distribution and habits of the red snapper have been so thoroughly described that it is unnecessary to advert to them here.

This fishery is located almost entirely in the Gulf of Mexico, and in Florida it ranks next in importance to the sponge fishery. The vessels engaged in it are smacks and smaller vessels that preserve their catch in ice, and also the small open boats that fish near the harbor mouth, using no preservative of any kind. Pensacola is the greatest distributing point in the country for red snappers. All vessels belonging in Mobile, New Orleans, and other western ports land their fish here, to be shipped to their home ports. Outside of this, those cities depend largely on Pensacola for their supply of deep-water fish, as do all the inland towns and cities from the Gulf to the Canadian boundary.

The fishing grounds and methods of fishing.—The grounds where the red snapper are taken lie along the coast from off Mobile Bar to the latitude of Tampa Bay, in depths of water ranging from 10 to 40 fathoms. Between Mobile Bar and Cape San Blas they seem to be gullies in level sand-flats, where all sorts of animal life have found shelter from the strong currents, providing food for each other. These gullies are of all lengths and widths, some not much larger than a small vessel, while others are several miles long and quite wide. One harmonious feature about them is the way in which they lie, being parallel to one another, and running in nearly every case southeast and northwest. The farther to sea they extend the more life there is in them and the more coral and lime-rock is present, until a depth of 40 or 50 fathoms is reached. Beyond 50 or 60 fathoms the bottom becomes sandy.

Eastward and southward of Cape San Blas the snapper is found mainly living upon ridges and points of calcareous rock which protrude at more or less frequent intervals from the vast sand deserts of the Gulf bottom. In the shoaler water, rock shows itself in rather even ridges, or perhaps in almost level tracts that rise but little above the surrounding sands; while in the deeper water, as from 19 to 35 fathoms, there are sharp uneven hills and valleys that often make a difference of 3 or 4 fathoms in the depth of water within a distance of 200 feet. The latter region is the more thickly populated with fishes, but as on all grounds south of Cape San Blas, the red-snapper yields supremacy of power, in numbers, to the groupers (*Epinephelus*). They being here more abundant, more easily taken than the snapper and of not much value and in limited demand in the United States, these southern grounds are not as valuable to the red-snapper fishermen as those west of Cape San Blas where the groupers are not so troublesome. Still there

are colonies of red-snappers living by themselves in the southern region, which yield most excellent fishing on account of their having been but little disturbed by man. They are, however, small, and lying, as they do, far from land in broad areas of unproductive bottom, they are difficult to find.

The fishing grounds south of Mobile Bar in 37, 39, and 40 fathoms are called "The Southwest Ground" or "Campeche;" southeast from the same point in 19 fathoms, is the "Trysail Ground;" a small spot in-shore of that is known as the "Dutch Bank." Then from Pensacola Bar, is the "Old Southwest Ground," a small shoal-water spot but a few miles from land; the "Middle Ground" is another small bank, situated 5 or 6 miles from the bar; the "Old Deep-water," a 40-fathom ground S. and S. by E. off-shore; and the "Charles Henry Ground," and the "Henry Holes," at the edge of deep-water southeasterly from the bar. Between Pensacola and Cape San Blas there are numerous small spots for fishing which have each several names given according to the fancy of the fishermen, and often referring to some object on land that may be used as a range or bearing; as for instance the "Roger's Hill Bank," the "First Yellow Bluff," and the "Second Yellow Bluff" banks, the "Fifteen off Bald Hill," &c. Off-shore there are other grounds, designated by the depth of water on them, and some conspicuous land-marks that the fishermen use to lay their course from, as "The Twenty-one Off The Pass," "The Second Seventeen Off The Inlet," the "Saint Andrews Ground," the "Old Cape Ground," and the "New Cape Ground." South of Cape San Blas the grounds are not so well known, and also being mostly far from land are not so easily distinguished from each other. There are a few names applied to large areas of ground, as the "Dog Island Grounds," and the "Middle Ground," one including at least 25 miles square and the other being twice as large.

The fishing grounds are found by sounding, the sudden change in the depth of water showing that a gulch is reached, whereupon the vessel is hove to until the lines are tried for a bite. If the fish bite freely, a buoy is placed to mark the spot and the vessel is allowed to drift, with sails slacked off sidewise from the wind, until the fish cease to bite, when the sails are trimmed in to work the vessel up to the buoy again.

In smooth water, when a first-rate "bank" is found, the vessel is anchored near the buoy, but on small and thinly populated "banks" anchoring is unnecessary, for two or three drifts suffice to catch up all the fish that will bite. Some "banks" are so infested with foul fish, sharks, large jew-fish, leather-jackets (*Balistes capriscus*), and porgies (*Sparus pagrus*) that they give the snappers but little chance to bite, and the fishermen are obliged to leave them for others.

The gear used in this fishery consists of cotton lines 60 fathoms long, arranged with two cod-fish hooks at the end, on different snoods, and a piece of lead for sinker, weighing 2 pounds or more, fastened to the line 5 or 6 feet above the hooks. Red-snappers, and in fact all the large bottom fish caught on these grounds have their swimming-bladders very much distended with air by being relieved of the great pressure to which they are accustomed, and unless the air is removed at once the fish will not live in the vessel's well, nor will it keep so fresh in ice. To provide for this, when the fish are to be kept alive, the fishermen have little metal tubes, called "prickers," fitted in wooden handles and sharpened at the end, which they thrust through the side of the fish into the bladder, when the air escapes, and the fish is thrown into the well as lively as ever. The coarse scales of the side seem to cover the opening made by the pricker, keeping water from filling the cavity of the stomach. When fish are to be stored in ice, the air is let out by means of an old file or a one-tined fork that the fishermen sometimes use for handling fish. The deeper the water is that fish are taken from, the more distended they are with air. Those caught in 35 or 40 fathoms are puffed out in an almost round form, and the scales along the sides are started and turned up on end, giving the fish a peculiarly distressed appearance.

As a rule groupers do not become much distorted, but instead have their stomach protruded from their mouths. In such cases the stomach, when pricked, collapses and goes back to its proper place.

Some of the fishermen have finger "stalls" to prevent the hard lines from wearing and cutting their fingers, but they are not in general use. They are knitted woolen coverings for each separate finger. The Connecticut fishermen have a leather thumb "stall" to use in their business, so that they can hold the fish, while unhooking and pricking them, by the under jaw, with the thumb in their mouths, and not suffer from the snapper's long, sharp teeth.

Both fresh and salt baits are used in snapper fishing. The former is undoubtedly the best, and of the different kinds of shore fish, bluefish (*Pomatomus saltatrix*) and lady-fish (*Elops saurus*) are the best, either fresh or salted.

In the spring, summer, and fall the fishermen get sufficient bait of the kinds just mentioned on the beaches by seining, but in winter they have to depend on that which they have laid by in salt in the fall, and "bank bait" is fish caught on the "banks" and used fresh. Snappers are very capricious at times, especially in regard to their food. One hour they will readily accept salt bait, and the next nothing but fresh baits will do.

In such cases, when no fresh bluefish or lady-fish can be had, sharks, leather-jackets, porgies, and like fish are cut up and substituted. In this kind of fishing the lines are not dropped quite to the bottom, for there the large fish and groupers remain, and as the fishing goes on it often happens that the fish are tolled near the surface, when much labor is saved.

Unlike the custom on Key West smacks, these fishermen prick their own fish as they are caught, and much more care is exercised that the fish shall not touch the deck or anything that would injure them. When the well is so full of fish that holes in the bottom cannot be seen, no more are put in, for if too much crowded there is risk of losing the whole fare. Eight thousand pounds is a good load, and these smacks do not average more than 5,000 pounds.*

In winter it is necessary to go 50 or 75 miles eastward from Pensacola Harbor for snappers, while in summer they can be caught within 20 miles of it. The smacks belonging on the coast fish all the year, but are limited in summer as to the amount they shall bring to market. The Connecticut smacks come to Pensacola in November and remain until May, when they go home to engage in fishing for the New York market. All the vessels in this business average one trip per week.

Vessels employed by the Pensacola dealers deliver their cargoes as they arrive in port, handling them in bulk, and selling by the pound for fish weighing under 7 pounds, and so much apiece for all over that size. Large fish of any kind are not as salable as small ones, and but a comparatively small amount is taken at any price.

Those vessels fishing for the Pensacola Ice Company have ice-houses in them and carry ice, so that if they have heavy weather, and the fish will be damaged, they are taken from the well and placed in ice. All fish, both from the well and from ice, are packed away in the dealers' ice-boxes as soon as landed and weighed. The Mobile and New Orleans smacks bring most of their fares to Pensacola, to be shipped to home ports by rail or by steamboats. By doing this they avoid all risks of losing their cargoes by fresh water in Mobile Bay and about New Orleans, and also save much time. The additional expense of shipping in this way is more than balanced by the greater amount of fish that can be landed at Pensacola.

HISTORY OF THE RED-SNAPPER FISHERY.—About 1845 the red-snapper fishery was pursued in a small way from Mobile and New Orleans, and for a long time the only red-snappers landed

*The well-smacks are now being superseded by tight-bottom vessels and the fish are preserved in ice.

anywhere were brought to those ports by two or three small sloop-smacks which were the greater part of the time engaged in seining shore fish, and sold there at high prices in the public markets

About the year 1874 attempts were made at Pensacola to catch and handle red-snappers in a more economical and business-like manner. Staunch, well-equipped schooner-smacks were chartered in Connecticut to fish off Pensacola during the winter, and on shore arrangements were made for the storage, shipment, and sale of a large catch. On account of the poor facilities for transportation of such goods, the high prices at which the fish must be sold, and their strangeness to inland people, there was but small demand for several years, and the prospect was not encouraging to the men who had interested themselves in the enterprise. At last, however, the red-snapper became introduced throughout the country, and most other conditions were favorable for its sale in large quantities.

The pioneer Pensacola firm introduced several new methoths and features into the business, such as the buying of fish by the pound instead of by the bunch, as had before been the custom, the shipping of fish to the interior, using ice for the preservation of fish on the vessels, and the wages system of payment to the fishermen.

In 1880–'81 another fishing firm was established and new impetus given to the trade.

This season witnessed the most decided changes from many of the old customs of the business, ashore and afloat, to the latest ideas and newest methods. The fleet of vessels was considerably enlarged, and the whole improved in equipment and in the plans for catching and preserving fish. Men of experience from the deep-water fisheries of the northern countries were employed, some receiving shares of the voyages, while the majority were paid monthly wages. The crews were enlarged in number from five to seven or eight men, the extra men being required to fish from dories at different parts of the ground. Before this all of the fish that swallowed the hook or had their stomachs forced out of their mouths were thrown away, as they would not live in the well, but good ice-houses or pens were built into the vessels and all the "gulleters" saved, amounting to several hundred fish on some trips.

It was also found profitable to have a supply of ice at hand so that in stormy weather all of the fish may be removed from the well, to prevent their being chafed or killed. At first each vessel would take one or two tons of ice, but within five months the same vessels carried five or six tons, and they brought very few of their catch in wells. Consequently since that time nearly all the additions to the fleet have been vessels without wells, but with large and convenient storage-room for ice. The question of having a regular supply of fresh bait has received much attention for six years, and still is unsolved. A small pound was kept down one fall during a run of young menhaden, and as long as the fish were present it kept a supply of good bait. The part of the year when red snappers are dainty about their food is early spring when, generally, no good bait-fish can be caught anywhere within 400 miles of the fishery. The northern salt-bait, excepting squid, have been tried and proved of no value for snappers.

Another year a small freezing-room was filled with lady fish (*Elops saurus*), which kept in excellent condition, and answered the purpose well when carried to the fishing-grounds in ice water, but it was too expensive to become generally used. For the preservation of small or soft fishes there is no better way than to keep them in ice water.

The fishing-grounds lately resorted to by the fleet are so far from land and so small in area that very often the good weather would be spent in finding them by the old plan of steering a certain course and then blindly searching with sounding line. Therefore to lessen such difficulties the vessels were provided with patent taffrail logs, and the captains in some cases instructed in the simple methods of finding their position at sea by the sun.

Other methods of fishing such as are used in other waters, as for instance, trawl-lines and the cod gill-nets, have been tried by the fishing firms at a considerable outlay of money and time, but without success. One of the schooners the same year had a full crew of Gloucester or Portland trawlers, and a good outfit of trawls and dories, but it was soon decided that more fish could be caught with hand-lines than on trawls. A fishing steamer of about 85 tons was thoroughly tried in the business, and while she was quite successful and at times had great advantage over sailing vessels, the running expenses were too heavy to make it a profitable investment. The value of the steamer, invested in schooners, would give much larger returns of money, as well as of fish.

The necessity for going so much farther from Pensacola to catch red-snappers in winter has brought a larger and better class of vessels into the business than was formerly required. The most of them have been brought from the north, where they were engaged in the cod, mackerel, or New York market fisheries.

During the winter the larger vessels go 210 to 250 miles eastward from Pensacola to the "Middle Ground," consuming 10 to 15 days on a trip, and bringing home on an average 1,500 fish, and as many as 4,000 fish.

Such vessels carry from 6 to 10 tons of ice and about three weeks' outfit of stores, wood, and water. The smaller vessels fish between Pensacola and Cape San Blas, mainly southerly from Pensacola Bar, and make weekly trips. For this fishing-ground 1,000 fish is considered a good fare. During the spring, summer, and early fall, the whole fleet is fishing westward of Cape San Blas, and is quite successful on grounds that are barren in winter. Some of the vessels are either laid up at Pensacola or are engaged in northern fisheries during the months of June, July, August, and September, when it is too warm to send large quantities of fish to the interior. The fishermen are of all nationalities, and are taken largely from the merchant ships that visit Pensacola. The captains are paid by a one-fifth share of the net proceeds of the catch and 8 per cent. for skipperage; the mate receives $40 per month as wages, the cook $30 per month; and each of the crew $25 per month. The vessel pays the mate and cook from her share. The other bills are all put in together and deducted from the gross stock before there is any division between captain and owners. Some vessels still sail on the old share plan, which gives the vessel 40 per cent. of the gross earnings, less 40 per cent. of the ice bill, and the crew the remainder, less their share of the ice bill and all of the store, wood, and bait bills, which is divided equally among them. The captain receives, in addition to his share, 15 per cent. of the vessel's share.

In winter this red-snapper fishery is very rough, and even those accustomed to George's and Nantucket Shoals complain of the hardships to be endured in it. The large fishing schooners from Portland and Boston always meet with more accidents to spars and sails in one season of the choppy seas and sharp squalls of the Gulf than they do in a long time at home.

The buying price of red-snappers has remained nearly stationary for several years. At the beginning of the business at Pensacola all sizes were bought at the rate of 4 cents per pound. Then for several years there was very little demand for large size fish, during which time the prices were 4 cents per pound for small sizes under 7 pounds, and 37½ cents apiece for all fish over that weight. About 1879 the prices became 3½ cents per pound for small and 25 cents apiece for large, or "counts," at which point it has remained the most of the time, with occasional fluctuations to outside vessels of 3 cents per pound for small and 20 cents apiece for counts. Groupers have never been readily salable, and are a nuisance to the trade, as they are becoming more abundant every year, and seem to be in less demand. The fishermen bring in but a small proportion of the number caught. The grouper is a good food fish, but cannot be sold at all as long as a snapper can be had, even though the price of it is but one-half that of the other. Formerly

a few groupers were taken with snappers at the same price, but for the past two years they have been separated and sold for one or two cents per pound.*

2. THE RED-SNAPPER FISHERY OF EAST FLORIDA.

In East Florida snapper fishing is carried on chiefly by amateur fishermen and with the same kind of bait as in the Gulf.† It is stated that the fish will sometimes bite at a white rag. I am inclined to doubt the statement of Norris, the only angling authority who has written understandingly about this species, who says that they bite readily at the silver or pearl squid. They are similar in habits to the sheepshead and sea-bass, and it is well known that these fish seldom rise to the surface.

A trip to the snapper banks is a favorite summer recreation for the gentlemen at Jacksonville. A tug is chartered for the day, and always returns to the city with flags flying, whistles triumphantly sounding, and gorgeous festoons of redfish hanging over the bows.

Dr. J. Kenworthy, of Jacksonville, describes one of these excursions as follows:

"Eighteen of us left Jacksonville at 2 o'clock in the morning, reaching Mayport before daylight. Before the sun rose we were 12 miles from the shore and near the banks. The second cast of the lead furnished unmistakable evidence of rocks, and overboard went the lines. They scarcely touched bottom before the cry of 'Snapper!' 'Snapper!' was heard, and a crimson beauty graced our deck. All were soon engaged, forward, aft, starboard, and port. To feel the bite of a 25-pound snapper at a depth of 12 fathoms causes a sensation never to be forgotten. As the line is pulled in, and the fish is first seen at a depth of several fathoms, he looks like silver, and not larger than one's hand. As he comes nearer his tints deepen; as he struggles at the surface to escape, all his rich, brilliant colors are displayed; and when he reaches the deck every one exclaims 'What a beauty!' For a few minutes the shouts resounded from all sides; but a change soon occurred. Each man labored as if the number to be captured depended upon his individual exertions, and no breath or time could be spared to cry 'Snapper!' or indulge in fisherman's chaff. In less than two hours the whistles sounded 'Up lines!' for we must cross the bar at a particular stage of the tide. The fish were biting rapidly, but our tired arms and blistered fingers induced us all quickly to obey the warning.

---

*Since the above account was written Mr. Stearns has obtained the following additional information about the extent of the Pensacola fishery:

Statistics of red-snapper fleet, 1874 to 1886.

Season of—	Number of vessels.	Tonnage.	Number of men.
1874–'75	11	328.22	60
1875–'76	13	376.93	71
1876–'77	11	323.47	57
1877–'78	10	297.10	54
1878–'79	11	282.12	60
1879–'80	14	302.11	71
1880–'81	21	458.03	108
1881–'82	26	732.39	150
1882–'83	24	662.91	133
1883–'84	25	577.96	140
1884–'85	27	751.56	163
1885–'86	33	1,149.10	231

In the season of 1885–'86 Mr. Stearns states that the fishery has been a financial failure, probably on account of the severe cold having driven the fish into deeper water.—*A. H. Clark.*

†Since 1882 there have been three or four schooners from Noank, Conn., fishing for red snappers off the east coast of Florida in winter, marketing the catch at Savannah. They ship part of their catch to New York.

"On the home trip our captures were counted—not sea-bass, porgies, and small fry, but fish worth counting—and it was found that the party had captured one grouper weighing 35 pounds, two of 18 pounds, and 208 snappers, averaging 25 pounds each, the entire catch weighing 2½ tons."

Dr. J. Kenworthy's description gives a vivid idea of the abundance and voracity of red snappers on their feeding grounds.

"In April, 1877," says Mr. Goode, "the pilot-boat Nina, of Mayport, went out at noon and returned at noon on the following day. She carried six fishermen who brought back with them 90 red snappers, weighing from 20 to 30 pounds each, or about 2,300 pounds in all, besides 40 blackfish. The snappers were sold to a Savannah dealer for $1 each, and he forwarded them to New York. I saw 35 of them on the steamer Gazelle on the way to Jacksonville. I also had an opportunity of tasting one of them. The delicate flavor was destroyed by the vile process of frying, by which Floridians make their good food indigestible."

"G. W.," a correspondent of Forest and Stream, details in the issue of that paper for May 25, 1876, the history of a trip to the snapper banks, which is here abridged in order to present it as a contribution to the history of this splendid species:

"The snapper is a large, chunky-built fish, of bright-red color, weighing from 20 to 60 pounds. Its home is on a reef extending parallel with the coast, directly out to sea, from the mouth of the Saint John's. It bites greedily; when hooked fights nobly; and last, but not least, 'eats' splendidly. The steamer Mabey was to leave Jacksonville at 2 a. m.; so half an hour before that time I wended my way through the deserted streets, armed with a rope, which by courtesy they called a snapper-line, and a hook about 6 inches long. Most of the excursionists were present and the remainder were speedily collected, and then, with about fifty impatient fishermen, the Mabey steamed rapidly down the Saint John's, and about daylight arrived at Mayport, which is near the bar. It consists of some twenty houses, built upon the white sand, without a trace of vegetation. It is a summer resort for the people of Jacksonville, who go there for the sea-breeze and the fishing. Having obtained our bait, we left this place and crossed the river, where a very pretty collection of cottages marks the site of *Pilot Town*, so named from its being the home of the pilots of the Saint John's Bar. Having obtained our pilot, we stood directly out to sea. Many of the party were seasick, and while I myself was in a deplorable state, lying flat on my back, we reached the banks. After throwing out a buoy to mark the place, the fishermen baited their hooks and cast them out, and it was at this stage of the proceedings that I, who had not stirred from the cabin, heard a frantic yell of 'Snapper!' 'Snapper!' accompanied by a scampering upon deck, which sounded as if bedlam had broken loose. The noise continued, the yells grew more frequent and were of a different character, for, mingled with the cries of 'Snapper!' I now heard 'Blackfish!' 'Shark!' My sporting instinct was aroused, and, in spite of myself, I staggered to my feet, and, grasping my line, frantically gained the deck. Such a sight! The deck was strewn with blackfish and five or six large snappers, while over the side leaned four and thirty frantic men, some pulling in, some throwing out, and all yelling like madmen. I forgot that I was sick. It was a triumph of mind over matter. Baiting my hook, I quietly lowered my line. It hardly touched the bottom before I felt a pull that nearly pulled me over. I responded with a right good will. I pulled; the fish pulled. Sometimes he gained, and then, with a mighty effort, I would bring him in. The deck resounded with encouraging shouts. Finally he appeared in sight, 4 or 5 fathoms deep in the clear, blue water. He soon reached the surface, and, grasping my line, I hauled him on board. What a beauty! I never had experienced such a feeling of triumph as when, out of sight of land, I landed that snapper. Congratulations poured in, for he was the largest caught that day, and weighed full 40 pounds. I returned to the sport, and though I hooked another snap-

per, I did not land him; but I caught a noble string of blackfish, sometimes two at a time. We could stay on the bank only forty-five minutes, for we had to get back in order to cross the bar at high tide. But in that time were caught 20 snappers, weighing in the aggregate 600 pounds, and over 250 blackfish, which weighed from three-fourths to 1¼ pounds each. If we had struck the reef a little sooner we might have staid two hours, and I assure the reader that two hours of such fishing is as much as he will want.

"We strung all our fish forward, and, forgetting our sickness, sat down to a chowder of snapper, such as might make an epicure's eyes water. We arrived at Jacksonville with bell ringing, whistle blowing, and all our flags flying, and were greeted by a large and enthusiastic crowd."

2.—THE HAVANA MARKET FISHERY OF KEY WEST.

ORIGIN, PRESENT CONDITION, AND METHODS OF THE FISHERY.

A trade in fish has been carried on between the Key West fishermen and the Cubans for over fifty years, having been first started by Connecticut fishermen who spent their winters in the Gulf. At first the smacks were small and chiefly sloops, carrying 5,000, 6,000, or 7,000 pounds of groupers in their wells. As schooners came into general use in the fisheries they were sent here. These were larger, with greater well room. In 1860 there were eight or ten smacks engaged in the trade. At that time there was great demand for fresh fish in Havana, and good prices were paid for them. A smack would make eight or nine trips a year if she fished summer and winter, and it was considered that she was doing very well at that. Some few contracted with the Cubans to furnish groupers at 50 cents apiece for all fish over 5 pounds; those weighing less were counted two for one. This rate was finally broken up by competing parties, who would meet the vessels at sea, offering large prices, such as 15 or 20 cents per pound for all sizes of fish. The result was that more smacks were brought out after our civil war was ended, and the fishermen crowded them so with large deep-water fish that would not live long in the "cars" that they failed in business. Since then, or for the past ten years, the trade has assumed larger proportions, and is carried on by more reliable parties.

The smacks now make twelve or fourteen trips per year, or more than a trip per month, unless they fall in with a wrecked vessel, when they perhaps miss a trip while attending to it. (All smacks, and spongers have licenses for wrecking.) The fishing grounds are located all along the West Florida coast from Charlotte Harbor to Cedar Keys in water that is deeper than 7 or 8 fathoms. Fish are found only about the "patches" of rocks that occur on the bottom off that coast. Some of the best fishing places are in gullies where there is living coral and an abundance of other animal life; other places (not so productive generally) are on ridges of calcareous rock, that seem to be surrounded by no amount of animal life, except, perhaps, minute animals that live in the scanty growth of marine plants. When the fishermen reach the "grounds," or the vicinity of localities where they have previously caught fish, they use the lead-line continually until rocky bottom or fish are found. The sounding-lead itself has an "arming" of tallow or wax to show the character of the bottom, while on the lead-line is attached a baited hook, which is generally taken by the fish if there are any near. When rocky bottom is found, but no fish, the vessel is allowed to drift or move slowly, while the crew try their fishing-lines, and very often good fishing grounds are found in that way. As soon as it is ascertained that there are plenty of fish below, the schooner's jib is hauled half-way down, the mainsail slacked off to the fullest extent, and the schooner allowed to drift sidewise over the spot. Finally they drift away from the fish; then the lines are taken in, jib hoisted, mainsail hauled flat (foresail is seldom used at all), and the smack is worked up to

windward of the fishing ground, in order to make another drift across it. Those well acquainted know of places where they can drift several miles and catch fish nearly the whole time. They never anchor on these rocky banks, for there is every chance to lose an anchor. Fishing-lines are hard-laid cotton lines, with hooks and leads of about the same size as those used in codfishing. On these lines the lead is at the end, with the two hooks attached to it above by snoods that are 2 or 3 feet long. Groupers are strictly bottom fish, and the idea is to have the hooks as near the bottom as possible.

Baits for grouper fishing from the smacks engaged in the Havana market fishery are obtained on the fishing grounds or in the bays. Usually the grouper will take any kind of meat or fish, and then salt pork, beef, or salt fish is used to catch enough fresh bait—groupers, snappers, or sharks—to serve in catching the whole load; but there are times, winter and spring generally, when the groupers cannot be induced to take any but the choicest baits. Then the fishermen go into some bay and catch a quantity of mullet, which they put up in barrels with brine, to be kept in reserve for such times as the groupers do not bite freely. Several other kinds of fish, such as the bluefish (*Pomatomus saltatrix*), the lady-fish (*Elops saurus*), and the jackfish (*Caranx pisquetus*) are equally as good, or perhaps better, than the mullet, but are not usually found in sufficient quantities to be much sought for. This salted bait is not soaked out before being used, and seems to be as readily taken by the fish as if it were fresh. Pieces of about 2 inches square are used on each hook.

The men have to be very expert to hook the fish while drifting, and it is necessary to work fast, for the vessel moves rapidly and the spots are small. The deck is kept wet, so that the fish will not be "burned," as the fishermen call it, or injured by the hot deck, and the fish are thrown on to it as fast as caught. One of the crew, the captain usually, stands by and pricks each fish before placing it in the well. The air-bladder, or swimming-bladder, is so distended with air on being relieved from the pressure of water that the fish would not live in the well, but would float belly up; so the fishermen have a small metallic cylinder which they thrust into the bladder from the side, just above and a little back of the pectoral fin, whereupon the air rushes out with a hiss and the relieved fish flaps into the well and swims downward. Every fish must be "pricked," as this operation is called, and one of the crew does nothing else.

No fish are put into the well that are caught in over 10 fathoms of water, as they would not live until the smack reached Havana. Fish caught in over 20 fathoms of water appear at the surface swollen all over, eyes pushed nearly out of the head, and even the scales on the sides started and standing erect, presenting a distressing appearance, to say the least. Such fish will live a day or two after being pricked, but must be handled very carefully. Those from shoal water are quite hardy, and will live for months in a smack's well.

The big schooners that are now in the business carry 12,000 pounds or more, and it takes a week or two of fishing to fill them up. When the well is so crowded that the holes in the bottom cannot be seen, it is calculated that they have enough. Sometimes when it becomes calm, and the fish are not getting sufficient circulation, they have to take out a great many fish and place them in live cars alongside. This does not often happen at sea, but is of frequent occurrence in Key West and Havana Harbors. For that purpose each smack carries three or four cars, which are 8 feet long, 4 feet deep, and 4 feet wide, and made so that they can be taken apart and stowed below deck. As soon as loaded the smacks come to Key West and clear for Havana. Their cargoes are all estimated as being the same, and appear on all the manifests alike.

Arriving in Havana the smacks are assigned a place to lie in, and have to undergo many strict formulas. Their first wish is to have the fish placed in live-cars, so that they will not die. A few

days after their arrival the purchaser comes aboard with scales and proceeds to weigh the cargo alive, changing them from one car to another across the scales. The expenses per smack in Havana amount to nearly $100, and the other expenses per trip from $50 to $100.

The manifests are made out by the party who clears the smack, generally the owners or agents, then taken to the custom-house to be recorded and signed by the officials there. It is made out in the following form:

CLEARED BY FOGARTY & JOHNSON.

Report and manifest of the cargo laden at the port of Key West, Fla., on board the American schooner Mary Matilda, whereof H. Taylor is master (or conductor), bound for Havana, Cuba.

Shippers.	Consignee.	Number.	Description (marks, &c.).	Weight.
				Kilos.
Master	Manuel Suarez	2262	2,262 kilograms of live fish (estimated), valued at $500, or 1,000 escudos. No other merchandise on board. Vessel and cargo consigned to Manuel Suarez.	2,262
Ship-stores: ¼ bbl. beef, ½ bbl. flour, ½ bbl. pork, coffee, and small stores.				

Signature of ——— ———,
Collector of Customs.

PART XI.

THE POUND-NET FISHERIES OF THE ATLANTIC STATES.

By FREDERICK W. TRUE.

1. Importance and location of the fisheries.
2. The fisheries of Maine.
3. The fisheries of Cape Ann.
4. Trap fishing on the north side of Cape Cod.
5. Trap fishing on the south side of Cape Cod and in Vineyard Sound and vicinity.
6. Statistics of the pound-net fisheries of Massachusetts.
7. The fisheries of Rhode Island.
8. The fisheries of Connecticut.
9. The fisheries of New York.
10. The fisheries of New Jersey and of Delaware Bay.
11. The fisheries of Chesapeake Bay.
12. The fisheries of Albemarle Sound.

Blank page retained for pagination

PART XI.

THE POUND-NET FISHERIES OF THE ATLANTIC STATES.

By Frederick W. True.

1. IMPORTANCE AND LOCATION OF THE FISHERIES.

The pound-net fishery is an important one, both in view of the great quantities of fish taken and on account of the powerful influence it is supposed to exert in reducing the supply of shore-haunting species. Few forms of fishery apparatus are more effective in gathering in all kinds of fish, both large and small, whether swimming at the surface or along the bottom, than the great pound-nets of Massachusetts. Hook-and-line fisheries, and even the majority of seine fisheries, do not compare with the pound fisheries in the magnitude of their results. Again, while most forms of apparatus imply very considerable skill in the fisherman, the pound-net requires none. It operates by certain constant peculiarities of tides and fishes, which remain in force whether the fisherman be awake or asleep.

The distribution of pound-net fisheries along the sea-shore, as well as of the varieties of apparatus used, is modified largely by the configuration of the coast. Where it presents high cliffs looking directly seaward, the deep waters at whose base are lashed to foam in every storm, we shall look in vain for pound-nets. It would be folly to set them in such places. Those most stoutly built can scarcely withstand the violence of the open sea even on a sandy and gradually sloping shore. All other things being equal, the more sheltered a situation is the more suitable it is for the erection of these nets. For this reason we find them grouped together in bays and inlets and in the mouths of rivers. It is not to be supposed, however, that a soft, sandy, or muddy bottom is necessary for the establishment of nets. The ingenuity of the fishermen is sufficient to enable them to erect pounds on a bottom of solid rock, and in fact those in use in Maine are so built almost without exception.

The present distribution of pound-net fisheries on our Atlantic coast is in some respects a peculiar one, and will doubtless suffer many changes in coming years. Hundreds of miles of coast, especially southward, have never been appropriated for this fishery, although apparently eminently suitable for it. At present the most important pound-fisheries are those of Cape Cod, Massachusetts, and the adjacent islands. Nets are extensively in use both on the northern and southern shores of the cape, but, as I shall presently show, the fisheries of the two regions are quite distinct. Many nets are in use on the north shore of Martha's Vineyard, and a few about Nantucket and the Elizabeth Islands and in Buzzard's Bay. North of Cape Cod we find no pound-nets, if we except the very few employed at Cape Ann, until we reach Portland Bay, on the coast of Maine.

South of Cape Cod we find fisheries in Narragansett Bay, along the eastern half of the Connecticut shore, and at the eastern extremity of Long Island. A few nets are in use in New York

Harbor. From thence southward a long stretch of unemployed coast intervenes, the next fishery being in Delaware Bay. Albemarle Sound is the most southerly region in which pound-nets are in use. In importance the fisheries of Vineyard Sound and Massachusetts Bay rank first; those of Cape Ann are the least developed. Each of the more important fisheries has peculiarities as regards apparatus, methods, and ends, which I shall now briefly notice.*

2. THE POUND-NET FISHERIES OF MAINE.†

A discussion of the pound-net or weir fisheries on the coast of this State is given by Mr. Earll in the chapter on the herring fishery, and need not be repeated here. The fishery is quite different from that of any other portion of the coast.

The catch consists almost exclusively of herring. The high-flowing tides, numerous and irregular inlets, and prevailing rocky bottoms of the region have induced the use of a kind of brush weir, very simple in construction and readily adaptable to different situations. The quality, and consequently the cost, of these weirs has varied much within the last quarter-century, following the many new departures which have taken place in the fishery industry of the State within that period. A few years prior to the war of the rebellion the demand for smoked herring had become a very considerable one, and the weirs, particularly east of Penobscot Bay, were largely taxed to furnish the supply, from which it naturally resulted that they were built more substantially than before. With the close of the war the demand for smoked herring declined, and the products not being in request the weirs were suffered to deteriorate. This condition of affairs prevailed to such an extent that in 1875 less than one-fourth the number of weirs were in sound condition than had been employed in 1860. In the former year, however, the sardine industry began to assume importance, and since that time the demand for herring, especially for small herring, has been constantly on the increase. Well-built weirs have therefore been once more brought into operation, while at the same time the fishing season, which formerly extended from August to November, has been much protracted, and lasts from March to December. This last change will be looked upon with disfavor by those who believe that the pound-net fishery leads to the extermination of certain species of fishes.

In addition to these larger weirs, others, smaller and much inferior, have been constantly in use in supplying herring for bait, especially for the great lobster fishery of the State and other local fisheries, and sometimes, too, for the offshore fisheries. These have never varied much in quality or size.

Two or three heart-pounds have also been in use in Maine, a little to the eastward of the entrance to Portland Harbor, for a few years. They have practically formed the material of an experiment, and one which has been fairly successful. They resemble the brush weirs in nothing, but are closely allied to the pound-nets of Cape Cod. They cost at least $1,000 apiece, and serve in the capture of a variety of fish which are sent fresh to market. It is very doubtful whether any more of these nets will be introduced into Maine.

The financial arrangements of the weir-fishery, like the weirs themselves, are quite simple. Each of the smaller weirs costing not more than $50, and frequently much less, is usually owned by a single fisherman. Quite commonly it is necessary to replace them annually, for the crush of

* The pound-net fishery of the Great Lakes is considered in the chapter on the Great Lakes. In this chapter pound-nets include the several kinds of fish traps locally known as brush weirs, weirs, traps, or pounds, the construction of which is described in another part of this report.

† The pound-net fisheries in the rivers of Maine are described by Mr. Atkins in the next chapter.

the winter's ice "leaves not a rack behind." Even in connection with the larger weirs there is no elaborate financial organization. Usually about four men contribute to buy the weir, and are themselves fishermen for themselves.

The results of Mr. Earll's investigations show that there were in Maine, in 1880, 132 weirs, valued at $27,500.

3. THE POUND-NET FISHERIES OF CAPE ANN.

Until the year 1874 no attempt had been made in the vicinity of Gloucester to capture fish by the use of traps, pounds, or weirs. In that year a floating trap was set at Milk Island, on the outside of the cape, and a successful trap fishery has been carried on there since that time. In 1880 there were fourteen traps along the shores of Cape Ann, from Manchester to Annisquam. Most of them were made of old seine-netting, and they were therefore of little value. The fish taken in 1880 were chiefly herring and mackerel, valued at $18,000. A description of the trap in use here is given in another part of this report.

4. TRAP FISHING ON THE NORTH SIDE OF CAPE COD.

LOCATION OF THE TRAPS.—The fisheries of Cape Cod and the adjacent islands are of much greater moment than those of Maine. As I have already implied, the pounds located in Massachusetts Bay are quite different from those in Vineyard Sound, and the fishing is differently prosecuted.

The restless waters of Massachusetts Bay have caused many changes in the configuration of the northern shore of Cape Cod. Moved by their power, the sand has spread itself in an even plain, extending from high-water mark a half mile seaward, and but little inclined to the plane of the horizon. Relentlessly it has filled the old-time harbors, and thereby stifled the activity of the north-shore fishing-towns of former days. But while the vessel fishery has forever disappeared from many of the towns, the weir fishery has taken its place to a considerable extent. We may, however, with the old fishermen, look somewhat regretfully upon a change which has taken the profits of labor from the many and bestowed them upon the few.

The north-shore weirs,* as I saw them in 1880, were set at intervals along the shore from Truro to Sandwich. With but two or three exceptions they are "shoal-water" weirs, built according to a single model, and varying only in dimensions or occasionally in the absence of one "wing." The leaders run out to the edge of the great shore-shoal, being in several cases not less than half a mile long.

The manner of working the weirs is somewhat peculiar, though very simple. As one passes along the north shore roads, running parallel to and a mile or more distant from the beach, one sees narrow trails leading off at right angles through the unfenced, pine-covered, and sandy fields. If the curious traveler, desirous of knowing how these by-ways were made and whither they lead, turns into one of them when the tide in the bay be a little past the ebb, he will not long be in ignorance. At a sudden turn in the narrow lane he will come upon the fishermen, in their single-horse, two-wheeled carts, returning from the weirs with loads of fish. Twice between sunsets, during the height of the season, they drive from their houses through these lanes down to the shore, across the great wet beach and into the weirs. The fish are shoveled into the carts and carried back to the fishermen's houses, where they are packed for transportation by rail. In the upper part of the cape the towns lie near the shore, the pine barrens give place to extensive salt marshes, the water offshore is deeper, and one sees little of the odd lanes and two-wheeled carts.

* For description of these weirs see section on APPARATUS.

Boats are now generally employed in removing the fish. In pleasant weather and when the tides ebb very dry the use of carts does not involve unusual labor, but at the opening and closing of the fishing season, in May and November, when the chilly water is high in the outer part of the weirs even at lowest ebb, the work of removing the fish is most arduous. The fishermen must oftentimes wade to their waists or above in the cold water, the carts float and knock against the walls of the weirs, and the horses, half standing and half swimming, become restive and troublesome. The hearts of many men would doubtless be gladdened if the tides would henceforth ebb and flow at the same hours every day, and of none more than of the weir fishermen. At present they are forced to be at their posts at all hours, now in broad day, now in the darkness of midnight.

SPECIES CAPTURED.—The weir fishery of the north shore of Cape Cod is practically a bluefish fishery; at least it is principally upon this species that the owners depend for profits. In spring and fall great quantities of mackerel, alewives, and sea-herring are taken. Many pounds of flounders and eels are also caught, and in some seasons tautog, shad, and striped bass. Menhaden were formerly an important factor of the catch. An occasional salmon is taken. Sometimes a "delicate monster," in the form of a loggerhead, or leather turtle, or a white whale, strays into a weir, and is offered at the shrine of science by the not ungenerous fisherman. An important article on the products of the weir fishery of the north shore was published in the Yarmouth Register in June, 1870. It is so entertaining that I may be pardoned for quoting it in full:

"We have noticed many cart-loads of that not very inviting-looking fish known as the 'skate' passing our office during the past week, and understand that the entire catch of this fish in the Independent Weir has been purchased by Mr. Wilson Reyder, of Barnstable, who uses them for manure. That of the Yarmouth Weir has been purchased by Mr. Enoch F. Reyder, who finds it remunerative to boil them down and convert them into 'fish guano,' while the livers yield considerable oil. The catch is large at this season of the year, as many as 7 or 8 tons being sometimes taken in a single weir at a tide. More than 30 tons were taken from the Yarmouth Weir last month. A visit to the interior of a fish-weir, when the ebbing of the tide has left it nearly or quite dry, is interesting. More varieties of fish find their way into these 'traps' than most people imagine are found so near inshore—codfish, mackerel, squid (sometimes in immense numbers), porgies, herring, dogfish, salmon (occasionally), bluefish, bass (generally the striped bass), skate, lobster, flatfish, shad, now and then a shark, and a great variety of smaller fry, horseshoe crabs, &c. Bass and bluefish are the staple catch in the weirs off Yarmouth, though all the above varieties are taken.

"For some years past the first bluefish of the season in the Yarmouth Weir has been taken on the 2d day of June, so that now the skirmishers of this finny army are regularly looked for and confidently expected at that date. From that time until the season closes this voracious fish is a regular visitant, the catch varying from a dozen or two to several hundred at a tide. A 'pound,' as the interior trap of a weir is called, filled with these fish, presents an exciting and animated spectacle when the tide has ebbed so far that they are only partially covered with water. The ferocity and strength of the species is then shown by their frantic efforts to avoid their certain fate, their darting and snapping and fighting; and the looker-on is impressed with the idea that a company of sharks would not fight more desperately than they if occasion offered.

"Porgies are generally taken, if taken at all, in immense numbers, though their visits are not frequent in our weirs. Until within a few years the weirmen have not cared to find their pounds filled with these fish, but now the case is different, as the very fact of their coming in such numbers makes them a more valuable catch, and they are used for their oil and the manufacture of guano.

"All the edible varieties of fish taken in our weirs find a ready market in New York, where they are sent, packed in ice, every day. The weirs are visited every tide, and all of value brought to the shore, while the 'trash' is thrown outside, to be carried off by the next tide."

DISTRIBUTION OF THE CATCH.—Most of the pounds on the north shore are in direct communication with the markets by rail. The Cape Cod branch of the Old Colony line threads its way along the entire cape from Sandwich to Provincetown, and during the height of the fishing season special trains are frequently run in the interests of the fisheries. The favorite market is Boston, as being nearest, but great quantities of fish are sent to New York and Philadelphia, and occasionally as far south as Baltimore.

The mass of the products is shipped fresh, packed in ice. Almost all the weir companies are in the habit of buying boards cut in suitable lengths for shipping-boxes, the latter being put together as fast as they are needed. The weight of a full box ready for shipment is about 300 pounds. About the packing-houses of the more important weir companies, such as Philip Smith's, at Eastham, one sees great piles of these boards, which give the premises the appearance of small lumber-yards.

THE WEIR COMPANIES.—The business organization of the north-shore weir companies is not complicated. Usually four or five men own the weir, two or three of whom act as fishermen and one as bookkeeper. In the larger companies, however, the number of stockholders is often not less than ten or twelve, and the majority do not take an active part in the real work of the company, but simply invest their money here as they would in any other enterprise. The stock frequently amounts to several thousand dollars, and covers the cost of the weir, ice-houses, horses and carts, boats, tools, boxes, and other necessary apparatus and accessories of the business. In favorable years the investment is a profitable one. The more impecunious fishermen look with envy upon the wealthy weir-owners, and many regard them as at once the destroyers of their financial prosperity and of the fishes from which it might be derived. The Nobscussett Weir Company of Dennis, in 1872, declared a dividend of 20 per cent.* The interest on the capital is usually not less than 10 per cent.

Nearly every company has an agent at the markets, who sells the fish and forwards the money obtained to the bookkeeper, after deducting his commission. The agents have almost unlimited powers in many cases, and seem to be implicitly trusted by the fishermen.

The running expenses of the companies are made up of items for packing-boxes, ice, transportation, commission fees, and for repairs on the weirs. The last is an important item, for it frequently happens that the weirs are kept in the water too late in the fall, and, encountering the violence of an autumnal gale, are torn to pieces and thrown upon the shore.

6. TRAP FISHING ON THE SOUTH SIDE OF CAPE COD AND IN VINEYARD SOUND.

LOCATION OF THE POUNDS.—On the shores of Vineyard Sound we find quite a different pound fishery from that existing on the north side of the cape. The pound-nets here employed are "pounds," properly so called, being constructed entirely of netting. The huge seas which roll through the sound in stormy weather would make quick work of the destruction of lath pound-nets if the fishermen were foolish enough to attempt to employ them. The ordinary form of "heart-seine" is the net most employed,† but at Waquoit and some other places "square pounds,"

* See Provincetown Advertiser, January 10, 1872.

† See section on APPARATUS for description of these pounds.

or pounds without curved lines, are successfully operated. The Monomoy pounds are double—that is, they have two leaders and two hearts and bowls, the second leader extending outward from the first bowl.

The most important fisheries are at Chatham, off Monomoy Point, and along the western portion of the north shore of Martha's Vineyard. Other stations exist, however, at intervals from Chatham to Wood's Holl, on the south shore of Cape Cod, among the Elizabeth Islands, about Nantucket, and the eastern portion of the north shore of Martha's Vineyard. The fishery seems most completely organized at Monomoy. The nets are set westward from the shore on the great flats that extend off the point in that direction, and at but short distances from one another. Along the south shore of the cape they are placed in the shallow bays and inlets; westward, about Falmouth, at the outlets of the curious fiords of that region. The nets about the Elizabeth Islands are not of great importance, if I may exclude the Rhode Island traps which have been introduced there, to which I shall allude when treating of the fisheries of that state. Along the Vineyard shore the pounds are placed in the inlets, such as Lombard's Cove, Menemsha Bight, and others.

Unlike the fisheries of the north shore, the stations in Vineyard Sound are remote from the villages. This is notably the case at Monomoy. The fishermen establish a colony there at the opening of the fishing season, and remain until it is past. Each party, consisting of about ten or twelve men, is accompanied by two cooks, that there may be no lack of digestible and strength-giving food, and a bookkeeper, that the accounts may be in order. One or more fish-houses, in which the fishermen live, stand opposite each pound-net. The arrangements are not so elaborate on Vineyard Sound, and at the west end of the cape the pound nets lie comparatively near the dwellings of the fishermen.

The season at Monomoy extends from the 10th or middle of April to the last of May or 1st of June. It extends over a much longer period on the Vineyard, but the pounds are usually up during the heated term in the summer.

CARE AND DISPOSITION OF THE CATCH.—The catch of the Vineyard Sound pounds includes a great variety of species of fish, the number and size of each kind varying, of course, greatly in different parts of the season. The most important factors in the product of the fishery are mackerel, sea-herring, menhaden, alewives, flounders, and shad. Scup are not usually taken to any considerable extent. Some of the pounds on the north shore of Martha's Vineyard catch great quantities of squid, which are sold to the vessel fishermen for bait, as is also the major portion of the menhaden and alewives taken in all the pounds.

It is not unusual for the Martha's Vineyard companies to secure considerable quantities of bonito and Spanish mackerel. I remember that while at Menemsha Bight in 1879, at the fish-house of one of the pounds a flag was flying in order to signal to the smacks, which were lying at a distance, that the pockets of the net were full of bonito. This fish and Spanish mackerel seem to vary greatly in abundance from day to day, the hauls of the pounds for a week at a time perhaps containing not a single specimen of either species. The arrangements for disposing of the products of the weir are quite different from those employed by the north-shore companies. From the pounds of Monomoy Point the products are conveyed to market by way of Dennisport. They are carried from the nets to that place in small sloops, which are pressed into service at the beginning of the season and are kept constantly employed. The fish are, of course, taken from the pounds fresh, and are simply stowed in the boats. When they arrive at Dennisport they are taken out and packed with ice in barrels and other receptacles. Thence they go directly by rail to Boston and New York. Along the western portion of the south shore of the cape, as I have already stated,

the nets are located near the villages and in close proximity to the railroad stations, so that the fish can be immediately transferred to the cars. On the north shore of Martha's Vineyard it is customary, to a certain extent, to send the fish by smacks to New York. Several of the pound companies have, however, made an agreement with certain parties at Wood's Holl—the terminus of one of the branches of the Old Colony Railroad—for the shipment of the products through their agency to the markets. They are taken by boat from the Vineyard to Wood's Holl, and, as in the case of Monomoy, the fish are then packed in ice and shipped by rail. The use of pockets in connection with pounds enables the fishermen to hold the catch until the smacks can arrive from New York; nevertheless, those who are able to do so seem much to prefer sending by the more direct route by rail. The latter arrangement, of course, produces much more regularity in the hours of work in connection with the nets—a matter of very considerable interest to the fishermen. The practice of shipping fish in boxes, so prevalent on the north shore of the cape, is not so extensively in force here. Many fish are sent in barrels, the majority of which are sugar and flour barrels purchased from the local grocers.

FINANCIAL ARRANGEMENTS.—The financial arrangements differ but little from those already described as existing on the north shore of Cape Cod. The net pounds are quite expensive, and it is therefore necessary either that a few men invest a considerable sum or that many invest small sums. It is difficult to obtain a notion of the profits of the companies. The fishermen are quite reticent on this topic, and it would hardly be just to publish what information was actually gathered. It is well known, however, that the profits vary considerably in different years; sometimes they are so great as to make the fishermen feel wealthy at the end of a single season; but, unfortunately, at the close of a succeeding year they may feel correspondingly impecunious. In each company there are many silent partners. Usually only four or five men are actually engaged in fishing the nets. As on the north shore of the cape, one man directs the work, and is styled "captain of the pound." At the Monomoy pounds, as I have already stated, two cooks and a bookkeeper are joined to the force. The wages of the fishermen are about $50 per month.

WEIRS IN BUZZARD'S BAY.—At Fairhaven and at some other points near the head of Buzzard's Bay there are from 25 to 30 pound-nets for the capture of alewives, tautog, scup, squeteague, bluefish, and eels, also menhaden and other species used for oil or manure. The pounds, locally called weirs, are made of twine fastened to poles, and cost from $400 to $500 each. They have leaders 400 to 500 feet long. The average depth of bowl is 18 feet, with a diameter of 50 feet. They are fished from March 15 to July 15, and again from August 15 to November or December. The fishermen pay a land-lease for their weirs of from $5 to $75 a season, according to the location. The catch is marketed at New Bedford and the nearer cities, Boston, New York, and Philadelphia.

Mr. D. W. Deane, who for more than twenty-five years has been engaged in fishing with weirs in Buzzard's Bay, gives the following dates of the first appearance of each species of fish in 1880:

"March 24, caught the first menhaden, alewife, smelt, tomcod, flatfish; April 1, tautog, skate, perch; April 6, sea-herring, eel; April 14, shad; April 15, striped bass; April 17, scup; April 24, dogfish, mackerel; April 26, rock bass; April 27, sea-robin; April 28, squid; May 8, butterfish, kingfish; May 11, squeteague; May 12, flounder; May 13, bluefish; June 8, stinging ray; June 7, sand shark; June 10, shark; June 25, bonito. On July 10 the weirs were taken up, and put down again August 26, on which day the first seres was taken. This is a gold-colored fish about the size of the scup, a very palatable fish. It is quite common some seasons during August and September. August 30, first Spanish mackerel; September 6, first razor-fish; September 6, first goose-fish."

6. STATISTICS OF THE MASSACHUSETTS POUND-NET FISHERIES.

The statistics gathered by the special agents in Massachusetts in the census year show that the number and value of pound-nets in the State in 1880 were as follows:

	District.	Pounds, weirs, &c.	
		Number.	Value.
1	Newburyport	0	.....
2	Gloucester	14	$6,500
3	Salem	2	600
4	Marblehead	0	.....
5	Boston	1	500
6	Plymouth	0	.....
7	Barnstable	44	52,650
8	Nantucket	1	200
9	Edgartown	9	4,000
10	New Bedford	29	11,100
11	Fall River	6	325
	Total	106	76,875

The amount of the products of the fishery in 1880 must be set down as not less than 9,275,000 pounds as taken from the water, the first valuation of which was not less than $210,000.

7. THE POUND-NET FISHERIES OF RHODE ISLAND.

The pound-net fisheries of Rhode Island have certain peculiarities which are not possessed by those of any other region on our coast. We find no weirs here corresponding to those of Maine or Cape Cod. The coast is too much exposed to permit the use of such a frail apparatus. Pounds similar to those employed in Vineyard Sound are quite extensively in use, and very successfully. The characteristic form of net, however, one which seems to have originated in Rhode Island and has never been extensively employed elsewhere, is the trap.* It is a very simple apparatus, but one which demands the constant care of the fisherman.

As even the tyro in geography and fishery lore would at once suspect, the principal fishing-grounds are in and about Narragansett Bay. A favorite locality is at the mouth of the Saughkonnet River. As I have already stated in another place, a few traps have been introduced by the Rhode Island and Connecticut fishermen among the Elizabeth Islands, but of late years they have not been very profitable.

THE FISHING SEASON.—The fishing season for pounds extends from April to October, although but few fish are taken during the warmest days in summer; a great many pounds, however, are taken up at the end of spring. Traps are not generally in use except in spring, usually from the latter part of April to the middle or last of June. According to Mr. D. T. Church, of Tiverton, the majority of the fishermen of that place go to Seaconnet in spring and fish with their traps for about a month. At the end of that time they dry their nets and use them no more till spring again returns.

THE SPECIES TAKEN.—The principal species of fish taken are scup, bluefish, squeteague, sea-bass, flounders, striped bass, and herring. The herring are usually the fish earliest caught, and are followed by menhaden and squeteague.

* See section on Apparatus for description of this net and the manner of working it.

In the remarks of Mr. E. W. Whalley, of Narragansett Pier, before Professor Baird, in 1871, we find a statement of the usual sequence of fish at Point Judith, and are presented at the same time with a most charming fragment of folk-lore. In reply to the inquiry as to whether fish were not earlier arrived at that point than usual, he replied: "About the same. They expected them in February and got the seines ready. They had them in the water in March. I always judge by the dandelions. When I see the first dandelion, scup come in; I watch the buds, and when the buds are swelled full then our traps go in; when the dandelion goes out of bloom and goes to seed, the scup are gone. That is true one year with another, though they vary with the season. I am guided by the blossoms of other kinds of plants for other fish. When high blackberries are in bloom we catch striped bass that weigh from 12 to 20 pounds. When the blue violets are in blossom—they come early—you can catch the small scoot-bass. That has always been my rule; that has been handed down by my forefathers."*

The fish appear to be moving eastward when taken in Narragansett Bay. This is particularly the case with scup.

DISPOSITION OF THE CATCH.—The facilities for shipping fish from Narragansett Bay by rail are excellent. No difficulty is found in getting the catch safely to market in a very fresh state. They are usually packed, as in other places, with ice in barrels. Good prices are generally obtained.

FINANCIAL ARRANGEMENTS.—The financial organization of most of the trap companies in Rhode Island does not differ from that of the pound-net companies in other regions already described. At Little Compton, according to Mr. Kumlien, the shore suitable for the pound fishery is divided into twenty-one "sets" or sections, of 65 fathoms each. As some sets are better than others, all are drawn for by lot. No one can draw unless he has all the gear required for fishing. A man may have nearly all the necessary apparatus and yet be excluded from the lottery. That the poor man, however, may not be unfairly pushed aside, he is allowed to ally himself with some man richer than himself, thereby forming a firm. A rich fitter often enters into partnership with a poor fisherman, the former furnishing the lacking apparatus, while the latter does the fishing. The nets must be 65 fathoms apart. When three sets exist in one bay the parties occupying the middle one are allowed to use leaders of sufficient length to bring their net in a line with the remaining two. In this same locality, before the Sunday close-time was enforced, the fishermen had the rule that those who were not at their posts on that day got nothing of the profits from the fish taken.

The fishing is usually carried on on shares, the fitter receiving one-third of the gross receipts and the fishermen the remainder, after the expenses of board are subtracted. Usually a fishing-gang consists of six men and a cook. Frequently it occurs, however, that one cook is able to prepare food for two or three gangs of fishermen.

An average trap is worth $350. This amount includes the cost of boats, extra twine, and all other minor appurtenances incidental to the active prosecution of the industry. These traps are seldom owned by a single man, but usually by three or four, the majority of whom are part owners. Many pound-nets are made of condemned menhaden-seine netting, and have therefore no great value.

According to the data collected in Rhode Island in 1880, the number and value of pound-nets in use in the State were as follows:

Traps.	Number.	Value.
Pounds and weirs.....	166	$56,633

* Report U. S. Fish Commission, I, 1873, pp. 24–25.

This is a marked increase over the number existing in 1877, which has been set down by Professor Goode as thirty.

No difficulty is usually found in securing good prices for the fish in New York and Philadelphia. The markets of Providence and Newport also absorb a very considerable proportion of the products of the fishery.

STATISTICS FOR 1880.—The amount of the catch in 1880, according to the information obtained by Messrs. Kumlien, Wilcox, and others, was about 8,300,000 pounds.

In 1877 the yield of three traps was as follows:

	Pounds.
Flounders	17,225
Tautog	15,675
Scup	112,750
Weakfish	29,325
Sea-bass	10,500
Bluefish	28,625
Total	209,100
Average to the trap	69,700
Estimated yield of the 30 traps in use in 1877	2,091,000

In 1876 the three traps of Messrs. Edward Gladding & Co. and Mr. H. M. Merritt yielded 248,400 pounds of fish, or about 82,800 pounds to the trap.

In 1867 Mr. Benjamin Tallman, of Portsmouth, caught in six traps in nine days $18,000 worth of fish. Estimating the value of the fish at $5 per box, which is not too great a sum, the number of boxes secured was about 3,600, representing 1,260,000 pounds of fish. The average catch to a trap each day was about 23,300 pounds.

8. THE POUND-NET FISHERIES OF CONNECTICUT.

CONNECTICUT RIVER SHAD-POUNDS.—The pound-net fishery in Connecticut for the capture of shad is carried on chiefly at the mouth of the Connecticut River and to the westward. The nets are in every respect similar to those fished on Vineyard Sound, and it is therefore unnecessary for me to do more than allude to them. Full information on this topic will be found in the chapter on the river fisheries of the Atlantic States.

9. THE POUND-NET FISHERIES OF NEW YORK.

LOCATION AND IMPORTANCE OF THE POUND-NET FISHERIES OF LONG ISLAND.—In New York the pound fisheries are confined to Long Island, and are not so extensively carried on as formerly. The height of the prosperity of the fishery seems to have been reached in 1875. The investigations of Mr. Fred. Mather show that there are nets scattered along both shores of Long Island at considerable intervals. They are moved quite frequently, to the end that more fish may be taken.

The nets employed correspond to those in use in Vineyard Sound. Some, however, have no "heart," but merely a funnel leading into the bowl, which may be circular or square. Such nets are known in common parlance as "traps." All the nets have leaders.

The fish most sought for are shad and striped bass. Some of the traps are employed for the capture of the latter species alone. A few Spanish mackerel are taken in many of the nets.

According to the information obtained by Mr. Goode from Captain Ashby in 1877, it appears that certain pounds at Napeague in 1876 caught nothing but squid. Each pound took an average of 15 tons every morning during six weeks. This was during the last of May and through the month of June.

Between Orient and Oyster Bay, on the sound shore, the fishermen are mostly the farmers of that district. To the eastward, however, many nets are owned by non-resident citizens, who purchase the fishing privileges from the resident owners.

About Orient and some other regions the season lasts from May to October, but in Flushing Bay and elsewhere, where the nets are only employed for shad and menhaden, the fishing times *occur only in spring.*

New York market absorbs the greater portion of the products of the Long Island pound-nets. The fish are commonly sent by rail in ice. Many menhaden are used for manure.

The total catch of the pounds in 1880 was not less than 1,566,000 pounds.

Mr. Mather gives the following interesting statistics of two pounds owned by Capt. Henry Ballort at East Marion, and regularly in use for nine years. The owner shipped his fish to New York market in boxes containing 225 pounds. His shipments for nine years were the following:

Year.	Boxes.	Pounds.
1871	272	61,000
1872	321	72,225
1873	363	81,675
1874	320	72,000
1875	251	56,475
1876	146	32,850
1877	236	53,175
1878	241	54,225
1879	113	25,425
Total	..	515,050

Captain Ballort had kept no record of the separate amounts of various species taken, but recollected the annual catch of Spanish mackerel to be about as follows: 1871, 6,000; 1872, 2,500; 1873, 1,000; 1874–'78, 500; 1879, 10 fish. He says that in 1871 Spanish mackerel were plenty.

The number of pound-nets in use in New York State in 1880 was 87, valued at $43,500.

10. POUND-NET FISHERIES OF NEW JERSEY AND DELAWARE BAY.

We find the main body of the fisheries occupying but two localities, namely, the west shore of *New York Harbor to* Sandy Hook, and Delaware Bay between Cape May and Dyer's Creek. Some nets are also set about Barnegat Inlet. Pound nets were introduced into New Jersey in 1855, but did not come into general use till 1873. In 1879 there were six pound-nets between Long Branch and Sandy Hook, stocking an average of $10,000 each, and clearing fully $7,000 apiece on fish taken during the season. In 1880 there were eleven pound-nets in the same section and two smaller ones in Sandy Hook Bay. These outer pounds averaged about $8,000 each, and cleared $5,500. The best one stocked about $12,000.

The nets employed in Delaware Bay are peculiar in having two compartments in the bowl, one for fish, and one for king-crabs. The king-crab compartment has stakes at the bottom, netting not *being suited to hold these animals. The other pounds are of the* ordinary type. These pounds are

much inferior to those at Sandy Hook, being valued at only about $90 each. They were introduced here about 1870. On account of the difficulty of finding a market for their catch they stock on an average only about $400 a season.

The fishing season about Sandy Hook extends from May to November if the weather permits, and in Delaware Bay from March 1 to the middle of June.

The chief varieties of fish taken are weakfish, or squeteague, Spanish mackerel, butterfish, bluefish, sheepshead, bonitos, and shad. In Delaware Bay, as I have just stated, great quantities of king-crabs are caught.

The financial arrangements present no especial peculiarities. The products of the nets go mainly to New York and Philadelphia. The prices are frequently so low that the fishermen cannot dispose of the fish to any advantage, and often let them loose in the water. This is more especially the case southward.

The number of nets in use in the State in 1880 was twenty-seven, valued at $19,800.

Regarding the introduction of pound-fisheries into New Jersey, Mr. Earll says that the first pounds fished there were very small, and were placed along the inner shore of Sandy Hook. The same style of pounds were fished until about 1873, when larger ones were placed along the ocean shore, and their importance in connection with the Spanish mackerel fishery was then discovered. The majority of the mackerel secured about Sandy Hook are now taken in this way. One hundred fish in number was considered an average daily catch for the fishing season of 1879, and 100 to 140 for 1880, though much larger catches were occasionally secured. The best day's fishing for a pound-net in that locality occurred in the summer of 1879 when Mr. Robert Potter took 3,500 pounds, valued at $700, at a single lift.

11. POUND-NET FISHERIES OF THE CHESAPEAKE BAY.

Between New Jersey and Chesapeake Bay there are no pound-net fisheries. In the latter locality the fishery has been engaged in since 1858, having been introduced from New Jersey in that year. Mr. Earll, in his account of the Spanish mackerel fisheries on a preceding page, says that the pound-net was introduced into the Chesapeake against the prejudice of the fishermen, but has revolutionized the fisheries of Virginia. Prior to 1870 the fisheries of the region were of little importance, being carried on with hand-lines and drag-seines for a few weeks in the spring and fall, while to-day the Chesapeake is the center of one of the most important shore fisheries in the United States. The pound-net has not only more than doubled the catch of ordinary fishes, but it has brought to the notice of the fishermen many valuable species that were previously almost unknown to them. In 1880, 162 pounds were fished in Virginia waters, with two others located at Crisfield, Maryland, just above the Virginia line.

In general make-up the net employed in Chesapeake Bay corresponds closely to that in use in Vineyard Sound. Each costs about $1,000, a second set of netting being used when the first is taken out to be dried and repaired. In the warm waters of this region the netting cannot remain down more than two or three weeks without being seriously injured.

The hauling of the pounds is ca[illegible] three or four men from a boat. When there is a large run of "scrap fish," or when [illegible]arge, a signal is given and a flat boat or scow is sent out from the shore to rece[illegible] It is taken to the point on the outside of the net, and the worthless fish are thr[illegible]st as the marketable ones are sorted out. Frequently both boats are loaded and [illegible]d after reaching the shore.

The average stock for marketable fish during the season for this locality is about $4,200 per net, the marine species named in order of value being Spanish mackerel, taylors, trout, sheepshead, porgies, and mixed fish. If the value be neglected, and the number of individuals be considered, the order should be changed so as to read: Trout, taylors, mackerel, mixed fish, porgies, and sheepshead, with the addition of refuse fish, which are either thrown away or used for fertilizing purposes.

According to the best-informed fishermen, 100,000 trout, 40,000 bluefish, locally known as "taylors," 30,000 Spanish mackerel, 10,000 mixed fish, 3,000 porgies, and 1,000 sheepshead represent the catch of the average pound for 1879. The money value of the catch is divided among the species as follows: Mackerel, 36 per cent.; taylors, 24 per cent.; trout, 21 per cent.; sheepshead, 6 per cent.; porgies, 5 per cent.; mixed fish, 8 per cent.

On the west shore of the Chesapeake the pounds are much smaller and the catch is proportionally less, while the fishing season is also different. Here the pounds are put out in time for the run of shad, which begins early in March and continues until the last of May. After the shad season is over many of the nets are taken up. Almost none remain down through the summer, though a number are fished in the fall for trout and other species. On the eastern shore the law allows pounds to be fished only between the 25th of June and the 1st of October, during which time they are lifted regularly every day when the weather will permit.

12. POUND-NET FISHERIES OF ALBEMARLE SOUND.

In Albemarle Sound, the southern limit of the pound-net fishery, this branch of the industry is not so important as some others which are prosecuted there. Col. Marshall McDonald, who visited this region in behalf of the census, gathered information on pound fisheries, and has given me a summary of his observations.

It appears that pound-nets were introduced here in 1870 by a German, Mr. Hettrick, who still controls some of the more important stations. The nets employed are similar to the Rhode Island traps, but are so constructed as to prevent the escape of the fish. They are located almost without exception at the head of the sound, on the north side.

The fishing season lasts from the middle of March to June. The principal fish taken are white perch, rockfish, herring, and alewives. Considerable numbers of shad are also taken.

The business arrangements of the fishermen are somewhat different from those of other regions. Usually several nets are owned by a single man, who furnishes the netting and buys the fish. The products are shipped to commission agents in the principal cities to which they are sent.

At least half the products supply the local demand, the remainder being sent to Norfolk, Richmond, and Baltimore, from which points, of course, they are again distributed. The fish are taken from the nets to Edenton in six or seven small schooners and sloops of 11 to 15 tons burden; thence they are shipped to the centers, fresh, in ice, in boxes of about 300 pounds each. The majority of the herring, however, are smoked or "struck," and sold to the farmers in the immediate vicinity of the fisheries. It is only in spring that the fishermen find it profitable to send their herring fresh to the larger markets, Philadelphia and Baltimore. In 1880 about 104 nets were in use, worth at an average $400.

A small number of brush weirs are also in use in the sound, but the fishery is not important.

In 1880 pound-nets were introduced into the Ogeechee River. Their use is at present experimental. Two or three nets are also in use in the Neuse River.

Blank page retained for pagination

PART XII.

THE RIVER FISHERIES OF THE ATLANTIC STATES.

FLORIDA TO LONG ISLAND SOUND BY MARSHALL McDONALD; MASSACHUSETTS AND NEW HAMPSHIRE, BY W. A. WILCOX AND FREDERICK W. TRUE; MAINE, BY C. G. ATKINS.

1.—THE RIVERS OF EASTERN FLORIDA, GEORGIA, AND SOUTH CAROLINA.

1. Saint John's River, Florida.
2. Saint Mary's River.
3. Altamaha River.
4. The Satillas.
5. The Ogeechee River.
6. The Savannah River.
7. The sturgeon trade of Savannah.
8. The Edisto River.
9. The Santee River.
10. The Peedee, Sampit, Black, and Waccamaw Rivers.

2.—THE RIVERS AND SOUNDS OF NORTH CAROLINA.

1. The Cape Fear River.
2. The Neuse River.
3. The Pamlico and Tar Rivers.
4. Fisheries of Pamlico Sound.
5. Albemarle Sound and its tributaries.

3.—THE FISHERIES OF CHESAPEAKE BAY AND ITS TRIBUTARIES.

1. General Review.
2. The James River.
3. York River and its tributaries.
4. The Rappahannock River.
5. The Potomac River.
6. The Susquehanna River.
7. Minor tributaries of Chesapeake Bay.

4.—THE FISHERIES OF THE DELAWARE RIVER.

History and present condition of the fisheries.

5.—THE FISHERIES OF THE HUDSON RIVER.

The shad, sturgeon, and herring fisheries of the Hudson River.

6.—THE CONNECTICUT AND HOUSATONIC RIVERS AND MINOR TRIBUTARIES OF LONG ISLAND SOUND.

1. The Connecticut River.
2. The Housatonic River.
3. Minor tributaries of Long Island Sound.

7.—RIVERS OF MASSACHUSETTS AND NEW HAMPSHIRE.

1. *The Taunton and Cole's Rivers.*
2. Buzzard's Bay and its tributaries.
3. The alewife fisheries of Cape Cod.
4. *The Merrimac River.*
5. The Exeter River, New Hampshire.

8.—THE RIVER FISHERIES OF MAINE.

1. Geographical and climatic relations.
2. Characteristics of the rivers.
3. Natural and economic history of the river fishes.
4. Descriptive and historical notes on local fisheries.
5. Laws relating to the river fisheries.

Blank page retained for pagination

PART XII.

THE RIVER FISHERIES OF THE ATLANTIC STATES.

1.—THE RIVERS OF EASTERN FLORIDA, GEORGIA, AND SOUTH CAROLINA.

By Marshall McDonald.

1. SAINT JOHN'S RIVER, FLORIDA.

Description of the river.—The extreme sources of the Saint John's River lie south of the twenty-eighth degree of north latitude. It trends north and south, and, gathering accessions from a hundred lakes, finally discharges its waters into the Atlantic Ocean under latitude 30° 30′. Its general course is from south to north. Like the Gulf Stream, therefore, it carries the warmth of the south to colder latitudes, in which respect it differs entirely from the other principal streams of the Atlantic slope, all of which run south and east, having their sources north, among the mountains, and carrying down to their lower reaches water of a lower temperature than that of the surrounding locality. This is especially true in the spring and early summer, when we find the temperature of these streams progressively diminishing as we ascend to their headwaters. The data are not at hand to furnish a tabular statement in proof of this progressive rise of temperature as the headwaters of the Saint John's are approached, because records are only kept at one point—Jacksonville; but the course of the river from south to north clearly shows that such must be the case. From the records of the signal office at Jacksonville we have obtained a connected series of observations* of the temperature of the river for the years 1873–'74, 1877–'78, 1878–'79, and 1879–'80.

An examination of these tables shows that the river temperature passes below 60° about the 1st of December, not again rising above that degree until the middle or end of February.† Coincident with this period of low temperature the shad run begins, the fishing season being at its height in February, when the temperature reaches 60°. A comparison of these observations with those for other rivers shows that though the shad season on the Saint John's differs widely in time from that on more northern streams, yet it occurs under similar conditions of water temperature; in other words, the time of the occurrence of shad in any river appears to depend solely upon the

* For tables see Section I, Natural History of Aquatic Animals, pp. 600, 601.

† In 1871 William Dempsey bought shad at New Berlin, on the Saint John's. He found that the average monthly catch per net was, in December, 82.6; in January, 413; in February, 619; and in March, 207. This indicates that from the latter part of January to the end of February is the period of the greatest abundance of shad in this river.

relative temperature of the water. The shad ascend to the very sources of the Saint John's, there being no obstructions, and spawn in Lake Monroe, distant several hundred miles from the Atlantic.

METHODS EMPLOYED IN THE SHAD FISHERY.—In this river the shad is the only fresh-water species which is the object of organized fisheries. The principal salt-water fisheries are discussed by Mr. R. E. Earll in his account of the salt-water fisheries of the Florida coast. From Palatka down the shad fisheries are prosecuted entirely with gill-nets. On Lake Monroe are three small hand-seines.

The shad caught in the Saint John's are either sold fresh to supply local demand, or are packed in ice and sent to Northern markets. Savannah is the principal point to which shipments are made. There the fish are rehandled and reiced, and then sent by steamer and rail to the interior towns of the South Atlantic States or to the Northern cities. Probably three-fourths of the entire catch is so distributed. No definite number of shad makes a package, which usually consists of a rice or other convenient barrel or box, the largest being selected when possible, in order to save freight.

MR. EARLL'S ACCOUNT OF THE FISHERY.—Mr. Earll gives the following historical data in regard to the fisheries of the Saint John's:

"Shad were first caught at Mayport by Charles Waterhouse, of Connecticut, in 1858. He had previously fished in the Savannah, but abandoned it on account of poor results. At Jacksonville gill-nets were first used in the shad fisheries in 1868. At Palatka, C. B. Smith, of Connecticut, was the first to establish a shad fishery. He began the work in 1872, and it was not until 1877 that a second fishery was started. In the year 1873, 94,000 shad were caught at New Berlin with thirty nets (an average of 3,133 to the net). From 1865 to 1875 the average catch was 25,000 to the net. The year 1876 was the most prolific season of all, when each net averaged a catch of 5,000. In 1875, at Palatka, one net caught 11,000 shad, and in the same year it is said six nets took 55,000."

Dr. Charles Kock, in a letter from Jacksonville dated January, 1874, says: "From the bar at the mouth of the Saint John's River up to Palatka seventy-five to eighty nets are fished during the shad season. These nets are about 200 yards long and 10 feet deep (the mesh 1½ inches square), and are set in from 10 to 12 feet of water. In 1874 the product of the shad fisheries amounted to 250,000 shipped or consumed. The average price at Jacksonville, season of 1872–'73, was 15 cents *apiece*."

MR. GOODE'S ACCOUNT OF THE FISHERY.—The following interesting description of the shad fisheries of the Saint John's River, from the pen of Mr. G. Brown Goode, is inserted entire:

"The shad is next to the mullet the most important fish of East Florida. The Saint John's seems to mark its southern limit of distribution, though within the past few years it has been acclimated by the efforts of the United States Commissioner of Fisheries in trans-Mississippi and several other waters emptying into the Gulf of Mexico. It has been claimed by many persons that the shad has not inhabited the Saint John's River until within a few years past. This has been clearly shown to be a mistake, arising from the fact that during the war no fishing was carried on, and that before the war local enterprise was not sufficient to develop the industry. Col. H. S. Sammis, of Arlington, and other early settlers remember the capture of shad in the Saint John's as early as the year 1840. Mr. Waterhouse had one or two nets at Mayport about 1861, and is said to have met with good success. About 1865 and 1866 Mr. Remps and others began fishing, and since 1870 the fisheries have been constantly on the increase. There are shad also in the Saint Mary's River, though no effort is made to capture them. The Saint John's River shad are not so

large as those of the Connecticut, the average weight being 3 or 3½ pounds. In 1874 I was told that they sometimes weighed 6 pounds, in 1878 that they never exceeded 5. Has there been a falling off in size? They are rather higher in body than the Northern shad, but are in no wise less plump and delicate in flavor. Like most Southern shad, they have black-tipped caudal fins. I ate shad caught at Jacksonville April 15, 1878, and in spite of the warmth they were fully as hard and sapid as the best May fish from the Connecticut, just from the seine.

"The season of 1877–'78 was unusually long in the Saint John's. The first shad was taken November 20, 1877, and they were in market in some numbers at Thanksgiving. December 15 shad fishing was at its height. April 15 shad were still in fine condition, though the nets were taken out about this time. In 1874 the first was taken November 10, in 1876 December 1. In 1874 the fishing continued till June 1.

"The spawning time is apparently from the middle of March to the latter part of April. March 20, 1875, and April 15, 1878, showed mother fish in fine full roe, almost ready to spawn. I am told that the fishing continues a week or two later farther up the river at Lake Monroe. The fishermen say that the shad spawn at the very head of the river, but I have no doubt that many deposit their eggs on convenient grounds nearer the sea. The fishermen also have a notion that shad that have well ascended the river never return, for they say that they have never known a spent fish. This they account for by the theory that they are devoured by alligators and catfish, the shad being weak and helpless after spawning. The young fish, they tell me, are seen in large schools along the banks in summer and autumn, descending to the sea.

"The shad fishery is carried on entirely with gill-nets. These nets are 4½ to 5 inch mesh, usually scant 5 inches, 45 to 50 meshes deep and 300 to 500 fathoms in length. They are made in Boston and cost from $100 to $125 each, fitted for use. The boats are center-board sail-boats, about 15 feet long, with movable mast and sprit sail. They are built at the mouth of the Connecticut River, and cost about $60 each.

"The nets are heavily leaded; the leads weigh 2 ounces each, and are placed 2½ feet apart. Formerly they were placed 6 feet apart.

"The fishermen are principally Northern men from Cape Ann, Connecticut, and Delaware Bay, who come south expressly for this shad-fishing. From sixty to one hundred of these men come down every winter. They camp out in tents or shanties conveniently situated to the various reaches along the river.

"The nets are allowed to drift with the current; they are set directly across the river, and drift broadside to, one end being buoyed, the other retained in the boat.

"There were about eighty shad-nets operated on the Saint John's at the date of my last visit, in April, 1878. Of these Kemps, Mead & Smith, of Jacksonville, owned twenty-five, receiving also the proceeds of four independently owned. John Buckle, of New Berlin, owned seven, and received the fish from eight fishermen who owned their own nets and boats. The Mayport Fish Company, Mr. L. S. Burroughs agent, runs four nets, and there are also eight or nine independent fishermen at the bar who own their own gear. There are said to be one or two nets at Lake Monroe. Kemps, Mead & Smith work their nets in all the reaches from Mayport to Palatka; Melton & Co. from Mayport to Jacksonville; Mr. Buckle and the other New Berlin fishermen from Mayport to New Berlin; and the Mayport fishermen from Mayport almost to New Berlin.

"Between Mayport and Jacksonville are seven reaches or long stretches of river suitable for drifting with the shad-nets. They are (1) the Mayport Reach, about a mile long; (2) the Sisters Reach, 2 miles long; (3) Saint John's Reach, under Saint John's Bluff, half a mile long; (4)

Shipyard Reach, three-fourths of a mile long; (5) Clapboard Reach, 1 mile long; (6) Yellow Bluff Reach, half a mile long; and (7) Baxter's Reach, 7 miles long, from Reddy's Bluff to Jacksonville.

"The nets are worked both on the ebb and flood tide, though the latter is preferable, from the fact that the fish ascending the stream 'gill' easily in the net drifting in the opposite direction, while the net floating behind them with the flood overtakes them with difficulty. Sometimes the boats make two drifts on one tide, sailing back a second time to the head of the reach. Often there are many nets on one reach. In this case they take turns, the first set belonging to the boat which first gains the head of the reach.

"Averaging the eighty nets at 2,500 shad each, which seems to be a fair estimate in the opinion of Mr. Kemps, Mr. Buckle, Mr. Balsam, and Mr. Kelly, of New Berlin, we have the estimated yield of 200,000 shad for the Saint John's for the season of 1877–'78. The results of the previous season, 1876–'77, obtained by a similar method, probably did not fall much below 280,000, while 1875–'76, 1874–'75, and 1873–'74 the yield was about 160,000 or less.

"Mr. Yate estimated independently that the catch of 1877–'78 amounted to 200,000, and that of 1876–'77 100,000 additional.

"Melton & Co. handled about 80,000 shad in 1877–'78, of which about 20,000 were sent north. In 1876–'77 they handled about 120,000. In 1875, at the time of my second visit to Florida, Mr. Melton estimated the quantity handled by him in the season just past, that of 1874–'75, at 125,000.

"Kemps, Mead & Smith handled, in 1877–'78, 35,000 to 40,000 shad; in 1876–'77 about 60,000, of which 40,000 were sent north. In my own judgment, the shipments to Northern markets in 1876–'77 cannot have fallen far short of 100,000 fish, and in 1877–'78 probably approximated 60,000.

"The fishermen who work the shad-nets are employed on shares, the boat and net being furnished by the fish dealers, the fishermen receiving from 8 to 12 cents for each shad they catch. Ten cents is perhaps a fair average rate. The most successful net at New Berlin in 1878 took 4,000 shad; the least successful, an old net worked by two negroes, took 900. The two fishermen netted in the first instance $200 each, in the last $45 each. The average profit in the last instance was probably $150, in 1878 not more than $100, a very meager return for four months' labor, after board bills, cost of fishing-clothes, and passage money are deducted.

"The cost of the fish to the dealers is rather hard to determine. The boats cost $60 and the nets $125. The boats last five or six years, the nets hardly more than one season. Allowing $15 for wear of boat and interest on its price, and $100 for the net, we find that, independent of their own subsisting and the cost of maintaining their establishments throughout the year, the actual cost of catching the fish, which falls to the share of the fishery capitalist, amounts to 4½ cents on each fish. Thus, at the very lowest estimate, the cost of bringing the fish from the water into the boats cannot fall much below 15 cents. These fish retail in the local markets for 25 cents each, small ones sometimes selling for 20. The cost of shipping to a Northern market is considerable. Let us take the extreme example of New York City. When shad are iced for the Northern markets they are packed in tierces which contain about 140 fish. To pack a tierce of fish properly requires 250 or 300 pounds of ice. Ice costs, perhaps, $12 per ton, bought from the Northern schooners. Allowing for waste, we will estimate the cost of ice for a tierce of fish at $2. The tierce is worth at least $1. Expressage to Savannah costs $3 on each tierce, and freight by steamer to New York $2. Thus, making no allowance for cartage or labor of packing, at the end of the route we must add $8 to the cost of a tierce full of shad, or 5 cents and 7 mills each. The cost of fish delivered in New York is 21 cents, and perhaps more. But then we must take into account the severe losses necessarily sustained by dealers in such perishable wares as

fresh fish. Thousands are often lost in a week, and the loss of one tierce materially lowers the profit on many others. In my own judgment, 40 cents would be a very small return, and perhaps 50 or 60 would be more equitable. Before the shad reaches the table of its final purchaser it must pass through the hands of two additional agents—the wholesale fishmonger and the retail dealer. It appears evident, then, that Florida shad must always be a luxury in the North. If the proposed improvements in the navigation of the Saint John's are ever effected, through lines of steamships to New York, with refrigerators built especially for transporting fish, would doubtless be sustained. In this event the cost of transportation would be much diminished, the cost of icing somewhat diminished, and the risk of loss entirely done away with. The fish would then reach their destination in excellent condition, and we may anticipate a very great reduction in their price. Forty or even 35 cents ought to remunerate the dealers, as well as double that price at the present time."

STATISTICS OF THE FISHERY.—The amount of capital invested in the shad fishery on the Saint John's in 1877 may be roughly estimated as follows:

	Value.
Seine-boats (80, at $50 each)	$4,000
Gill-nets (80, at $100 each)	8,000
Shanties, platforms, reels, fish-houses, &c	3,000
Total	15,000

The number of fishermen and shore hands does not probably exceed one hundred and seventy-five.

The total value of the shad fisheries for the four months and a half beginning December and ending April 15 may be fairly estimated at $50,000, allowing 25 cents to be the price at retail in Jacksonville. The actual cost of catching the fish has been shown to be 15 cents, allowing no profit and no risk-margin to the capitalists. The cost of taking the fish out of the water, then, is about $30,000.

Statistical summary of the fisheries of the Saint John's, Florida, for the season of 1880.*

Number of men employed	182
Amount of capital employed	$13,630
Product of the fisheries, in pounds (shad)	251,700
Value of product	$20,136

2. SAINT MARY'S RIVER.

Saint Mary's River lies between Florida and Georgia, and has its source in Okefenokee Swamp. From its size and character we would expect to find it abounding in extensive and valuable fisheries. Shad fishing, however, has met with only doubtful success, and no organized fresh-water fisheries have ever been prosecuted on the river. A considerable number of sturgeon are taken in the estuary, and find a market in Savannah. The statistics of capture and value are given in the discussion of the sturgeon trade of Savannah.

3. ALTAMAHA RIVER.

The shad fisheries of the Altahama seem to have been formerly much more productive than they are now. The migrations of the shad before there were any obstructions extended on the Oconee to some distance above Milledgeville. At the present day, although there is nothing to prevent their passage up to that place, they are rarely or never seen there.

* For details see Census Volume on *Fisheries*.

The organized fisheries are prosecuted exclusively with gill-nets, which are either floated with the tide or staked across where the fish run. Skim-nets and dip-nets are used at various points along the river, but the product thus obtained is insignificant, and we have no returns of it.

No regular fisheries exist above Doctor Town, at which point four men, fishing five gill-nets, take annually about 1,200 shad and 4,000 pounds of other fish. Parties from Brunswick, fishing for shad to supply the local market, take 3,000 shad and 6,000 pounds of other fish. At Darien, Ga., eleven men fish eleven nets. The product is 4,400 shad and 8,000 pounds of other fish, all of which goes to supply the local market.

The following summary will show how disproportionate to the magnitude of the river is the importance of its fisheries:

Number of men employed in the fisheries	49
Amount of capital employed	$2,900
Product of 1880, in pounds:	
Shad	30,100
Sturgeon	8[illegible],500
Mixed fish	38,000
Value of product	$10,123

Fully one-half of the fish taken and sold as shad are hickory-shad (*Clupea mediocris*).

The statistics of the important sturgeon fisheries at the mouth of the river are given in the chapter on the sturgeon trade of Savannah.

4. THE SATILLAS.

The Satillas traverse in their lower reaches an extensive region of alluvial swamp, which, by levees, has been converted into productive rice-fields. Both these rivers, like the Ogeechee, take their rise in the sandy belt which lies between tide-water and the Piedmont section of the South Atlantic States, the result being that they are never muddy, as are the Savannah or the Peedee. There are no obstructions to the ascent of fish. No organized fresh-water fisheries, however, exist except for sturgeon, which are taken immediately at the mouth and a short distance up the river. The product and value of the sturgeon fisheries will be given when treating of the sturgeon trade of Savannah.

5. THE OGEECHEE RIVER.

The Ogeechee River rises in the sandy belt of Georgia. Its waters, which drain through extensive swamps, are never muddy like those of the Savannah or Altamaha, nor, like them, is the stream subject to sudden floods and changes of temperature, which in the Ogeechee is higher than for the corresponding dates in the Savannah. This is to be explained by the fact that the former rises in the tide-water belt, instead of having its sources in the mountains.

As a result the run of shad and herring commences very early in the Ogeechee, and the fish mature their spawn at an earlier period than in the Savannah. So true is this that any one at all familiar with shad can, on seeing them exposed in the Savannah markets, tell at a glance, judging only by the degree of development, from which of these rivers they came. The run of shad begins in the early part of January and ends about the last of March.

The run of alewives, according to local report, begins about the 1st of March.

Although no permanent obstructions to the ascent of fish exist in the Ogeechee, only a small proportion of the fish which enter the river reach spawning-grounds, being excluded by the gill-nets, which are sufficient in number to almost totally block the way. To their agency must doubtless be attributed the very decided decline which has occurred in the last few years.

The principal object of the fisheries of this river are the shad and sturgeon. There seems to be a considerable run of *Clupea æstivalis* (locally known as English herring), but no organized fisheries exist for their capture. Most of the shad are caught in gill-nets, operated by gangs of men from Savannah, to which place the fish are shipped by carts or rail.

The following is a statistical summary of the fisheries of this river for 1880:*

Number of men employed	111
Amount of capital employed	$5,790
Product, in pounds:	
Shad	90,650
Sturgeon	88,500
Mixed fish	265,000
Value of product	$22,690

At some distance up the river quite a number of skim-nets, stake-nets, and dip-nets are used, but all the fish so caught go to supply the local demand, and we have no statistics of the product.

In the last two or three years pound-nets have been introduced into the river. The fish principally caught in them are rock and catfish, and, in their season, herring in large quantities, together with a few shad.

Extensive sturgeon fisheries exist in the estuary of the river, operated almost exclusively by fishermen from the Delaware. *These fish are captured with gill-nets, and kept penned up until a* sufficient number are taken, when they are slaughtered and sent by schooner to Savannah.

From local tradition we glean the following facts bearing on the shad fisheries of the Ogeechee. The run of shad is later than it used to be, and the fish have decreased materially in size. At the present day it is not worth while to put nets in the water until some time in February, while in former years, according to the fishermen, some fish were taken before Christmas. Formerly the *catch per net in a night was from 200 to 280; now a net averages 15 or 20. On the other hand,* fish which formerly sold for from 5 to 8 cents apiece now bring 25 cents and 30 cents apiece.

6. THE SAVANNAH RIVER.

DECREASE OF SHAD IN THE SAVANNAH.—The extreme sources of the Savannah are in Western North Carolina.

The records of the United States Signal Office show that the temperature of the river is higher at Savannah than at Augusta from August to May, but that during June, July, and August it is higher at Augusta. The winter temperature is usually about 45°, but it sometimes runs down to 40°. The data we possess, though not as accurate or as extended as we *could desire, are* sufficient to prove that there is a connection between the temperature of the water and the movement of the shad in the river. Thus much, at least, is certain, that shad do not enter the river till about the 1st of January, when the temperature is rising and is about 50° Fahr.

From the best available information on the subject the conclusion is reached that the Savannah shad fisheries do not now yield one-third the product they did eight years ago, and this decrease may be ascribed to the following causes:

First. The narrowness of the river. One familiar with the broad estuaries of the streams which flow into the Chesapeake remarks at once the extreme narrowness of these Southern rivers. Thirty miles from its mouth the Savannah River is not more *than 400 or 450 yards wide, and as a* result an amount of gill-net fishing that would have no effect in retarding the run of shad up the Potomac or Rappahannock is sufficient to almost completely obstruct the Savannah.

Second. The vast volume of muddy water which is always moving down, especially in the shad season. As a consequence no suitable spawning grounds exist on the lower portion of the

* For detailed statistics see Census Volume on Fisheries.

river, and the shad must ascend above Augusta to deposit their eggs. Seven miles above Augusta is the water-works dam, which prevents any further ascent; and the spawning grounds of this river are therefore practically confined to the 7-mile stretch from Augusta to the dam. Cooped up, as it were, in this area, the shad are entirely at the mercy of the innumerable traps and cast-nets that abound there.

In a word, the gill-nets permit but a small proportion of the shad which enter the river to reach their spawning grounds, and the appliances of capture in the vicinity of the dam take the rest. Instead of being surprised, therefore, that the shad fisheries have fallen off so greatly, we should rather wonder that the whole breed of fish has not been utterly extirpated.

Many years ago the shad pushed their annual migrations as far up as the Falls of the Talulah, a mountain tributary of the Savannah, where they were taken in some numbers. The height of the falls prevented further progress. Thence down to Augusta they were taken in very considerable quantities, and formed a very important food resource, being consumed fresh or salted away for winter use. The unrestrained and destructive modes of fishing pursued made their impression year by year upon the supply, which became greatly reduced, until the erection of the water-works dam, 7 miles above Augusta, cut off the run altogether.

Under the law authorizing the erection of this dam, sluices for the passage of fish were required to be left and kept open during the running season of the fish. Some shad were taken in 1879, 80 miles above. These necessarily passed through the openings in the dam. The calculated velocity of discharge through the sluices being upwards of 13 miles per hour, this fact furnishes a surprising exhibition of strength and boldness on the part of this fish.

THE SHAD SEASON.—The shad season begins at Savannah in the first half of January and ends about the last of March. It begins at Augusta in the middle of February and ends about the 10th of May, though shad are sometimes taken as late as July. This difference of more than a month between the season at Savannah and Augusta—180 miles above—shows an average rate of progress up the river of 6 miles a day. At this rate shad would reach Tallulah Falls about the 1st of April, and the season there would extend into July.

FISHING WITH TRAPS.—Between the water-works dam and Augusta, where the river descends by a series of falls or rapids a vertical distance of 45 or 50 feet, every favorable location is the site of a trap fishery—a mode of fishing which was formerly very productive, but is now considered no longer profitable. The traps are of three kinds: (1) the "fall" trap, or "slide," such as is in use in all our streams; (2) the "hack" trap, and (3) the square trap. The last two are essentially the same in principle, the only difference in construction being that the "hack" trap, instead of being square, has a V-shaped frame with its apex pointing upstream.

These traps are placed in strings or rows—from six to fifteen in a row—the intervals between them being occupied by a rough cribbing of logs filled in with stones. In 1879 there were about one hundred and ten of these traps between the dam and a point three miles below, and at several places they almost completely obstructed the channel of the river, so that it seemed impossible for a shad to run the gauntlet and reach the dam in safety. Fortunately, with a full river, which is frequent in the shad season, the traps are submerged, and fish may pass over them without much risk of capture.

FISHING WITH CAST-NETS.—Besides the traps in the rapids, a number of cast-nets are fished immediately under the dam. With clear water, so that the fish may be seen lying in the pools, this proves a very effective mode of fishing. I have seen six or eight shad taken at a single cast of the net. There was in 1880 an average of twelve cast-nets fished in the vicinity of the dam,

the catch varying from six to fifty in a day, according to the condition of the water and the good luck or skill of the fishermen.*

FISHING WITH HAUL-SEINES AND GILL-NETS.—The use of floating gill-nets is not practicable at any point above Augusta on account of the shoals and rapids of the river. Below that city the river is navigable for steamboats, and no traps are used. Haul-seines were formerly used at favorable locations all along the river for some 60 miles below Augusta. At Sand Bar Ferry, 5 miles below the city, was a noted fishery where the product each season bore no insignificant proportion to the entire catch of the river at the present time. These seine-shores are now abandoned, and the gillers gain a precarious subsistence by drifting in the empty seine berths.

Some short seines, gill-nets, and scoop-nets are fished all along the river in an irregular way for local supply, but the fishing for market is altogether with (float-seines) gill-nets. From Augusta to Johnston's Landing, 60 miles below, there were engaged in gill-net fishing, during the season of 1879, fifty nets and boats and one hundred men. The men are all native, about one-half being white. In most cases they own boats and outfit; but some receive their outfit from the dealers, to whom they agree to deliver their whole catch at a stipulated price; then from the net returns of sales the dealers deduct the cost of boat and nets, paying the fishermen the balance.

The average catch to the boat during 1879 was 300, making the total catch of the gillers in the upper river 15,000 for the season.

From Johnston's Landing down there is no fishing for market until we reach the vicinity of Savannah, where we find twenty-five nets and boats and fifty men fishing to supply the Savannah market.

The fishing grounds of the Lower Savannah are the straight reaches of the river for some miles above and below the city. The nets are about 100 fathoms long and from forty to fifty meshes deep. They are laid out across the channel, and from the extreme narrowness of the river they occupy and obstruct a considerable portion of the entire breadth. With twenty-five of these nets in the water at once, in *échelon*, and at no great distances apart, a very effectual obstruction to the upward movement of fish is established.

STURGEON FISHERY.—The sturgeon fisheries of the Savannah are of considerable commercial importance. In the lower part of the river, in the vicinity of Savannah, and for some 40 miles above, this fish is pursued by professional fishermen from the Northern States, especially Connecticut, New Jersey, and Delaware, who later in the season carry on the same work in the Delaware. The same nets are earlier in the season kept busy in the Saint Mary's, the Satillas, and the Altamaha. The product of all these fisheries centers at Savannah, and the details are given in full in the section on the subject of the sturgeon trade of that place.

STATISTICS FOR 1880.—The following is a summary of the fisheries of the Savannah River for 1880:

No of men employed in the fisheries		331
Amount of capital employed		$9,395
Product of the fisheries:		
Shad	pounds	138,250
Sturgeon	do	88,500
Mixed fish	do	361,500
Value of products	do	$26,754

* Cast-nets are used in the Savannah River in fishing for shad, trout, red-horse, &c., and all along the southern coast for taking shrimp, mullets, &c. They are likewise in use in all the lakes and small streams of the interior. Their use is only possible in comparatively shallow waters with a clear bottom, for if there be rocks or snags the net will hang and the fish escape. The cast-net is used to great advantage in the mouths of the rice trunks. When the tide runs down, trout, silversides, and suckers collect in the pools, and are sometimes taken a half bushel at a throw.

7. THE STURGEON TRADE OF SAVANNAH.

From the different inlets of the Georgia coast and from the Satilla River, the Altamaha, the Ogeechee, the Savannah, and the Cohambee rivers a considerable number of sturgeon find their way to the Savannah market. Here they are dressed, packed in ice, and shipped by steamer to New York. The roe, also, after some preliminary process here, is shipped to New York to be converted into caviare.

The sturgeon are taken in drift-nets of 12-inch mesh, No. 40 cotton twine. The length of net varies from 80 to 150 fathoms, and is from 18 to 26 meshes deep. The length and depth vary with the width and depth of the river in which they are to be used. Two men and boats are necessary for each net. The cost of a fishing outfit is on an average $130. Where the fishing is done by hired crews the men receive from $25 to $40 per month. Where the fishing is on shares the party furnishing outfit receives one-third of the proceeds, and the outfit is returned, but the nets are not serviceable more than one season.

The fishing begins first on the Satilla. In 1880 the camps were established on the 6th of February, but the season did not fairly open until the 18th.

The sturgeon as taken are either penned or tied out in the water and kept alive until a shipment is made up, when they are killed, disemboweled, heads and tails cut off, and shipped to Savannah. Here they are skinned, the backbones taken out, packed in ice, and forwarded to New York, and sold at a price of 6 or 8 cents per pound.

The species of sturgeon which is the object of this fishery is the *Acipenser oxyrhynchus*, or sharp-nose sturgeon.

The average weight, gross, of the sturgeons brought to Savannah is about 150 pounds. The average weight, net, is 65 pounds. The largest size seen by Mr. Hudson, one of the principal dealers here, weighed 250 pounds.

The fishing equipments in use during the season of 1880 were as follows:

Locality.	Nets.	Men.
On the Satilla River	4	10
On the Altamaha River	30	66
On the Ogeechee River	10	22
On the Savannah River	2	5
On the Combahee River	2	5
Total	48	109

These nets are not confined to one river or locality; these now being fished in the Satilla, later in the season will be transferred to the Savannah or rivers farther east and north.

According to the best estimates which I can make, the average catch per net [illegible] one hundred, which gives 15,000 pounds gross and 6,500 pounds net weight to each [illegible]

Of the roe, we have an average of fifteen sturgeon to the keg of 125 pounds, wh[illegible] kegs of roe to each fishing outfit. I have not learned that there is any use made [illegible] could, of course, be used in the preparation of oil.

We have the following statistical summary of the product and value of the sturgeon trade of Savannah and of the men and capital engaged in it:

Number of fishing equipments engaged	48
Value of same	$6,240
Number of men employed	109
Average number of sturgeon to net	100

Total number taken	4,800
Gross weight of sturgeon to net ..... pounds..	15,000
Net weight of sturgeon to net ..... pounds..	6,500
Weight of roe to net ..... pounds..	875
Number of pounds of dressed sturgeon marketed	*312,000*
Value of same, at 7 cents per pound	$21 840
Number of pounds of roe (336 kegs, each 125 pounds)	42 000
Total value of roe	$2 940
Total value of the sturgeon trade of Savannah	$24,780

S. FISHERIES OF THE EDISTO RIVER, SOUTH CAROLINA.

The Edisto River lies wholly within the limits of South Carolina, having its sources chiefly in the sandy belt. Its waters, being filtered through extensive tracts of swamp and low ground, are usually clear, even in seasons of high water, but always with a transparent brown tint from the infusion of vegetable matter. The tide ebbs and flows as high as the crossing of the railroad about 40 miles above its mouth. There are no obstructions, natural or artificial, in this river or in either of the main tributaries. At Orangeburg there are several "*hack*" and "*fall*" traps, which take some shad every season for local supply, but these do not invade the river channel. Rafting of timber is carried on extensively on the Edisto and its tributaries, and the active prosecution of this industry upon this and other Southern rivers has exerted a conservative influence upon the fisheries by maintaining an open channel for the passage of fish. The shad fishery—the first in importance—has fallen off very much of late years, for reasons not clearly understood. The second and only remaining fishery of importance is that for the capture of sturgeon, which is prosecuted in the mouth of the river, where the depth of the water and the width of the channel permit "drifting," *i. e.*, "floating of the net." On March 6, 1880, we found quantities of sturgeon moving up the river 40 miles above the mouth. Indeed, they almost caused a close season for the shad fishermen by running in their nets and tearing them to pieces.

Fishing for shad is prosecuted almost entirely with gill-nets. There are no fykes or pounds and only a single haul-seine, which is dragged 9 miles below the railroad crossing. This seine is worked by a crew of six negro men in the most improvident and careless way and to very little profit.

The gill-nets have a 5-inch mesh and are made of No. 40 twine. They reach to the bottom of the river and are stretched from bank to bank. Whilst in the river they form as effective an obstruction to the passage of the grown fish as if they were so many impassable dams. Fortunately for the fish, the waters of the Edisto are so clear that the nets are not set during the day, because the fish will not enter them. The nets are put out when the flood tide is three-fourths run, and stand until the ebb tide begins to run strong, when they must be taken up, lest the strength of the current should break the anchoring ropes. Consequently there is but one "laying out" or setting of the net in twenty-four hours, unless the ebb tide makes about sundown, when there is ebb again [illegible] sunrise.

[illegible] *height and length of the net is made to correspond with the breadth and depth of the* [illegible] On each bank is a round pole, to which the end of the net is fastened. These poles are [illegible]ed with lead or other heavy material in order to keep them upright. To each pole is attached a "rope bridle." The ropes are brought together and the ends securely fastened to stakes or trunks of trees on the shore. In no case are the nets set at a less distance than 300 yards apart. A State law prohibits their being placed nearer.

There was but a single camp for sturgeon fishing on the Edisto during the season of 1880. The fish taken here are shipped to Charleston by schooner, where they are packed in ice and sent to New York by steamer. The nets do not differ in any respect from those employed all along the Atlantic coast in the same fishery. The number of fish taken to the net was 125.

The statistics of the fisheries of the Edisto for 1880 are given in the following summary:

Number of men employed		*156*
Amount of capital employed		$3,610
Product of the fisheries:		
Shad	pounds	90,000
Sturgeon	do	37,250
Mixed fish	do	125,000
Value of the product		$12,285

9. THE SANTEE RIVER.

The Santee River has no organized fisheries for shad or alewives. While undoubtedly a considerable number of fish must be taken in so large a river, with its numerous tributaries draining so extensive and diversified a section of country, yet the information that was obtained was so indefinite as not to warrant the expenditure of the time which would have been necessarily consumed in arriving at an approximation of the products of this river.

Shad in considerable numbers were formerly taken at Columbia, situated at the junction of the Saluda and the Broad. Indeed, in the early history of the country important shad fisheries existed on the main tributaries of the rivers as far up as 150 or 200 miles above Columbia. At the present time only stragglers occasionally ascend the river as high as the dam, just above Columbia. It is probable that productive fisheries, both for shad and sturgeon, could be established at the mouth of the Santee River were it not for the fact that the markets are so inaccessible as to have deterred private enterprise from attempting to develop them.

10. THE PEDEE, SAMPIT, BLACK, AND WACCAMA RIVERS.

All these rivers are tributaries of Winyah Bay, and their product of fish is included under the statistics of Winyah Bay and its tributaries. The only fisheries prosecuted are for shad, chiefly in the Waccama River, and for sturgeon in that river and in Winyah Bay. The product of these fisheries is concentrated at Georgetown, because the tri-weekly steamer from that point to Charleston furnishes the only means of transportation to market.

Fishing for shad gives employment to about sixty men, including those engaged in supplying the local demand for fish, the catch of which is only estimated, as no definite information in regard to the quantities taken could be gained.

The sturgeon fisheries of Winyah Bay are extensive and valuable, and are prosecuted chiefly by professional fishermen from the Delaware, who, later in the season, pursue the same avocation on that river. On March 11, 1880, when these fisheries were visited by the agent of the U. S. Fish Commission, two parties or camps were engaged in the sturgeon fishery on this bay.

The fishing outfit for each "camp" consisted of huts for the men, a long scow with a cabin at each end, one of them being used as quarters by a portion of the men; the other, devoted to the preparation of the caviare for market. The middle portion is [illegible] over and used as a platform for slaughtering and dressing the sturgeon for market. A [illegible] ed for carrying away the offal, and a 15-ton schooner transported the dressed fish [illegible] to Georgetown. There

it was packed in ice and shipped by steamer to Charleston, thence to New York. The boats employed for "gilling" were the ordinary Whitehall boats. Two men fish a net. These average about one hundred fathoms in length. The sturgeon which are taken at each drift are transferred to floating pens made with slatted sides and bottom, so as to permit a free circulation of water. The pens, or live-boxes, containing the male sturgeon, or "bucks," are kept tied close up to the scow. It is, however, necessary to anchor the pens containing the female or "roe," sturgeon out in the bay, remote from shore; otherwise the eels, which are abundant in the creeks and along shore, would enter their vents and eat out the roes, and thus destroy the most valuable part of the fish, which is prepared as caviare for market.

Twice a week the fish that have been taken in the interval are slaughtered on the scow, the heads and tails being first cut off. While the fish are still alive their belly is ripped open and the roe taken out, placed in buckets, and handed over to the expert who is charged with the preparation of the caviare. The fish are then skinned and split down the backbone, divided longitudinally into two halves, and stacked up until the slaughtering is completed, when they are transported to the schooner and shipped to Georgetown.

A great deal of mystery enshrouds the preparation of the caviare. In fact, however, it seems to consist simply in passing the roe through sieves, in order to separate the fibrous matter which adheres to it, and then salting it down in barrels capable of holding 100 pounds each. The quantity and kind of salt used could not be ascertained.

Statistical summary of the fisheries of Winyah Bay and its tributaries for 1880.

Number of men employed		97
Amount of capital employed		$4,050
Product of the fisheries:		
Shad	pounds	78,400
Sturgeon	do	224,000
Mixed fish	do	300,000
Value of the products		$23,028

2.—THE RIVERS AND SOUNDS OF NORTH CAROLINA.

By Marshall McDonald.

1. CAPE FEAR RIVER.

The basin of this river and its tributaries lies wholly within the State of North Carolina. It is navigable for steamers up to Fayetteville, N. C.; a short distance above this point are the first falls of the river. Here a dam has been erected in connection with the slack-water navigation of Deep River, the main tributary of the Cape Fear. This obstruction, of course, prevents the further upward migration of the shad. From Fayetteville to the mouth of the Cape Fear River organized fisheries are prosecuted for the capture of shad. In 1880, when the examination of the river was made, the importance of these fisheries had decreased very much, the product at that time not exceeding 45,500 in number for the whole river. This entire quantity of fish found a local market on the river at good prices, the average being about 30 cents apiece.

Drift-nets, skim-nets, and haul-seines are operated on this river, the different kinds of apparatus for capture being adapted to the locality. In the vicinty of Fayetteville several haul-seines are in use; there is also another at the mouth of the river in the vicinity of New Inlet.

Skim-nets for the supply of fish for local requirements are fished all along the river from Wilmington to Fayetteville. Drift-net fishing is confined to a stretch of about 40 miles of river extending above and below Wilmington.

The season for shad fishing extends from January 20 to May 1. Ripe fish are found in the river about March 1.

Herrings (*Clupea*) are taken in limited numbers in the vicinity of Wilmington in drift-nets. The run of this fish into the Cape Fear River and all rivers south of it is very insignificant compared with the vast schools which annually pass into the Albemarle and its tributaries. The most important fisheries of the Cape Fear are those for the capture of sturgeon. The methods and apparatus used do not differ from those which have been already described as in use on the more southern rivers of the Atlantic coast. The nets and boats are furnished by dealers at Wilmington, who in some cases receive a stated portion of the catch, and in others a rental for the use of the nets, &c., the dealers buying and receiving all the sturgeon at prices mutually agreed upon. If a dealer owns the boats and nets, the catch is divided equally between himself and each of the two men.

This fishery gives employment to 20 nets and boats, which are usually skiffs, and 40 men. The value of a fishing outfit, including net and boat, averages about $40.

The sturgeon fishing season for the New York market lasts from March 10 to the end of April and from September 10 to November 1. To some extent, however, this fishery is prosecuted all the summer in order to meet local demands and supply the interior towns of the State. The average catch of a net for the fall fishing is about 200 fish and for the summer fishery about 50, making a total average of 250 per boat for the entire season.

The fish intended for shipment to New York are dressed and packed in ice. Those for State consumption are shipped whole. No use is made of the roe.

The product of these sturgeon fisheries is concentrated chiefly in the hands of two dealers, Messrs. John Carroll and William Davis. The average weight of a dressed sturgeon, according to Mr. Carroll, is 60 pounds. Ripe and spent sturgeon are taken both in the spring and fall fisheries.

The following are the statistics of the Cape Fear River for the season of 1880:

Number of men employed		270
Amount of capital employed		$6,238
Product:		
Shad	pounds	182,000
Sturgeon	do	262,000
Mixed fish	do	537,000
Value of product		$40,210

In addition to the above-named species, about 1,200 pounds of rock and 25,000 pounds of red-horse and other varieties are annually taken as an incidental product of the shad fisheries. Catfish are found in large numbers in the river, and at one time, as an experiment, a number were shipped to market, but objection was made to the color of the meat, and the enterprise therefore proved to be unprofitable and was abandoned.

2. FISHERIES OF THE NEUSE RIVER.

DESCRIPTON OF THE RIVER—IMPORTANCE OF THE FISHERIES.

While the headwaters of this river are in a clay section of the State, viz, Orange, Granville, and Pearson Counties, the principal area of its basin lies in the Sandy and Poquosin belts, and consequently the water at ordinary stages is clear and dark colored. Continued rains about the sources

bring down floods which frequently prevent the seine-haulers from fishing for several days at a time. The same result is produced at ordinary stages of water by easterly winds, which retard the current and produce the effect of heavy rains. As is elsewhere stated, the skim-netters carry on their operations when seine hauling is impossible for reasons above given. The fish during these times of swollen waters pursue their upward migrations comparatively unobstructed and unmolested; indeed, it is doubtful whether but for such opportunities there would at the present time be any fisheries in the Neuse River worthy of mention.

The product of the fisheries on the Neuse River bears a favorable comparison with that of other streams in the South Atlantic States; but of late years the supply has materially decreased in all the rivers owing to overfishing and the erection of obstructions. In former years the shad ascended the Neuse in great numbers into Western North Carolina, and profitable shad fisheries were operated as high as Raleigh. At the present time shad fishing for market does not extend farther up the river than Kinston, which is at the head of steamboat navigation on the Neuse; several thousand shad are, however, annually taken above that point in skim-nets, fish-slides, and hack-traps, but are used for local trade only. All the shad taken by the pound-nets, stake-nets, and seines are sent to New Berne, whence they are shipped by steamer and rail to Northern cities during the early part of the season. The principal firms in New Berne thus engaged are those of C. T. Watson, B. B. Lane, T. Daniels, G. N. Ivis, D. Bell & Co., C. L. Dickinson, F. M. Augostine, and A. W. Nelson. As the season advances, however, and the cities in the North receive fish from more northerly points on the Atlantic, the price of Southern fish becomes depreciated, and it is no longer profitable for the New Berne and other shippers to send their fish North. Thenceforward to the close of the season the majority of the fish taken are shipped to the interior of the South Atlantic States.

In former times the fishing below Kinston was mainly prosecuted with haul-seines, skim-nets being used in the upper part of the river, *i. e.*, above Kinston. In later years stake-nets have begun to take the place of haul-seines, and the fishermen have ascertained that stake-nets planted in the lower regions of the river below New Berne cut off the run of the fish in the river to such an extent as to render haul-seining no longer profitable. Within the last few years, however, pound-nets have been introduced into the river below New Berne, and it is more than probable that before the lapse of many years they will be substituted for the stake-nets. Judging, however, by the tone of the present legislature of North Carolina, and in view of the fact that the majority of the fishermen can better advance their interests by employing other modes of fishing than by the use of pound-nets, it is quite probable that the employment of these nets will be largely restricted, if not actually prohibited by legislation.

APPARATUS.

Seven kinds of nets are used on the Neuse for the capture of fish, chiefly shad; of these the haul-seines, skim-nets, and gill-nets are mainly employed between New Berne and Kinston, and the stake, drag, and pound nets between New Berne and the mouth of the river.

STAKE, OR SET NETS.—There are 3,750 of these nets used below New Berne, handled by 150 men, each of whom tends 25 nets. Above New Berne 160 set-nets are fished by 16 men. The majority of the set-nets are owned and worked by fishermen from Carteret and other coast counties. These men, except during the shad season, are engaged in salt-water fisheries. Probably 1,200 set-nets are owned by the fish dealers of New Berne. The set-net averages 20 yards in length, the depth differing with the depth of water. The size of the mesh is from $5\frac{1}{4}$ inches to 6 inches. The nets are stretched by staffs or poles at each end, and are set down-stream. Were

these nets set at right angles with the current, its force would tear them to pieces, and passing vessels would run them down. Above Kinston the nets are smaller and are used by the farmers chiefly to supply their own tables. The set-net fishing in the season of 1879–'80 was very unprofitable, owing to the continuous state of low water in the river, and its consequent clearness and brackishness.

The following summary shows in detail the facts concerning the set-net fishing on the Neuse, for the season of 1879–'80:

	Number of men.	Number of set-nets.	Value.	Number of boats.	Value.
From New Berne to mouth of river	150	3,750	$7,500	75 at $10	$3,000
From New Berne to Kinston	16	160	480	8 at 10	80
Total	166	9,910	7,980	83	3,080

DRAG-NETS.—*About 25 of these nets are fished below, and are owned in New Berne.* The crew consists of three men, the captain, who receives one and a half shares, and two men who receive a share each, the remaining one and a half shares (making five shares in all) being the property of the net and boat. These drag fishermen have no settled fishing grounds, making their hauls at a venture, and rarely twice in the same place. Being prohibited by law from landing their seines on the beaches or shores, they are compelled to work in the water waist deep. To one end of the net is fastened a pole which at the moment of making the haul, is thrust into the bottom; the free end is then drawn toward and past the pole end (the lead-line being kept down with the foot) until the fish are hunted in the end of the seine next to the staff, which is then drawn up. The seine is now "footed up" and the fish are emptied into the boat.

The following table shows the number of men, boats, and nets engaged in the drag-net fishing, and the amount of capital employed. The boats and nets are usually furnished by New Berne dealers:

Number of men	75
Number of nets	25
Value of nets	$1,250
Number of boats	25
Value of boats	$1,250
Total amount of capital employed	$2,500

THE POUND, DUTCH, POT, OR TRAP NET.—This net has only come into use, as above stated, of late years. Four are fished in the Neuse River below New Berne, one at the mouth of Trent River, and one in Upper Broad Creek; all are owned by New Berne fish-dealers.

Below is a summary of the men, nets, and boats engaged in this fishery:

Number of men employed	12
Number of nets	6
Value of nets	$1,500
Number of boats	6
Value of boats	$240

HAUL-SEINES.—Below New Berne are four beaches where the haul-seine is used. These seines average from 500 to 800 yards in length, and require crews of 10 men each, one seine being hauled by horse-power. Between New Berne and Pitch Kettle 23 haul-seines are in operation, and between Pitch Kettle and Kinston are 6 or 8 small seines, which supply local markets, rarely shipping to any great distance.

Below is a statistical summary showing the number and value of the haul-seines and boats tending the same in operation on this river, and the number of men employed:

Designation of fishery.	Number and description of seines.	Value.	Number of men.	Boats, number and description.	Value.
Four seines below New Berne, crews of 10 men	From 500 to 800 yards	$1,000	40	4 flats	$160
Lewis Fishery	1 seine, 125 yards	75	4	1 canoe	75
Wood's Beach	do	75	4	do	75
Canady's Beach	1 seine, 100 yards	75	4	do	75
Lewis's Beach	do	50	4	do	50
Nelson's Beach	*2 seines, 120 yards*	75	6	2 canoes	100
Gatlin's Beach	2 seines, 100 yards	100	6	2 flats	75
Parish's Beach	do	100	6	do	50
G. Nelson's Beach	2 seines, 150 yards	120	6	do	55
Watson & Lane	1 seine, 150 yards	100	5	1 canoe	70
Ives's Fishery	1 seine, 120 yards	90	5	do	70
Spring Garden	1 seine, 150 yards	100	8	do	60
Watson's Beach	do	80	8	1 flat	60
Dolly Gut Fishery	do	100	8	do	60
Ewell's Lower Beach	1 seine, 80 yards	80	4	do	30
Ewell's Upper Beach	1 seine, 100 yards	90	4	do	35
Cohart's Beach	1 seine, 80 yards	75	4	do	25
Jackson's Beach	do	75	4	do	25
Caraway & Wiggins	1 seine, 150 yards	75	4	do	25
Watson's Beach	*1 seine, 80 yards*	65	4	do	25
Anderson's Beach	do	65	4	do	35
Mud Seine Beach	1 seine, 90 yards	70	4	do	30
Kitchen Landing	*1 seine, 100 yards*	75	4	do	25
Pitch Kettle	1 seine, 125 yards	75	4	do	25
From Pitch Kettle to Kinston, 10 small seines	10 seine, 60 yards	240	30	10 flats	100
Total	41 seines	3,135	186	41	1,415

SKIM OR BOW NETS.—On the Neuse, and many other southern rivers, "skimming" is a common and very effective mode of fishing, especially in the upper reaches of the river where on account of the contraction of the banks the fish are compelled to ascend in almost single file. The frame of the skim-net is a bow of tough, light wood, bent and secured.

The shape of the bow is a long oval, the longest diameter of which is 10 to 12 feet. The mesh is of hemp twine, about No. 60. The cost of the net complete is from $2 to $2.25, and the canoe costs about $5, making a fishing outfit complete, $7.

Two men are required to fish each net; one sits in the stern of the boat and guides its motion; the other stands in the bow holding the net in a vertical position, the shoulder-block resting on the thwarts of the boat. A trip-string, attached to the bag of the net and held in the hand, signals to the bow-man the slightest touch of any foreign object in the net. A dexterous twisting motion secures the fish (if it be a fish) and delivers it in reach of the free hand. At dusk the boat, equipped for fishing, paddles out into the current and drifts noiselessly with the bow down-stream. The man in the stern uses the paddles only to guide the boat. When several boats fish in the same reach they follow each other in single file. Sometimes as many as five or six may be seen in a line.

Skim-nets are used to the best advantage when the river is running high, at which stage the seiners are driven from their beaches, and the fish, by reason of the turbid waters, are easily netted. During the season 1878–'79 one boat and skim-net at Cowpens took eight hundred shad, and catches of three hundred and four hundred to the net for a season were by no means uncommon. In the estimates, however, one hundred has been used as the average catch for each net. Skim-

nets are in use all along the river from 9 miles above New Berne to the vicinity of Raleigh. Above Kinston this operation is carried on for the most part by farm hands in the early morning and in the evening.

Below is a tabular statement showing the number of men, with boats, nets, and their value, engaged in skimming, and the amount of fish taken. Between Kinston and Raleigh the average catch is estimated at only fifty shad per net during the season :

Location.	Number of men.	Number of boats.	Number of nets.	Value of boats and nets.	Average catch.	Total catch.
From 9 miles above New Berne to Cowpens	40	20	20	$140	100	2, 000
At Cowpens	32	16	16	112	100	1, 600
From Cowpens to Pitch Kettle	30	15	15	105	100	1, 500
At Pitch Kettle	20	10	10	70	100	1, 000
Pitch Kettle to Kinston	50	25	25	175	100	2, 500
Kinston to Raleigh	100	50	50	350	50	2, 500
	272	136	136	952	.....	11, 100

GILL-NETS.—The use of these nets on the Neuse River is prohibited by law, but six or eight are nevertheless fished during the night between New Berne and Pitch Kettle.

PROPORTIONS OF BUCK AND ROE SHAD.

The following table will show the proportion existing between the number of buck and roe shad taken in several seines on the Neuse River during the season of 1879:

1879.	Season.		Catch of shad.		Total.	Per cent. of bucks.	Per cent. of roes.
	Began.	Ended.	Buck.	Roe.			
Dollygut (1 mile below Cowpens)	Mar. 10	Apr. 15	1, 153	945	2, 098	54	46
Ewell's Upper Beach (Cowpens)	Mar. 8	May 18	1, 398	995	2, 393	58	42
Ewell's Lower Beach (Cowpens)	Mar. 8	May 4	1, 399	960	2, 359	59	41
Total	.....	.....	3, 950	2, 900	6, 840	.....	.....

During the same season also the firm of C. T. Watson handled as follows:

Month.	Buck shad.	Roe shad.	Per cent. of bucks.	Per cent. of roes.
February	543	271	.....	.....
March	3, 219	3, 098	.....	.....
April	2, 404	1, 135	.....	.....
May	548	590	.....	.....
Total	6, 714	5, 049	57	43

An analysis of the above tables shows, first, that the number of male shad is considerably in excess of the number of female shad for the season; second that the preponderance of males over females is very great at two periods during the season. This inequality in the run of males and females, and the capture of so large a proportion of males in advance of the maturation of the females, would indicate that the loss of fruitful eggs in the spawning season from lack of fecundation must be enormous.

SHAD "RUNS."—The great preponderance of buck shad at the beginning of the season, and again in April, would indicate that in the Neuse River, at east, there are two distinct runs of shad, viz, in January and in May. This conclusion agrees with the general belief of the fishermen on all the rivers of Carolina. Although the first run commences in January, shad fishing does not begin until the month following. The average duration of the entire fishing season is sixty days.

STATISTICAL REVIEW OF NEUSE RIVER FISHERIES.

The following tables show the number of men, with nets and boats, and value of the same, employed in the Neuse River fisheries during the season of 1879–'80, also the quantity and value of the products and disposition of the same:

Description of fishery.	Number of men employed.	Nets.		Boats.		Total capital invested.
		Number.	Value.	Number.	Value.	
Stake-net	166	3,010	$7,980	83	$3,080	$11,060
Drag-net	75	25	1,250	25	1,250	2,500
Haul-seine	186	41	3,135	41	1,415	4,550
Pound-net	12	6	1,500	6	240	1,740
Skim-net	272	136	476	136	476	952
Total	711	4,118	14,341	291	6,461	20,802

Disposition.	Shad.		Herring.*		Mixed fish		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Shipped to interior markets	49,698	$12,424	442,000	$2,652	2,106,692	$17,557	2,598,390	$32,633
Shipped to Northern cities	15,624	4,687			149,230	1,641	64,854	6,328
Estimated for consumption in New Berne	5,000	1,250	100,000	600	300,000	2,500	405,000	4,350
Estimated for consumption along the river	8,000	2,000	100,000	600	300,000	2,500	408,000	5,100
Total	78,322	20,361	642,000	3,852	2,756,112	24,198	3,476,434	48,411

*Clupea æstivalis and C. vernalis. †Of this number 15,660 are rock and 28,890 bass.

3. FISHERIES OF PAMLICO AND TAR RIVERS.

Pamlico River as designated on the charts is only the estuary of Tar River. The physical and hydrographic features of Pamlico River are in general similar to those of the Neuse below New Berne.

The methods of fishing pursued in Pamlico and Tar Rivers are the same as on the Neuse River with this exception, that near Washington, N. C., a large seine, like those used on the Albemarle River, is operated.

As on the Neuse River, the principal fisheries are those for the capture of shad and herring, the former being by far the more important.

All the fish taken from this river, with the exception of those retained for local consumption, are sent to Washington, N. C., whence, after having been packed in ice, they are transported by rail to a point on the Roanoke River. Here they are placed on board a steamer and shipped to Norfolk, from which point they are distributed, as consigned, to the various Northern cities. The product of the Pamlico River fisheries, as also the number of men employed, is about the same as that estimated for the Neuse River. But in the absence of detailed information on the subject, no statistical summary is given.

4. FISHERIES OF PAMLICO SOUND.

PHYSICAL AND HYDROGRAPHIC FEATURES.—At some distance from and stretching along the coast of North Carolina is a narrow chain of low sand reefs and islands, between which and the mainland lies a broad sheet of water, called Pamlico Sound. Communication between this water and the ocean is possible only through certain narrow openings between the reefs and islands. The three principal passages are known as Oregon, Ocracoke, and Hatteras Inlets. Through these openings is discharged the entire volume of water pouring into the sound from those sections of North Carolina and Virginia which are drained by the Neuse and Tar Rivers, and also those streams, such as the Roanoke and Chowan, which empty directly into Albemarle River or Sound,* and thence into the Pamlico. The result of this continual influx of fresh water into Pamlico Sound is to counteract the effect of the natural ebb and flow of the ocean tide. For this reason there are no tides in Pamlico Sound except such as are produced by heavy winds. During certain seasons of the year, therefore, the water in these sounds is at most brackish, and after the rivers have been swollen by rains sometimes quite fresh.

MOVEMENTS OF THE FISH.—By reference to the statistics of the fisheries of the Neuse and Tar Rivers, and of the tributaries of the Albemarle, it will be seen that immense numbers of shad and herring ascend those streams annually, and it is equally manifest that these fish enter those rivers from Albemarle or Pamlico Sound. A question here arises, and it is of the highest moment to the fisheries that a positive solution be arrived at, as to whether these fish winter in one or both of these sounds or pass into the ocean through the inlets already referred to, returning in the spring for the purpose of making their annual ascent of the rivers. If the former be the case, it is only necessary to find out their winter quarters in order to establish valuable winter fisheries for the shad and herring. If the latter theory be true, then at the time of their passage through these exceedingly narrow inlets, millions of fish might with ease be captured. To this end seine fisheries have repeatedly been established at these passage-ways, but the results, so far at least as shad and herring are concerned, have in no case been such as to make the theory tenable. In the discussion of the relations of the migrations of the fish to water temperatures in general, arguments will be advanced in support of the theory that these fish winter in waters between the reefs and the mainland, be it in Pamlico or in Albemarle Sound.

FISHING GROUNDS.—The only important fisheries for shad and herring conducted on the waters of Pamlico Sound are at its upper end, or, more strictly, in that narrow sheet of water connecting Albemarle and Pamlico Sounds, and named, as already stated, Croatan Sound. At this point large numbers of stake-nets and several haul-seines are in operation. The statistics relative to these fisheries will be given in the summation of the fisheries of the Albemarle and its tributaries.

5. ALBEMARLE SOUND AND ITS TRIBUTARIES.

The magnificent sheet of inland water known as Albemarle Sound stretches east and west from the coast to a distance of about 40 miles into the interior. Through Croatan Sound it discharges all of its waters into the Pamlico Sound. At its head it receives the waters of the Roanoke and the Chowan Rivers, two of the principal streams on the Atlantic slope. The headwaters of the Roanoke drain a considerable portion of Western North Carolina and Southwestern Virginia, the extreme sources of both of its principal tributaries being in the Appalachian range.

* Albemarle Sound is formed by the confluence of the Chowan and Roanoke Rivers, and its waters are discharged into the upper end of Pamlico Sound through Croatan Sound.

The principal tributaries of the Chowan are the Nottoway and the Meherrin. The sources of these rivers do not penetrate to the mountains, and this difference in the physical features of the two river basins entails corresponding variations in the character of the rivers themselves. The muddy waters which pour down the Roanoke during the seasons of high water bear a marked contrast to the dark and clear waters of the Chowan.

A number of minor tributaries of the Albemarle are North, Pasquotank, Little, Perquimans, and Alligator Rivers. These do not penetrate far into the interior, but all of them formerly received each season vast schools of herring and shad. At the present time, however, the fisheries on these rivers have become unproductive in consequence of the diminution of the supply. The main fisheries of the Albemarle are found about the head of the sound and for a short distance up the Roanoke and Chowan Rivers.

The waters of the Albemarle Sound are always fresh; indeed, it is only in dry seasons that the waters of the sound become at all brackish. In the season of 1880, during the whole of which extreme drought prevailed, the water was somewhat brackish as high up as Palens fishery, where several salt-water species were captured in considerable numbers.

The fishing season for the large haul seines on the Albemarle begins between March 1 and 15, although shad are sometimes taken in gill-nets in the Sound some weeks earlier. The following summary of fishing records for Willow Branch Fishery from 1835 to 1874, which was compiled by the late Professor Milner from the books kept at the fishing shore, gives a number of interesting data in regard to these fisheries. The duration of the fishing season and the date of maximum run, both for shad and herring, is found to vary widely from year to year. These fluctuations are due to corresponding changes in the meteorological conditions, which are of course impressed upon the waters.

Summary of fishing records for shad and alewives kept at Willow Branch Fishery, North Carolina, from 1835 to 1874.*

Years and months.	Beginning of season.	Ending of season.	Number of days.	Total of shad.	Total of alewives.	Average per diem of shad.	Average per diem of alewives.	Date of maximum.	
								Shad.	Alewives.
1835	March 15	May 9	51	33,259	484,600	652	9,502	April 6–14.	April 13–19.
March			12	5,441	57,600	453	4,800		
April			30	26,645	344,500	888	11,483		
May			9	1,173	82,500	130	9,166		
1836	March 16	May 7	53	13,231	1,236,700	249	23,333	April 16–19.	April 17–26.
March			16	3,160	28,100	197	1,756		
April			30	9,619	939,600	320	31,320		
May			7	1,462	269,000	208	38,428		
1837	March 16	May 6	52	34,769	1,982,300	657	38,121	April 9–21.	April 23 and 24.
March			16	7,453	76,700	465	4,793		
April			30	24,566	1,635,600	818	54,520		
May			6	2,060	270,000	343	45,000		
1838	March 18	May 8	52	32,204	1,093,100	619	21,021	March 30–April 6.	April 17–19.
March			14	9,480	56,100	677	4,007		
April			30	19,739	795,000	657	26,166		
May			8	2,985	252,000	373	31,500		
1839	March 14	May 9	57	73,130	1,595,000	1,282	27,981	April 4–6.	April 26–May 2.
March			18	27,946	90,500	1,552	5,027		
April			30	43,351	1,205,000	1,445	40,166		
May			9	1,833	300,000	203	33,333		

*Willow Branch Fishery, North Carolina, situated just within the mouth of the Chowan River, was one of the most valuable of the extensive seine fisheries lying around the head of the Albemarle. Its records, running almost continuously from 1835 to 1874, present most interesting material for study; and, when taken in connection with other records of the Albemarle fisheries which are extant, and contemporaneous meteorological observations will probably furnish valuable conclusions in regard to the laws or influences determining the great seasonal fluctuations in the river fisheries.

Summary of fishing records for shad and alewives kept at Willow Branch Fishery, North Carolina, &c.—Continued.

Years and months.	Beginning of season.	Ending of season.	Number of days.	Total of shad.	Total of alewives.	Average per diem of shad.	Average per diem of alewives.	Date of maximum.	
								Shad.	Alewives.
1840	March 12	May 5	55	51,674	3,313,900	939	60,252	March 12–16.	April 16–23.
March			20	26,115	164,900	1,405	8,245		
April			30	22,736	2,985,000	757	99,500		
May			5	823	164,000	164	32,800		
1841	March 11	May 7	58	29,248	2,148,775	504	37,047	March 22–27.	April 16 and 23.
March			21	12,806	102,775	609	4,894		
April			30	16,014	1,665,000	533	55,500		
May			7	428	281,000	61	40,142		
1842	March 6	May 2	58	55,784	1,367,075	961	23,570	March 8–13.	April 21–24.
March			26	44,353	244,500	1,705	9,403		
April			30	11,373	1,105,575	379	36,852		
May			2	58	17,000	29	8,500		
1843	March 15	May 8	55	31,615	1,680,100	574	30,547	April 6–12.	April 21–28.
March			17	3,941	93,000	231	4,882		
April			30	25,894	1,293,100	863	43,103		
May			8	1,780	304,000	221	3,800		
1844	March 16	May 1	47	60,205	1,402,600	1,280	29,842	March 22–28.	April 16–22.
March			16	21,701	84,100	1,356	5,256		
April			30	38,414	1,314,500	1,280	43,816		
May			1	90	4,000	90	4,000		
1845	March 13	May 2	51	53,179	1,556,000	1,042	30,509	March 31–April 3.	April 16–20.
March			19	31,832		1,675			
April			30	21,287	1,537,000	709	50,900		
May			2	60	29,000	30	14,500		
1846	March 15	May 1	48	33,117	718,650	689	14,971	April 3–6.	April 18–23.
March			17	10,931	65,350	643	3,843		
April			30	22,112	642,300	737	21,410		
May			1	74	11,000	74	11,000		
1847	March 15	April 29	45	21,157	567,140	470	12,603	March 15–19.	April 13–18.
March			16	11,722	100,000	732	6,250		
April			29	9,435	467,140	325	16,109		
1848	March 14	May 5	53	16,912	638,400	319	12,988	March 31, April 10.	April 28–May 24
March			18	6,821	40,200	378	2,233		
April			30	9,732	540,700	324	18,023		
May			5	359	107,500	71	21,500		
1849	March 19	May 10	53	47,017	389,816	887	7,355	March 24–April 3.	April 10–13.
March			13	16,999	25,676	1,307	1,975		
April			30	27,993	314,180	931	10,472		
May			10	2,085	49,960	208	4,998		
1850	March 12	May 7	57	25,882	451,103	454	7,944	March 15–21.	April 27–May 8.
March			20	14,417	15,486	720	771		
April			30	11,045	275,967	368	9,198		
May			7	420	159,700	60	22,814		
1851	March 11	May 2	53	12,963	428,650	244	8,087	March 12.	April 28.
March			21	7,664	18,990	364	904		
April			30	5,196	390,160	173	13,005		
May			2	103	19,500	51	9,750		
1852	March 8	May 14	68	34,896	744,428	513	10,947	March 21–29.	April 6–24.
March			24	17,877	59,728	744	2,488		
April			30	13,820	454,200	460	15,140		
May			14	3,199	230,500	228	16,460		
1853	March 7	May 8	61	37,880	559,809	620	9,177	March 25–31.	April 25–27.
March			25	20,416	53,300	816	2,132		
April			30	16,273	434,500	542	14,483		
May			6	1,191	72,000	198	12,000		
1854	March 9	May 10	63	28,087	965,500	445	15,325	April 4–6.	April 22–May 2.
March			23	10,996	34,500	478	1,500		
April			30	13,370	664,000	445	22,133		
May			10	3,721	267,000	372	26,700		
1855	March 12	May 11	61	32,112	1,105,100	526	18,116	March 28–April 20.	April 23–May 3.
March			20	10,132	47,200	506	2,360		
April			30	18,300	592,900	610	19,763		
May			11	3,680	465,000	334	42,272		

Summary of fishing records for shad and alewives kept at Willow Branch Fishery, North Carolina, &c.—Continued.

Years and months.	Beginning of season.	Ending of season.	Number of days.	Total of shad.	Total of alewives.	Average per diem of shad.	Average per diem of alewives.	Date of maximum.	
								Shad.	Alewives.
1856	March 17	May 9	54	23,524	419,700	417	7,772	April 10–16.	April 21–28.
March			15	4,361	23,200	292	1,546		
April			30	16,669	303,500	555	10,116		
May			9	1,474	93,000	163	10,333		
1857	March 12	May 15	65	28,053	569,200	431	8,756	March 25–April 9.	April 28–May 2.
March			20	8,123	28,400	406	1,420		
April			30	17,007	338,800	566	11,293		
May			15	2,923	202,000	194	13,466		
1858	March 15	May 12	59	16,242	245,280	275	4,157	April 3–10.	April 15–24.
March			17	5,744	12,950	337	761		
April			30	9,238	206,200	307	6,873		
May			12	1,260	26,130	105	2,177		
1859	March 14	April 30	48	12,002	120,700	250	2,514	March 14–17.	April 11–27.
March			18	7,692	30,000	427	666		
April			30	4,310	96,700	143	3,223		
1860	March 12	May 12	63	17,125	144,100	271	2,287	March 22.	April 25–27.
March			21	8,899	20,700	419	985		
April			30	6,586	83,400	219	2,446		
May			12	1,730	40,000	144	3,333		
1861	March 11	May 14	67	21,101	915,450	314	13,663	April 2–6.	April 22–May 3.
March			21	7,782	85,200	370	4,057		
April			30	17,469	549,500	382	14,983		
May			16	1,851	280,750	115	17,549		
1862	April 7	May 12	36	33,286	567,583	1,063	15,766	April 7–11.	May 5–7.
April			24	34,534	301,135	1,438	12,547		
May			12	3,752	266,448	312	22,204		
1863	No record kept.	No record kept.							
1864	No record kept.	No record kept.							
1865	No record kept.	No record kept.							
1866	March 12	May 5	55	36,599	1,589,000	665	28,890	April 10–12.	April 20–28.
March			20	14,315	217,500	715	10,875		
April			30	21,605	1,019,500	720	33,983		
May			5	679	352,000	113	58,666		
1867	No record kept.	No record kept.							
1868	March 16	May 15	61	31,551	1,144,700	517	18,765	April 18–28.	April 23–May 5.
March			15	5,095	34,700	318	2,168		
April			30	21,774	674,000	725	22,466		
May			15	4,682	436,000	312	29,066		
1869	March 15	May 15	62	17,647	583,950	284	9,418	April 5–9.	April 21–27.
March			17	4,041	33,950	237	1,997		
April			30	11,612	426,600	387	14,220		
May			15	1,994	123,400	132	8,226		
1870	March 14	May 12	60	15,099	620,530	250	10,342	April 7–14.	April 14.
March			18	3,657	11,530	203	640		
April			30	9,739	421,000	324	14,033		
May			12	1,613	188,000	134	15,666		
1871	No record kept.	No record kept.							
1872	No record kept.	No record kept.							
1873	March 17	May 10	65	50,195	1,650,330	912	30,005	April 7–25.	April 28–May 3.
March			15	2,797	39,670	186	2,440		
April			30	41,501	976,360	1,383	32,545		
May			10	5,897	643,300	589	64,330		
1874	March 10	May 11	63	30,893	923,372	490	14,656	April 1–6.	April 22–May 5.
March			22	12,036	24,672	549	1,120		
April			30	17,049	572,300	568	19,076		
May			11	1,758	326,400	159	29,672		

APPARATUS AND METHODS OF CAPTURE.

Until a comparatively recent period haul-seines have been the principal means of capture employed in the prosecution of the Albemarle fisheries. These were at first confined to the rivers, but gradually fishing shores were established on the sound. The effect of this has been to diminish the catch of the river seines to such an extent as to render them unprofitable, unless operated with small seines and crews involving correspondingly decreased expenditure of capital.

By degrees stake-nets have been introduced and operated by men of small means; these, however, are principally confined to the lower parts of the sound and to its minor tributaries. About 1870 pot-nets or Dutch-nets, as they are termed, were introduced. These have steadily increased in number each year, much to the detriment of the seine fisheries, since, as in the case of stake-nets, but little capital is needed for their operation.

At the time when the investigation of these fisheries was made these nets exceeded one hundred in number, and a considerable proportion of the catch of shad was taken in them and the stake-nets.

One of the most striking features connected with the Albemarle fisheries is the vast size of the seines operated. The largest of these has a length of 2,600 yards, and each sweep of the seine garners the crop from 1,200 acres. The hauling of the seine is usually effected by steam engines placed on the shore, these having been substituted for horse-power. In 1879 steamboats were first used for laying out the seine and are now in quite general use. In this operation two boats are used; one carries the shore end, the other the sea end of the seine. The center of the fishing-berth is marked by a stake with a bush tied to it, in order that it may be easily seen from the shore. In laying out the seine the boats pull together for the center stake, whence they separate, rowing in opposite directions and paying out the seine. The introduction of steam for this purpose has added greatly to the promptness and facility of this operation, and has rendered comparatively easy its accomplishment in all kinds of weather. The row-boat which carries the shore end is towed to the center stake by the steamer.

The magnitude of the work connected with the operation of one of these large seines is best shown by the following statistics:* The length of the seine is 2,600 yards, the depth 12 yards; size of mesh in breast of seine $\frac{7}{8}$ inch, in the wings $1\frac{1}{2}$ inches. The value of the seine is $5,220; of shore buildings, $2,500; of boats, $1,200; of engines, $1,800; of horses, $1,500. Total expenses for this one seine during the season, $8,500. The number of tons of ice consumed in packing 300, and of the bushels of salt used in the preparation of fish for market 2,000. The number of men employed is 61, of women 15. In 1879 this fishery took 52,700 shad, 900,000 herring, 13,000 pounds of rock, and 12,000 pounds of white perch.

During the season of 1880 there were in operation at the head of the sound, and immediately within the mouths of the Roanoke and Chowan Rivers, eleven large seines. In addition, a number of smaller seines were operated, the seine fisheries on the Chowan extending a short distance above the junction of the Notaway and the Meherrin.

DISPOSITION OF THE CATCH.

The fisheries of the Albemarle Sound reached their present importance through the extension of railroad and water routes south from Norfolk, whereby an easy and rapid communication with Northern markets was effected. The entire catch of shad, rock, and perch is shipped to

*The fishing shore here referred to is that known as "Sutton Beach," at the head of the Albemarle, owned and operated by Dr. Capehart, of Avoca.

market in a fresh condition, the greater portion being packed with ice in boxes, each containing about 225 pounds of fish. From Edenton and other landings the fish are transported by steamboat up the Chowan and Blackwater Rivers to the intersection of the Seaboard and Roanoke Railroad, or by the Dismal Swamp Canal, or yet again by the Chesapeake and Albemarle Canal to Norfolk. The fish are usually consigned directly from the shore to their point of destination. Agents are employed by the owners of the shores to attend to the packing and handling of the fish at Norfolk. Early in the season considerable numbers of herring also are shipped fresh, mainly to Philadelphia and Baltimore. The great bulk, however, is either sold fresh on the shore to the farmers, who carry them to the interior in carts and wagons, or is salted down in barrels and shipped, usually in sailing vessels, to Norfolk. The salt fish are prepared for market in three ways, being known, respectively, as "gross herring," the entire fish being salted down, as "split herring," the head and entrails being removed before salting, or as "roe herring," the head alone being removed, the main gut drawn, and the roe left in the fish. The manipulations connected with this preparation do not differ from those in common use all along the coast.

STATISTICS OF THE FISHERIES OF ALBEMARLE SOUND.

The following statistics show the extent and value of the fisheries of Albemarle Sound and its tributaries for the season of 1880:

	Number.	Value.
Men employed*	1,225	
Boats	205	$42,950
Apparatus		92,280
Shore property		55,800
Products.	*Pounds.*	
Shad	2,255,823	172,969
Herring	14,478,000	125,080
Sturgeon	114,400	1,144
Miscellaneous	513,200	50,620

*Fishermen and shoresmen.

3.—THE FISHERIES OF CHESAPEAKE BAY AND ITS TRIBUTARIES.

By Marshall McDonald.

1. GENERAL REVIEW.

The Chesapeake is a great highway for the commerce of the world. In contemplating its possibilities in this direction we are apt to lose sight of the fact that it is itself an area of vast and profitable production.

The fresh waters brought down by its grand system of tributary rivers, commingling with the salt waters of the bay, produce those peculiar conditions of salinity which are most favorable to the growth of the oyster. Consequently we find the shores of the bay itself, the mouths of all its rivers, and the bottoms of the tributary sounds—such as the Pocomoke and Tangier—thickly occupied by natural beds of oysters, the dredging of which furnishes profitable occupation for vast

numbers of the citizens of Virginia, Maryland, and other States. Many salt-water varieties of fish occur in the bay in countless myriads at their peculiar seasons, and furnish profitable and extensive fisheries. The most important species are the Spanish mackerel, two species of cynoscion, and the tailor or bluefish. In smaller quantities, also, are taken the sheepshead, drum, and porgy, and many other species of minor importance. Vast schools of menhaden frequent the bay from May to November, and, though not edible, are eagerly pursued and captured for conversion into oil and guano. Extensive manufactories for these purposes are in operation all along the bay, being more particularly abundant, however, on its western shore from the Rappahannock to the mouth of the Potomac. Northumberland County, Virginia, is the center of this industry. In the fisheries of the Chesapeake Bay are included those of Maryland and Virginia, and therefore the statistics of the commercial fisheries of those States, given in Census Bulletin No. 298, should be added together in order to show the aggregate production and value of the fisheries prosecuted in this important water area.

By this collation of figures we arrive at the following facts: Fishermen, 31,924; shoresmen, 1,884; factory hands, 11,064. This gives a grand total of 44,872 for persons employed in the Chesapeake fisheries.

The value of the apparatus, plus the capital otherwise invested, is $8,256,562.

The product amounts in pounds to 254,587,179, the value of which is estimated at $8,346,159.

2. THE JAMES RIVER.

PRESENT CONDITION OF THE FISHERIES.—The most southerly tributary of the Chesapeake is the James River, which rises in the heart of the Alleghanies and flows in a generally southeast direction, traversing more than 200 miles, through the mountains and the Piedmont section of Virginia, before reaching tide-water at Richmond, Va.

Prior to the establishment of obstructions in this river, caused by the construction of the James River and Kanawha Canal, large numbers of shad ascended the river as high as Clifton Forge and were taken in considerable quantities in fall-traps or "slides," in Jackson's and Cowpasture Rivers.

In the valley of Virginia west of the Blue Ridge seine fisheries were operated with profit, and the number of shad taken annually between Lynchburg and Richmond was at one time far in excess of the now entire catch for the whole river. The shad at the present time do not ascend higher than Bosher's Dam, about 9 miles above Richmond.

In the tide-water section of this river are received its two main tributaries, the Appomatox and the Chickahominy, which latter was, up to the time of the war, famous for its fine shad. The migrations of the fish into this river have not been limited to any appreciable extent by artificial obstructions. The erection of dams on the Appomatox at Petersburg has prevented the further ascent of fish, and consequently no organized fisheries are now prosecuted on that river.

During and long after colonial times large seine fisheries were operated all along the lower James. These have ceased to exist, only one small haul-seine—that at Harrison's Landing—being now in operation, gill-nets having almost entirely taken their place. A few pounds have been occasionally worked near the mouth of the river, but, being in defiance of law and unproductive in their results, have been discontinued.

The following is a summary of the statistics of the fisheries of the James River in 1880:

		Number.	Value.
Men employed		445	
Boats		264	$6,090
Apparatus and fishing houses			11,040
Products.			
Shad	pounds	357,000	14,280
Herring	do	850,000	10,200
Sturgeon	do	108,900	1,089
Miscellaneous	do	60,000	2,400

EARLY HISTORY OF JAMES RIVER FISHERIES.—*The following historical data are here reproduced* through the kindness of Mr. Alexander Brown, of Norwood, Va.

In 1743 old Dr. William Cabell bought a seine to catch fish, 6 feet deep in the middle, 4 feet deep at the staves or ends, well leaded and corked, about 15 fathoms long, and 100 weight of ¾-inch white cord.

[From the diary of Col. William Cabell, of "Union Hill," Nelson County, Virginia.]

1769.

October 3: Made up our fish dam, set trap, and caught several rockfish, tho' Mr. Hughes caught rocks a fortnight sooner. *October* 24: For several nights past caught 100 and large odd rockfish each night in our traps. *October* 25: Caught 2 fine carp in our traps.

1770.

April 10: Caught the first shad for this season.

November 23: Rented Jos. Cabell Ray's fishing place for £4 the next season.

December 18: By Jos. Cabell £5 for the rent of Ray's fishing place for 1770.

1771.

April 10: Begun to catch shad.

May 6: Humphrey to fish Thursday night. Mr. Nightingale to fish to-morrow fortnight.

1773.

June 7: By Abram Warwick a half Joe, which weighed 45 shillings, out of which I am to apply 10 shillings to his credit for a night fishing.

October 7: Rented John Depriest Ray's fishery as long as I have a right to it; so that it does not exceed nine years, to commence from the 25th Dec. next at £10 12*s.* 6*d.* a year, the first payment to be made the 10th of June next and the like sum annually.

1774.

July 19: By Col. Nevil 7*s.* 6*d.* for a night's fishing.

September 13: Caught a rockfish in one of my traps which was 2¼ feet long and weighed 10½ pounds.

1775.

March 11: Caught 17 white shad, 11 of which at one haul.

April 16: Caught a shad which weighed 7¼ pounds good weight.

May 15: Let Mrs. Prichard have 25 shad for her husband's mending my seein.

July 15: By Capt. Dawson, 14*s.* 2*d.* in full for 85 shad, at 2*d.* and 2*s.* 6*d.* for *Elliot Roberts for the Bostonians.*

1776.

July 15: Sent by Mrs. Prichard 16½ lbs. of twine to begin to knit me a seine.

1777.

March 30: At night caught shad for the first, being the first night that we began to fish. The river very low, scarcely a six hh'd tide, and has been so chiefly since Christmas. The dryest winter and spring, I believe, ever known.

1778.

March 21: Caught the first shad this season.

1779.

March 3: Rented my fishery on Wood's Island to James Matthews for theseason to find hima sceine and canoe, for 100£, to be paid at the end of the season, and to have the use of the sceine and fishery ten nights in the month of April, when I shall choose them. And he, the said Mathews, is to return the sceine and canoe at the end of the season, or *others of equal value in lieu thereof. Present, James Nevil and Nathaniel Watkins. March 31: Began to hall the* sceine, and caught ten shad, and delivered the sceine and fishing canoe to James Mathews all in good order. Present, Robert Hughes, Chas. Stewart, and many others.

April 2: At night there were 200 and odd shad caught at my fishery. *April* 10: Paid Mrs. Raly 25 shad, for which she paid me 4 dollars last Dec. *April* 18: In the morning finished fishing, and in 10 nights caught about 2,200 shad. *April* 28: By Chas. Stewart, $6 for 12 shad.

June 15: Charles Stewart, with one of my fellows and one of Landrum's, brought home my sceine, with many lead lost and much impaired by the cattle getting to it.

October 3: Caught 24 rocks in our traps, one of which weighed nearly 10 lbs., and had caught a few of a morning some time ago.

1780.

March 27: Begun to catch fish, 8 shad.

May 10: Sent Major Reid 47 shad in full of 65 which he paid me for some time ago (by negro Bob).

October 8: Caught a rockfish which weighed 12 lbs., and Hughes kept one that was much larger.

1781.

April 3: John Mays, James Mays, James Edmonds, John Layne, and Elijah Mays to have my sceine and fishing place on Wood's Island every Tuesday night during the present season for catching fish, for which they are to deliver me one-half they catch at my landing opposite the fishing place, to be careful of the sceine and keep it in good order; and if they fail to fish when the weather and river will permit, they are to be answerable to me for their neglect by paying me for one-half the fish, at the customary price, which are usually caught. At the end of the season to deliver up the sceine in good order. *April* 4: Moses Campbell, Ambros Campbell, Kellis Wright, Menos Wright, and John Alfred, same terms, every Wednesday night. *April* 5: J. Wright, C. Lavender, T. Largen, G. Wright, and J. Hollandsworth, every Thursday night caught in the course of the night 408 shad and fore some time past caught them very considerably. *April* 6: S. Edmunds and his company, same terms, every Friday night. Caught 473 shad in the course of the night. *April* 7: Sent Col. Sam'l Merideth, by Watt, his barrel with 200 pickled shad. *April* 8: James Mathews, with Col. Nevil's hands, to fish every Sunday or Monday night as shall be agreed between him and Capt. John Loving, on the same terms as the companies befor mentioned; at night caught 558 shad. *April* 13: At night the most severe frost I ever knew for the season. It has carried off all the fruit, killed most of our tobacco plants and those of all other kinds, destroyed our turnip and colewart seed in a great measure, and in short did every injury that frost could do. We caught at my fishery 64 shad, but when ever the sceine was a moment out of water it was frozen, and the water constantly froze to the poles while carrying the sceine out.

May 3: Caught 608 shad last night. *May* 4: Caught 508 shad last night. *May* 5: Caught about 400 shad last night. *May* 23: Declined fishing on account of the river rising; the fish tolerable good we caught the preceding night.

1784.

March 1: Wm. Ray (my tenant) to fish every Sunday night during the season and to deliver me one-half the fish that's caught, and am to find a sceine and canoe, and if he neglects to fish when the river and weather admit it, is to be answerable to me for each neglect; and Sam'l Edmunds & Co. same terms every Monday night, Jas. Edmunds & Co. every Tuesday night, Wm. Bibb & Co. Wednesday night, Killis Wright every Thursday night, Wm. Walton every Friday night.

April 13: At night caught 40 odd shad for the first, the winter being very severe and the spring very backward.

1785.

March 10: James Edmunds & Co. to fish every Monday night at my fishery, on Wood's Island, during the season, for one-half the fish he catches. Sam'l Edmunds & Co. Tuesday night, with Wm. Bibb & Co. Wednesday, do.; Killis Wright, do. Thursday, do.; Wm. Walton & Co. Friday, do.; Rich'd Murrow Saturday, do.; Young Landram Sunday, ditto.

April 15: Caugh 76 shad, for the first this season.

May 9: Monday night John Ball failed to haul my seine at the Swift Island, and the weather very good; to be answerable for the same. *May* 16: Paid Rich'd Murrow, jr., £3 for netting a seine in the presence of his father, Sam'l J. Cabell, and others.

1786.

February 11: James Brown, Wm. Key, Wm. Singleton, John Gregory, and Chas. Taylor to fish at Wood's Island every Sunday night (same terms as above); Sam'l Edmunds & Co., Monday do.; Jas. Edmunds & Co., Tuesday do.; Thos. Jopling & Co., Wednesday do.; Killis Wright, Thursday do.; Wm. Walton, Friday do.; James Mathews, Moses Ray, John Bibb, &c., &c., on same terms, &c., &c., at Swift Island fishery.

March 29: At night hauled the seine but caught no fish; Wood's Island. *March* 30: Caught 3 shad; the first. *March* 31: Caught 9 shad; the evening very wet and windy.

April 14: Caught 180 shad at the Swift Island; the first this season. *April* 15: Caught 177 shad at the Wood's Island fishery. *April* 16: Caught 930 shad at the Swift Island fishery. *April* 17: Caught 500 shad at the Wood's Island fishery. *April* 18: James Mathews caught 1,262 shad at my Swift Island fishery; James Edmunds caught 680 shad at my upper fishery (Wood's I.). *April* 19: Thos. Jopling, jr., John Ball & Co., 1,203 shad at my upper fishery (Wood's Island); Wm. Johnson & Co., 1,304 shad at my fishery (Swift Island).

May 4: Paid Nathan Ward 30 shillings pr. order of Rich'd Murrow jr. for netting one-half the seine at the Swift Islands.

1787.

March 25: Yesterday and to-day about 300 shad were caught at my Swift Island fishery.

April 8: Caught a shad at my fishery on Wood's Island which weighed 8½ lbs. good weight.

May 14: Declined hauling the seine; having from the 25th of March been engaged in that business with out ever being interrupted by rain or high water. A most excellent season for fishing.

August 14: Sent Dr. Geo. Gilmer a bbl. of pickle shad (150) by his man John.

October 6: In the morning took a rockfish out of our traps that weighed 12 lbs.

1788.

February 14: John Bibb to fish at my Swift Island fishery every eighth night during the season, with a good gang, &c. (other contracts as above).

April 4: Caught 18 shad at the Swift I.; the first this season.

May 16: John Boush failed to fish at night, the river and weather favorable, and fish plenty. James Mathews failed at Swift Island, do.

1789.

March 29: At night caught 12 shad at Wood's I.; the first this season. *March* 30: At night caught 52 shad at Wood's I.; at night caught 330 shad at Swift Island.

April 2: At night caught 709 shad at Swift Island.

September 29: Let out fish-traps and caught a few small fish in the night.

1790, 1791.

March 27, 1790: Begun to catch shad.

May 15, 1791: Declined fishing, very few being caught, tho' very good. A very unfavorable season for fishing, the river having been very low.

1792.

April 2: Caught the first shad this season. *April* 28: Just beginning to catch fish, having been prevented by high water, except two nights, in the course of the season.

May 3: Caught at Wood's I. 1,016 shad last evening. *May* 16: Edward Harding and his co. failed to fish at Swift Island; the fish very good, and upward of 100 caught by the proceeding company. *May* 20: Declined hauling the seine at Wood's I. When we caught upwards of 100 a night, and some of them tolerable good. *May* 25: At night, old Mr. Smith hauled his seine at Wood's I. and caught upward of 100 shad, which were mostly tolerably good.

September 29: Set our fish-trap, but the dam not secure.

1793.

March 24: At night caught 70 or 80 shad at Woods I.; might have caught several days sooner had the river not been too high.

November 5: Caught a rockfish in the Swift Island trap which weighed 16 lbs.

1794.

March 21: Began to catch fish.

May 15: Declined hauling my seine, having caught none of any consequence for some days past; it has been a very bad season for fishing altogether.

1795.

April 2: At night caught a few shad; the first this season.

May 18: Declined hauling my seine, altho' what few are caught are tolerable good. There have been the fewest and smallest shad caught this season of any within my remembrance.

Swift Islands are about 1 mile above Midway Mills and 102 miles above Richmond, via James River as it meanders.

Wood's Island, now known as Norwood Island, 10 miles above Richmond, via James River as it meanders, the largest and uppermost of the Swift Islands, containing 9 acres, where there was a most excellent fishery, was granted to Moses Ray, by patent bearing date December 15, 1749. Moses Ray died in 1766, and Col. William Cabell, sr., administered on his estate, and bought the said fishery from the heirs in October, 1784.

Buffalo Island, containing 40 acres, was patented by Dr. William Cabell in 1738, and deeded to his oldest son Col. William Cabell, of Union Hill, in 1763, first called *Buffalo Island*, then *Wood's Island* then *Upper Fishery*, then *Hughes Island*, and *now* Norwood Island.

From a memorandum of Col. William Cabell, jr. (the son of Col. William Cabell, sr., of Union Hill), who had recently married and had just begun to keep house:

1787.

March 24: 40 white shad were taken at one haul at the Swift Islands. *March* 28: Received 20 white shad from Swift Island fishery. *March* 30: Received 26 white shad from Swift Island fishery.

April 1: Received 51 white shad from Swift Island fishery. *April* 5: Received 32 white shad from Swift Island fishery. *April* 9: Received 37 white shad from Swift Island fishery. *April* 10: Received 30 white shad from Swift Island fishery. *April* 13: Received 15 white shad of my father. *April* 14: Received 50 shad, 39 of which I sent up to my quarter. *April* 24: Received 20 white shad of my father. *April* 25: Received 19 white shad of my father. *April* 28: Received 49 white shad of my father.

May 9: Received 20 white shad of my father.

1788.

April 4: Began to catch white shad.

From Col. William Cabell sr's. account books I find that fresh shad sold at 2 to 4 pence each, before and after the revolution. During the war prices varied with the currency.

Pickled shad in barrels, containing from 150 to 200 shad, sold for about $6 to $9 a barrel. Very few shad, fresh or pickled, were sold, but very many were given away.

3. YORK RIVER AND ITS TRIBUTARIES.

The York River is the common estuary of the Pamunkey and Mattapony Rivers, which have their confluence at West Point, about 20 miles west of Yorktown and Gloucester Point.

The area of the hydrographic basin drained by the tributaries of the Mattapony and Pamunkey is small compared with that of any of the principal rivers of the State; yet, in consequence of not being obstructed for some distance above the head of tide, the actual spawning area for shad and herring is greater than in the James, the Rappahannock, or even in the Potomac. The fact that these waters have been able to maintain a respectable shad fishery, in spite of the excessive drafts made upon them, clearly illustrates the disastrous influences exerted upon the fisheries of our principal rivers by the obstructions which restrict the migrations of the shad and herring (alewife) to the tidal areas.

Even in these rivers there has been a steady decrease in the value and the production of these fisheries. The herring fishery no longer exists. Probably 250,000 to 300,000 are taken in gill-nets for local consumption. Formerly with a haul-seine, upon a single tide, over 100,000 have

been taken. Now, the haul-seines are abandoned, there being but four in the two rivers, and the fishing is mainly with float-seines. The fish reach the market through West Point, Sweet Hall, Lester Manor, Cahoke, and White House, all stations on the York River Railroad, and thence are sent chiefly to Richmond, and some to Baltimore and Philadelphia. Sturgeon go to Richmond almost exclusively, and are known there as Charles City "bacon".

Summary of the fisheries of the Mattapony and Pamunkey Rivers for 1880:

Pamunkey and Mattapony Rivers.

	Number.	Capital invested.	Product of the fisheries.	
			Pounds of fish.	Value.
Men employed in fishing	425			
Boats	212	$3,920 00		
Apparatus		4,020 00		
Fishing houses and other shore property		425 00		
Products.				
Shad			238,850	$11,947 50
Herring			250,000	2,500 00
Sturgeon			51,661	1,549 83
Other fresh-water fish			25,000	2,000 00
Total		7,365 00	565,511	17,997 33

The fish for market are taken almost exclusively in float-nets and stake-nets; formerly there were a number of profitable seine hauls in both rivers, which are now abandoned. Four of the old shores are sometimes hauled, but they hardly pay expenses. Upon the two rivers one hundred and seventy-five boats are occupied in fishing float-nets and twenty-five boats in stake-net fishing. To each boat there is usually a man and a boy, and the cost of the outfits will average about $30.

Besides the float and stake-nets, there are three weirs in the vicinity of West Point and eight fyke-nets. They are principally valuable for the fall and winter fishing.

At the narrows of the rivers what are termed "hedgings" are numerous. They effectually impede the further ascent of the fish, and as nearly all the shad that reach them are ripe they must exert a very injurious influence upon the fisheries.

A "hedging" is made by driving down forks at intervals of 6 to 8 feet across the stream from one bank to the other. These support a continuous log or ridge-pole some 6 or 8 inches in diameter; resting upon this and pointing up the stream are poles 3 or 4 inches in diameter driven into the mud and spaced at intervals of an inch. An opening about 3 feet in diameter is left at one point. By the accumulation of leaves a tolerably tight dam is soon formed; the water is dammed back, and a strong current discharged through the opening, presenting the only possible passage for the ascent of the fish. At this opening stands a worthless, lazy contraband, or more worthless white, "skim-net" in hand, and when he feels a fish strike the net lifts it out. Such devices as these should be prohibited under the severest penalties.

4. THE RAPPAHANNOCK RIVER.

The sources of the Rappahannock are on the eastern slope of the Blue Ridge. Its mountain tributaries formerly abounded in trout, which have, however, almost entirely disappeared from most of the streams, being occasionally found in those above where the fishing laws have been strictly observed. The readiness with which these fish have been restored to their streams by

artificial planting proves that their disappearance was due not to any change in the character of the water, but merely to over-fishing. Before obstructions existed in the Rappahannock the shad ascended its main tributaries almost to the base of the Blue Ridge. Contests relative to the obstruction of the stream by dams began in colonial times, and petition after petition for arresting the encroachments of mill owners and manufacturers upon the general right was filed in the House of Burgesses. As is, however, usual, the march of progress triumphed, and the "annually recurring bounty of Providence," *i. e.*, the fish, was entirely cut off from the upper waters of the river. At the present day the upward movement of shad is limited to Falmouth—a short distance above tide-water—where a stone dam 20 feet high prevents further ascent. Here, as on most of the rivers, we hear the same well-grounded complaint of impoverished fisheries, due, however, as a rule, first to the diminished spawning and breeding area of the shad, and, secondly, to too excessive fishing by illegitimate appliances, such as traps and slides, the use of which above high water should in all cases be absolutely prohibited by law.

Organized fisheries are prosecuted in this river as high as Fredericksburg—about 140 miles from its mouth—where tide-water ceases. From the bay up to Bowler's wharf fishing is carried on almost exclusively by pound-nets. Thence to Leaton's stake-nets prevail. Each staker fishes from twenty-five to fifty nets, each about 9 yards long, with a stretched mesh of 4½ to 5 inches, the depth of the net varying with the depth of water. Three haul-seines are fished between Bowler's and Leaton's. From Leaton's to Fredericksburg the haul-seines and the gillers hold disputed sovereignty. During the season of 1879 nine seines in all were fished on this river. These were operated by horse power, and averaged about thirteen men to a crew.

The statistics of the *personnel* of these fisheries for the season of 1879, the capital invested, the products and their value, are given in the following table:

The Rappahannock River.

	Number.	Value.
Men employed	416	
Boats	180	$5,335
Apparatus and fishing houses		33,638
Products.		
Shad ..... pounds..	469,073	18,762
Herring ..... do....	732,797	8,793
Sturgeon ..... do....	37,700	177
Miscellaneous fresh-water fish .... do....	107,859	7,549
Offal, scrap fish* ..... bushels..	5,100	765

* Used for manure.

5. THE POTOMAC RIVER.

The Potomac River has its sources upon the eastern front of the main chain of the Appalachians; flowing south and east, it breaks through the Blue Ridge at Harper's Ferry and reaches tide-water five miles above Washington, by descending in rapids over a granite ledge about 60 feet high, known as the Great Falls. By its main tributary, the Shenandoah, which joins the Potomac at Harper's Ferry, it drains the rich valley of Virginia as far up as Staunton, which is on the divide between the waters flowing into the James and the Potomac.

The Potomac has always been celebrated for the excellency and value of its shad and herring fisheries. Reports of their magnitude have come to us from early days, and from them we gather that the production must then, as compared with our own day, have been simply fabulous. While

the Potomac and its tributaries above tide-water present all the conditions suitable for the spawning and breeding grounds of the shad, yet the Great Falls have always stood as an insuperable barrier to the further upward migrations of not only the shad and herring, but also of the more enterprising species, the rock-fish or striped bass. The fisheries of this river annually decreased in value and production up to the time of the war; the intermission which then ensued in the fishing operations on account of those of a martial character allowed the fisheries to recuperate, so that in the years immediately succeeding the war it was found that they had in a measure recovered from their former depletion. In 1878 the minimum of production was attained, during which season less than 200,000 shad were taken in the entire river. In 1879 the results of previous artificial propagation first manifested themselves, and there was a considerable increase in the run of shad, from which time the shad fisheries steadily increased, until in the season of 1880 nearly 600,000 were taken.

The early fisheries on the Potomac were prosecuted entirely by means of haul-seines. About the year 1835 gill-nets were introduced from the North. These have steadily grown in favor and for the last few years have been the principal instrument employed for the capture of shad.

In 1880, only eleven large haul-seines were in use where fifty had been fished in early days. Within the last five years pound-nets have been introduced. They are increasing in numbers rapidly, and are by degrees displacing the gill-nets, which, as above stated, displaced the haul-seines.

The following statistics show the extent and value of the Potomac fisheries for 1880:

The Potomac River.

	Number.	Value.
Men employed	1,208	
Boats	230	$30,750
Apparatus and fishing houses		209,550
Products.		
Shad ..... pounds	2,040,052	60,291
Herring ..... do	6,291,252	62,912
Sturgeon ..... do	283,000	2,880
Miscellaneous ..... do	1,317,638	39,510

6. THE SUSQUEHANNA RIVER.

The sources of this river are in the highlands of Pennsylvania and Western New York. Flowing in a general southerly direction, it breaks through the entire Appalachian system, and discharges into the head of Chesapeake Bay. Its principal tributaries are the Juniata, the North Branch, and the West Branch. The extreme sources of the North Branch are in the Catskill Mountains, while the western branch interdigitates with the headwaters of the Ohio. In the early settlement of the country the abundant run of shad into all these streams at the proper season was a matter of prime importance to the people, a very considerable proportion of their income being derived from this source. Profitable shad-fisheries existed at a number of points on the Juniata and on the North Branch of the Susquehanna, and vast numbers ascended the West Branch also up into the Chenango River in the State of New York, and were taken at a distance of several hundred miles above their present limit. The accounts in regard to abundance of shad, given by the early settlers on all the rivers of the Atlantic slope, seem almost fabulous to us in these days. If tradition has invented exaggerated stories concerning all the other rivers, those accounts touching the Susquehanna at least are undoubtedly established by authentic data. At the request of Prof. S. F. Baird, U. S. Commissioner of Fish and Fisheries, a

committee of the Wyoming Historical and Geological Society, of which Mr. Harrison Wright was chairman, has prepared and submitted the following very interesting report on the early shad-fisheries of the North Branch of the Susquehanna River.

REPORT OF A COMMITTEE OF THE WYOMING HISTORICAL AND GEOLOGICAL SOCIETY ON THE EARLY SHAD-FISHERIES OF THE NORTH BRANCH OF THE SUSQUEHANNA RIVER.

Prof. SPENCER F. BAIRD,

United States Commissioner of Fisheries:

SIR: The committee of the Wyoming Historical and Geological Society, to whom your inquiries touching the old shad-fisheries on the North Branch of the Susquehanna were referred for investigation, would respectfully report that they have interviewed, by letter or in person, a large number of the old settlers, who either now live or formerly did live near the banks of the river, and were calculated to be able to give the requisite information, and who were pleased to report. These persons have, in nearly every instance, most cheerfully and at no little trouble furnished us with the information asked. We make this acknowledgment for the reason that the parties to whom application was made are necessarily far advanced in age, all with but one or two exceptions having seen their "three score years and ten," and to them it was no little labor to write out their reminiscences of the early shad-fisheries.

Besides these interviews, the records of the county, files of old newspapers, the numerous printed histories of this section of country, have been consulted, and from these various sources the data upon which this report is based have been gleaned. With these preliminary remarks let us proceed to our report.

HISTORY.—There can be no doubt but that the Indians, for years before the white people thought of settling at Wyoming, caught their shad there in large quantities; their net-sinkers, though they have for years been collected by archæologists, are still very plenty, and can be found anywhere on the flats along the river in quantities, and the fragments of pottery show unmistakable markings with the vertebræ of the shad; these, together with the fact that the early settlers saw the Indians catching shad in a seine made of bushes (called a bush-net), point to the fact that *shad on the North Branch were taken in quantities by the Indians.*

The Connecticut people who settled here over a hundred years ago had, in the very start, their seines, and took the shad in numbers; as near as we can learn they were the first white people who seined the shad in the North Branch.

During the thirty years' war which the Connecticut settlers had with the Pennsylvania Government for the possession of this valley of Wyoming, the shad supply was a great element of subsistence; for this, unlike the fields, barns, and granaries, could not be burned by the Pennamites. An old settler says: "When we came back to the valley we found everything destroyed, and the only thing we could find to eat were two dead shad picked up on the river shore; these we cooked, and a more delicious meal was never partaken of by either of us." One of the most bitter complaints *made against the Pennamites, in 1784, was that they had destroyed the seines.*

After the Revolutionary war had ended, and the troubles between the Pennsylvania claimants and the Connecticut settlers had been quieted, the shad fisheries increased in numbers and value yearly, until about the year 1830, when the dams and canal were finished and an end put to the shad fisheries.

RUN.—It would appear, from the papers hereto attached, that the male fish preceded the female fish by some eight to ten days in their ascent of the river, and between the ascent of the former and that of the latter there was generally a perceptible rise in the river, and immediately following it came the large roe-weighted females in great schools.

FISHERIES.—Accompanying this report is a map of the Susquehanna River from the junction of the West Branch at Northumberland to Towanda, near the New York State line; upon this is noted the localities of the fisheries with as much accuracy as was attainable from the accounts received by us. Some have probably been omitted, especially in the stretch of river from Danville to a point 4 miles above Bloomsburg, where we were unsuccessful in our inquiries, but without doubt the most important on the river have been recorded by us.

At Northumberland, or just below, was Hummel's fishery; between Northumberland and Danville there were eight fisheries in order from Northumberland up, as follows: (1) Line's Island lower fishery; (2) Line's Island middle fishery; (3) Smith's fishery; (4) Line's Island upper fishery; (5) Scott's fishery; (6) Grant's fishery; (7) Carr's Island fishery; (8) Rockafeller's. The next fishery of which we have a record was the fishery of Samuel Webb, located about 4 miles above Bloomsburg. Above this point about 4 miles, and 6 miles below Berwick, was the fishery of Benjamin Boon; the next was located just above the town of Berwick, and about a mile and a half above Berwick was the Tuckahoe fishery (this last is the same as the Nescopeck fishery mentioned in Pearce's history); the next was at Beach Haven. Between this latter place and Nanticoke Dam there were three, viz, one at Shickshinny, one just below the mouth of Hunlock's Creek, and one called the "Dutch" fishery, on Croup's farm. Above Nanticoke there was one belonging to James Stewart, about opposite Jameson Harvey's place; one at Fish Island, and one at Steel's Ferry, called the Mud fishery. The next was on Fish's Island, three-quarters of a mile below the Wilkes-Barre bridge; the next was Bowman's fishery, immediately below the Wilkes-Barre bridge; the next was the Butler fishery, a little above the bridge; the next was at Mill Creek, a mile above the bridge; the next was the Monocacy Island fishery; the next Carey's; the next was on Wintermoot Island, this last landing on the left bank above the ferry at Beauchard's; the next was at Scovel's Island, opposite Lackawanna Creek; this and the Falling Spring fishery next above belonged to parties living in Providence, away up the Lackawanna. The next above was at Harding's, in Exeter township; the next above was at Keeler's, in Wyoming County; the next was at Taylor's (or Three Brother's) Island. This latter fishery was no doubt the one referred to by P. M. Osterhout as being opposite McKune's Station on the Lehigh Valley Railroad. The next was at Hunt's ferry *circa*, 5 miles above Tunkhannock; the next was Grist's Bar, about a mile above Meshoppen; the next was at Whitcomb's Island, a mile below Black Walnut bottom; a half a mile above this fishery was the Sterling Island fishery; and the next above was Black Walnut, and half a mile further up was the Chapin Island fishery; the next was at the bend at Skinner's Eddy; the next was at Browntown, in Bradford County; the next was at Ingham's Island; the next was at the mouth of Wyalusing Creek; 2 miles farther up was one at Terrytown; the next and last that we have any record of was at Standing Stone, about 6 miles below Towanda.

Thus it will be seen that between Northumberland and Towanda there were about forty permanent fisheries.

MONEY VALUE.—Our country records only go back to 1787. We spent a whole day in searching the first volumes, in hopes that we might find some entries of transfers of fishing rights, but our search was fruitless; we have, however, found among the papers of Caleb Wright a bill of sale of a half interest in a fishery between Shickshinny and Nanticoke, called the "Dutch fishery;" the price paid was £20 "lawful money of Pennsylvania," equivalent to $53.33.*

Jameson Harvey says that Jonathan Hunlock's interest in the Hunlock fishery was worth from $500 to $600 per annum; it was a half interest. Henry Roberts says a right in a fishery was worth from $10 to $25.

*Caleb Wright's son received 1,900 shad as his share of one night's fishing at this fishery.

Major Fassett's father was one of eleven owners in the Sterling Island fishery, and his interest was valued at $100.

Mr. Hollenback's information on the money value of the different fisheries is by far the most valuable; he says the Standing Stone fishery was worth from $300 to $400 per annum; the Terrytown fishery was worth about the same; the Wyalusing Creek fishery was worth about $250 per annum; the Ingham Island fishery, $50 less; the Browntown and Skinner's Eddy fisheries, about $150 per annum each.

Jameson Harvey say: "The widow Stewart, at the Stewart fishery, used often to take from $30 to $40 of a night for her share of the haul."

The data bearing upon this point are decidedly unsatisfactory, as they would only give to the forty fisheries an annual value of about $12,000, a large amount for those days, yet one we believe to be too small; the next item, the "catch," should be taken with this one to form a basis for calculation.

CATCH.—At the eight fisheries near Northumberland large numbers of shad were taken; three hundred was a common haul; some hauls ran from three to five thousand. The Rockafeller fishery, just below Danville (about the year 1820), gave an annual yield of from three to four thousand, worth from 12½ cents to 25 cents apiece.

Mr. Fowler says that the fishery just above Berwick was one of the most productive, and that he has assisted there in catching "thousands upon thousands," but does not give the average annual yield; he also says, that at the Tuckahoe fishery "many thousands were caught night and day in early spring;" and at the Webb and Boon fisheries the hauls were immense; at the latter they got so many at a haul that they couldn't dispose of them, and they were actually hauled on Boon's farm for manure.

At Hunlock's fishery the annual catch must have been about ten thousand.

At the Dutch fishery in one night thirty-eight hundred were taken.

At the Fish Island fishery, at a single haul, nearly ten thousand shad were taken.

Mr. Jenkins recollects of seeing a haul at Monocacy Island—just before the dam was put in—of twenty-eight hundred.

At Scovel's Island the catch was from twenty to sixty per night; at Falling Spring fifty to three hundred per night; at Taylor's Island from two hundred to four hundred per night.

At Wyalusing the annual catch was between two and three thousand; and at Standing Stone between three and four thousand.

The daily catch at the Terrytown fishery was about one hundred and fifty.

Major Fassett says that at the Sterling Island fishery "over two thousand were caught in one day in five hauls."

It is a plain deduction from the above facts that the fisheries down the river were much more valuable than those above. Above Monocacy we hear of no catch over two thousand, while below that point they were much larger, and while from $300 to $400 seems to be the general annual value above, we find the fishery at Hunlock's, 12 miles below, was worth from $1,000 to $1,200 per annum. The shad farther up the river appear to have decreased in numbers yet to have increased in size, and that brings us to the next head.

SIZE.—The opinion seems to be general that the great size attained by the Susquehanna shad was attributed to the long run up the fresh-water stream (carrying the idea of the survival of the fittest); that they were of great size is beyond doubt; nearly every one who recollects them insists on putting their weight at almost double that of the average Delaware shad of to-day.

Mr. Van Kirk gives from 3 to 9 pounds as the weight of the shad caught at the fisheries in Northumberland and Montour Counties.

Mr. Fowler says he has assisted in catching thousands weighing 8 and 9 pounds at the fisheries in Columbia County.

Mr. Harvey, speaking of the Luzerne County shad, says: "Some used to weigh 8 and 9 pounds, and I saw one weighed on a wager which turned the scales at 13 pounds."

Major Fassett, speaking of those caught in Wyoming County, says: "The average weight was 8 pounds, the largest 12 pounds."

Dr. Horton says of the shad caught in Bradford County, that he has seen them weighing 9 pounds; ordinarily the weight was from 4 to 7 pounds.

PRICE.—The price of shad varied, according to their size, from 4*d.* to 25 cents, depending of course upon their scarcity or abundance, and as some of our correspondents remember the price in years when it was high, and others in those when there was a great plenty of fish, there arise what appear to be conflicting statements in their letters.

At the town meeting held at Wilkes-Barre, April 21, 1778, prices were set on articles of sale, *inter alia*, as follows: Winter-fed beef, per pound, 7*d.*; tobacco, per pound, 9*d.*; eggs, per dozen, 8*d.*; shad apiece, 6*d.* At one time they brought but 4*d.* apiece. A bushel of salt would at any time bring a hundred shad.

At the time the dam was built they brought from 10 to 12 cents. On the day of the big haul Mr. Harvey says they sold for a cent apiece (Mr. Dana says 3 coppers).

Mr. Isaac S. Osterhout remembers a Mr. Walter Green who gave twenty barrels of shad for a good Durham cow.

Mr. Roberts says that in exchanging for maple sugar one good shad was worth a pound of sugar; when sold for cash shad were worth 12½ cents apiece.

Major Fassett says the market price of the shad was $6 per hundred.

Dr. Horton says the shad, according to size, were worth from 10 to 25 cents.

Mr. Hollenback, in calculating the value of fisheries near Wyalusing, has put the value of the shad at 10 cents apiece. In 1820 they were held in Wilkes-Barre at $18.75 per hundred. Mr. Fowler says they were worth 3 cents or 4 cents apiece.

COUNTRY SUPPLY AND TRADE.—Every family along the river having some means had its half barrel, barrel, or more of shad salted away each season, and some smoked shad hanging in their kitchen chimneys; not only those living immediately along the river were the beneficiaries, but the testimony shows that the country folk came from 50 miles away to get their winter supply, camping along the river's bank, and bringing, in payment, whatever they had of a marketable nature. They came from the New York State line, and from as far east as Easton, bringing maple sugar and salt, and from as far west as Milton, bringing cider, whisky, and the two mixed together as cider royal, and from down the river, and away to the south towards Philadelphia, bringing leather, iron, &c.

Mr. Isaac S. Osterhout says when quite a boy (1822–'23) he went with a neighbor to Salina, N. Y., after salt, he taking shad and his neighbor whetstones, which they traded for salt. The teams hauling grain to Easton brought back salt; in good seasons the supply of this latter important item always seems to have been short of the demand.

The shad, as far as we can learn, appear never to have gone up the West Branch in such quantities as they did up the North Branch, and the same may be said of the Delaware, or else the fish were of inferior quality, for the dwellers from the banks of both of these streams came to Wyoming for their supply of shad.

Mr. P. M. Osterhout tells of a firm (Miller & McCord) living at Tunkhannock which did quite an extensive business in shad, sending the cured ones up the river into New York State, and far down the river.

Mr. Fowler says: "No farmer, or man with a family, was without his barrel, or barrels, of shad the whole year round. Besides furnishing food for the immediate inhabitants, people from Mahantango, Blue Mountains, and, in fact, for 50 miles around, would bring salt in tight barrels, and trade it for shad."

Mr. Harvey says: "Boats coming up the river used to bring leather, cider, whisky, cider royal, salt, iron, &c., and would take back shad."

OTHER FISH.—We do not find that any other deep-sea fish (with the exception of eels) ever came up the river above Northumberland. The "Oswego bass," "Susquehanna salmon," "Yellow bass," "Striped bass," "Susquehanna bass" spoken of by the different correspondents appear to be the same fish, which is also sometimes called the wall-eyed pike; an excellent fish introduced into the river many years ago from Oswego Lake; they are not now as plenty as formerly, though within the past few years they have been increasing perceptibly. The other fish mentioned are nothing but the common river fish.

EFFECT OF DAMS.—There is no question that the building of the dams necessary to feed the canals put a stop at once to shad fishing; all our correspondents agree that after the Nanticoke dam was finished, in 1830, no shad were ever caught above it. As to the effect of the dams on the shad fishing, the following extracts from Hazard's Register are of interest:

1829. May 9, page 301. "Lewiston, Pa., May 2. It is stated that shad are caught in much greater abundance below the dam at North Island, in the Juniata, than has ever been known at any previous time. It is supposed that the dam in the Susquehanna, immediately above the mouth of the Juniata, has the effect of directing their course up the Juniata. The dam at North Island retards their passage farther, and the consequence is that the people farther up the Juniata are deprived of the luxury of fresh shad, which so abundantly falls to the lot of their neighbors a few miles lower down. But we must be content with these little deprivations by the promise of the immense advantages which are to accrue to the country from the canal."

1830. May 8, page 304. The Sunbury Beacon of Monday the 26th of April, says: "Not less than from 4,000 to 5,000 shad were caught on Saturday last within a quarter of a mile below the dam. Upwards of 500 were taken by one dip-net, and several others averaged 200 and 300 each. We understand that several hundred were caught with dip-nets yesterday."

1831. May 14, page 318. From the Wyoming Herald: "Wilkes-Barre, May 6, 1831. While the raftsmen complain of the Nanticoke dam, the boys find in it a source of amusement. The bass which ascend at this season in great numbers, stopped by the dam, offered fine sport. Indeed, hooks, half a dozen at a time without bait, are let down and suddenly drawn up often with two or three bass hooked by the side."

And on the same page, from the Susquehanna Democrat: "A short time since great quantities of bass were caught in a small eddy formed in the river directly below the abutment of the Nanticoke dam. The fish apparently lay there in schools, and by drawing hooks through the eddy numbers were caught. On Thursday and Friday last a number of fine shad were caught in the same way. One man drew out 9 in one day, and sold them for 50 cents each. This is the first instance within our knowledge of shad being caught with a hook. We mention the fact as one altogether new, as well as to say to the down-river folks, our market has not been altogether destitute of shad, though many a gentleman's table has."

We are informed that to-day the shad manage to get over the Columbia dam, only to be received in nets spread for them at the head of the sluice-way by a pack of scoundrels, among whom, if we hear correctly, are parties connected with our State fish commission; if it were not *for this we would have shad in small quantities as far up as the next dam at all events.* The cutting off of this staple of food from tens of thousands of people in this section of country could not but be a great loss, and it has been questioned if it was not greater than the benefits derived from the great internal improvements. Some slight improvements in the sluice-way of the lower dams and a regular ladder-way in that of the Nanticoke dam, good protective laws, well enforced (*with a double-barreled shot-gun for Columbia dam*), *certain days set for fishing along the river*, and one good stocking with young shad, would, we believe, give us shad in fair quantities all the way up the river.

We do not believe the expense would be very great, whereas the benefits would be incalculable. There is no doubt that the experiment is well worth trying.

Luzerne County will contribute her share towards the necessary improvements.

All of which is respectfully submitted.

HARRISON WRIGHT,
Chairman of Committee.

WILKES-BARRE, *May 27, 1881.*

PRESENT CONDITION OF THE FISHERIES.

LIMITS OF THE FISHERIES.—The present limit of the upward movement of shad in this river is Columbia, situated about 40 miles above tide-water. The dam at this place, about 6 or 7 feet high, constitutes an effectual barrier to the passage of the fish. To this point shad still ascend in large numbers, *from 30,000 to 40,000 being annually taken at the dam or in its immediate vicinity.*

Herring now ascend the Susquehanna only as far as Bald Friar, a few miles above tide-water, nor have we any information of their ever having pushed their migrations beyond this point.

SEINE-FISHING.—Rock and perch are taken in large numbers in haul-seines during the spring months. In summer and fall these fish are taken exclusively with gill-nets and small drag-nets.

Catfish are taken in great quantities for the Philadelphia market, where, dressed, they command a price per pound not much below that for perch and rock.

The most important fishing industry on the Susquehanna is the gill-net fishing, though twenty large haul-seines are operated at various points, in what is termed the "head of the bay," the North-east River, and in the Susquehanna itself, a short distance above Havre de Grace. In consequence *of the peculiar natural characteristics of the fishing grounds of this river, the landing of the seines* is provided for by special constructions. In some places large floats are used on which to land the seines. These are fully described in the section relating to the apparatus used in the capture of fish. In other cases, instead of floats, a "battery" is built of logs; this is filled in with earth and stones, and upon it the seine is landed.

GILL-NET FISHING.—In the gill-net fisheries, which are frequently conducted in very rough water, boats larger and far more seaworthy than those used on other rivers are here employed. A complete outfit for a giller is one round-bottom boat, costing, when new, $140; one scow with house and reel, $40; and four or five 100-fathom nets, costing about $25 each, making a total value of about $300.

The following graphical description of the mode of fishing these nets is from the pen of the late Professor Milner:

"The 'gilling ground' extends from Havre de Grace, Md., eastward and southward, to the mouth of the Chester River. Between Havre de Grace and *Spesutie Island a shoal extends* with the navigable channel to the westward, and to the eastward an old partially filled up chan-

nel known as Swash. Near the center of the shoal a light house has been built, called Battery Light. When the shad have reached this point in the bay, they come up on the shoal in the night, at slack water of ebb and flood of tide. From the Battery Light to head of the island is known to be the center of their congregation, and a great strife for good berths prevails, so much so that enterprising fishermen will lie in their boats for half a day, anchored to the spot where they desire to cast the nets after dark. These drift-nets are made of fine twine and entangle the fishes by the gill-flaps as they swim against them. The cork-line floats at the surface, and the lightly weighted lead line at low tide trails along the bottom. At each end of the nets, which have ordinarily a length of 300 yards, a float is tied, upon which rides a lantern. These lanterns are required to distinguish the different nets as they are cast along the shoal parallel to each other, often with not more than 50 or 60 feet intervening. They drift with the tide, and one floating too slowly or snagged at the bottom becomes fouled with its neighbor as soon as it is overtaken. It is essential that all are put out simultaneously, or the dividing spaces soon become irregular, and many of them too narrow, resulting in the nets becoming entangled with each other. A still night on the bay, in the height of season, is a pleasant experience. The anchored boats, scarcely discernible in the dusk, become deep shadowy masses at intervals or disappear in the darkness. Suddenly a muffled, quiet movement of oars is heard, and in quick succession lights appear on the water in a long line, and the rapid movement of a hundred pairs of oars is heard as they click in the rowlocks. Each rower vies with his rival to run out the 300 yards of net, his comrade in the stern rapidly and skillfully throwing the corks and leads. Some impatient fellow usually pulls up his anchor silently, but the light on the water telegraphs the fact to the rest and he rarely gets half a dozen strokes ahead. One hundred boats often pull abreast across the line of the shoal. The second lantern floating on the water announces the net all out.

"Standing in the night on an elevated point of the island, with many hundred lights strewn thickly over the wide expanse of water, the observer is impressed with the similarity of the view above him and below, as if the stars overhead were reflected on the surface of the bay with double brilliancy.

"The boatman either turns directly back and 'runs the net,' passing the cork line through the hands, readily detecting the presence of fish, or he rows back to the starting point, and it is run from that end, the net all the time drifting with the tide. The shad, whenever found, are 'ungilled' and thrown into the boat, and the net drops away again.

"The necessity for instantly going over the net relates to the presence of great quantities of eels, which soon spoil the shad for the market or for the table. Sitting in my boat while the oarsman was quietly rowing behind a 'giller' we were attracted by a continual splashing in a net near by. We thought it to be a sturgeon rolling and entangling himself in the twine as they sometimes do. Heading the boat in the direction of the sound and coming near, it seemed at first to be a number of 'herring' meshed in a singularly close huddle, and in their struggles flashing their white sides in the dim starlight. As we came nearer I turned the light of the lantern full upon them and discovered a swarm of eels tearing and stripping the flesh from the bones of a shad which had gilled itself near the cork line. Gathered in a writhing mass, with their heads centered upon the fragment of the fish, we had before us the living model of a drowning Medusa. There was at least a bushel of them, greedily crowding each other, fastening their teeth in the flesh of the shad, and by a quick, muscular torsion snatching pieces from the dying fish. It is not uncommon to see a dozen heads of shad, each with a long, slender backbone attached, taken one after the other out of the net, when a fisherman has delayed a little too long. Six good eels have been thrown into the boat by a dexterous jerk of the net where a mutilated shad was hanging. I have

seen four eels fall out of the abdominal cavity of a shad, when no eels were visible, when the fish came over the gunnel. They had devoured the viscera, which always seems to be the first portion sought by them.

"The habit is to run the net as soon as it is all out, and take the fish out immediately, before *they can be injured by the eels. The eels never mesh; they are too slippery to get entangled.* In the shoal fishing, when the weather becomes warm, the 'eel-cuts,' as these are called, often outnumber the marketable shad. The fishermen salt down the better ones for their winter food."

"The net is run twice or three times and is then taken up. Little else than shad is taken; a few striped bass and a few suckers are occasionally found. The captures, to each boat with two men, *number from 'water hauls' to several hundred shad.*

"After the first tide's fishing the boats anchor. Often several tie fast to another anchored one, and the men while away the hours to the next tide in gossip and yarn spinning, or go to sleep in the bottom of the boat. It often happens when anchored apart from the rest, they find themselves, in the small hours of the morning, chilly and solitary in the middle of the bay.

"*Quiet and harmony is the ordinary state of their communion,* although *the strife for good* berths sometimes arouses a dissension. An attempt to anticipate the line of boats in laying out the nets at too early a stage of the tide calls forth sudden and certain penalty. Not only the boats on each side, but some of those from a distance, crowd around and unite their protests, and when these are unavailing the offender is hemmed in by the boatmen, who, in a half jocose manner, yet with a fully in earnest purpose, set their nets across the line of direction he has started in 'surrounding him.' If he is still obstinate enough to persist or to attempt to cut the nets which are in his way, a melee ensues, and some sturdy boatman is apt to belabor him into reason with an oar, public opinion favoring a certain amount of this kind of punishment.

"The boats used in the head of the bay are small, and the mutton-leg sails have no provision for reefing. The foresail is much larger, and sail is shortened by unstepping the foremast and putting the mainsail in its place. At the approach of a squall they hurriedly pull in the nets and scatter like a shoal of mullets when a porpoise appears among them. They get caught out occasionally, and getting to the lee of the shoal or the island, they sometimes lie with the killock out all day."

FYKES AND POUND-NETS.—A large number of fykes are in use from Havre de Grace to Columbia in summer for the capture of perch, rock, and catfish. Under the Maryland law the use of pound-nets is prohibited, and their absence from the Susquehanna is a striking feature to one accustomed to seeing them in such general use in other parts of the bay.

STATISTICS.—**The history of the impoverishment of the Susquehanna fisheries is the same as for the Potomac.**

The minimum of production was reached in 1878, from which time there has been a gradual and steady increase.

The Susquehanna River.

	Number.	Value.
Men employed	1,643	.....
Nets	*3,342	$37,450
Boats	334	43,510
Products.		
Shad ..... pounds	2,119,000	96,705
Herring ..... do	5,483,333	62,700
Catfish ..... do	200,000	12,000
Perch and rock ..... do	60,000	6,000

*Four pounds; 36 haul-seines; 302 gill-nets; 3,000 fyke-nets.

7. MINOR TRIBUTARIES OF THE CHESAPEAKE BAY.

The minor tributaries, such as the Patuxent, Chester, Choptank, Wicomico, Patapsco, and the numerous creeks which indent the shores of the Chesapeake, contribute no insignificant portion of the total product of the Chesapeake area. We have not, however, the data enabling us to specify the exact amounts taken in each. Their aggregate is, however, included in the summaries for Maryland and Virginia, given in another section of this report.

4.—FISHERIES OF THE DELAWARE RIVER.

By MARSHALL McDONALD.

The present condition of the fisheries of Delaware Bay is discussed on a preceding page of this volume under the head of Fisheries of Southern Delaware.

The following is a statistical summary of the Delaware River fisheries in 1880, based upon general estimates:

Species.	Pounds.	Value.
Alewives	*a* 1,800,000	$26,000
Shad	1,050,000	82,500
Sturgeon	*a* 450,000	22,500
All other species	*b* 995,250	46,116
Total	4,295,250	147,116

a In addition, 596,700 pounds of alewives and 120,000 pounds of sturgeon were taken by the sea-fishermen.

b Includes 196,200 pounds of catfish, 150,000 pounds of perch, 100,000 pounds of striped bass, 15,300 pounds of turtle, and 533,750 pounds of mixed fish.

The following facts concerning the condition of the fisheries of Delaware River in 1837 are compiled from an article by Dr. Samuel Howell, in the American Journal of Science and Arts, Volume XXXII, 1837, page 134, entitled "Notice of the Shad and Shad Fisheries of the Delaware":

"The shad usually make their first appearance in the Delaware about the middle of March. In early seasons, however, they are occasionally taken in February.

"It is a singular fact that they are caught within a few days as early above the rapids, 160 miles from the ocean, as at the lowest fisheries on the river; but, although their advance guard would thus seem to move on with such celerity towards their place of destination, the main body evidently pursue their course more deliberately, and it is obvious from the operation of the successive fisheries that their progress upwards is slow, and that they do not move as fast as the tide would carry them, even admitting that they remain quiescent during the ebb. While they work their way slowly against the ebb-tide, it would seem that they head about and rather stem the upward drift of the flood. This is proved by the fact that the drift nets or gilling seines, which catch them meshed on their lower sides during their ebb drift, have them entangled on the opposite side when drifting upwards with the flood tide.

"While their general movement is upwards, for their final destination seems to be the clear shallow waters above the tide, their instinct instructs them to loiter by the way to employ their appropriate food, with which the turbid fresh waters of the river seem to abound; what this food is is conjectural.

"They certainly are not a fish of prey, and their alimentary canal on dissection discloses nothing but a greenish earthy slime, which is probably strained through their fringed throats as they suck in the water.

"We may fairly infer that their nutriment consists of the mucilage or matters held in solution by the waters. That they find congenial aliment in these waters is obvious from the fact that they increase in fat and flavor the longer they remain in the rivers.

"Whether all the myriads of shad which enter the Delaware annually would proceed to its head-waters if unobstructed is quite doubtful.

"There is some reason for believing that, like some of the migratory birds, they return annually to the parts of the river in which they were bred. How else are we to account for the marked difference observed in the shad taken in the different parts of the Delaware and its tributary streams? Those, for example, which are caught in the creek are so small and so inferior in flavor to those caught high up the river as almost to form a distinct variety of fish.

"The Trenton shad, or those caught at the falls, have from time immemorial been proverbial for their superiority in quality as well as size to those taken in the waters below.

"It would seem that these fish enter the Delaware in successive 'runs' or shoals, and the experience of all observant fishermen goes to prove that these runs make their appearance in ordinary seasons at definite periods. For example, there is a scattering run from the middle of March to the middle of April. These are for the most part small in size and not remarkable for flavor.

"From this period to the 25th of April occurs the great run, and this is felt at each successive fishery for nearly a week if no storm occurs to drive them into deep water, for it is a fact well ascertained that while in pleasant weather these fish swim near the surface, yet the moment a cold easterly wind commences blowing they sink so near the bottom that the deepest nets will sweep over their usual grounds in vain. This run generally continues until the beginning of May, after which period the successive shoals which enter the river are small and scattered until the termination of the season, which is usually about the 20th of June, though by an existing legislative restriction it [the fishing?] is limited to the 1st of that month in the lower waters of the river and to the 10th in the upper.

"The distinctness of these different runs is proved by the appearance of the fish, by their quality, and by the state of roe in the female, those of the late runs being for the most part less forward than those of the great run in April.

"The final cause of their annual visit is doubtless to seek a suitable place for the deposit of their eggs, which probably require a temperature higher than that of the ocean for their development, and a safe and appropriate nursery for their young during the early period of their existence, when they are of all others the most delicate.

"After having spawned the old fish soon disappear. They are occasionally caught, indeed, in the nets, but they are thin and worthless, and, from their attenuated condition, are called by the fishermen "racers."

"The young fish remain in the river until towards autumn, by which time they have attained the size of small herrings, when they in their turn disappear. They are caught in immense numbers in the weirs and racks and baskets which are constructed in the shallow waters above the falls for the purpose of taking the common river fish, and they are so tender as to be destroyed by the least violence. These contrivances, so destructive to the young fish, have consequently become objects of legislative prohibition.

"The destination of these fish after they quit the fresh water is unknown. I have never yet met with an authentic account of their being caught or even observed at sea, nor have naturalists attempted to trace their route through the ocean, as in the case of the herrings.

"Their term of life cannot be ascertained, but it is fair to infer that they attain their growth in a year, from the size to which the young attain during their short sojourn in our waters, as well as from the general uniformity of size observed in each of several runs.

"Their average weight may be about 7 pounds, but individuals are occasionally caught which weigh as high as 12 and even 13 pounds.

"The numbers of shad taken in the Delaware vary in different seasons. Perhaps it would not be far from the truth to estimate them at 30,000 at each shore fishery. Formerly, when fisheries were fewer, the number far exceeded this amount.

"I have no data by which to estimate the number caught by the gilling-seines, but from the rapid multiplication of these destructive contrivances it must be very great.

"The aggregate amount taken annually by the shore-seines and the drift-nets is probably not far short of 1,500,000, which, at $7 per 100, would be worth upwards of $100,000.

"The principal market is Philadelphia, but immense numbers are vended at the fisheries, to which people flock from all quarters in wagons and boats.

"The writer has known sixty and seventy wagons supplied in a day (each, perhaps, taking at least 100) at the Fancy Hill fisheries, 6 miles below Philadelphia. The great mass are salted like mackerel, and chiefly for domestic use. In the fresh state they are, in the height of their season, one of the most delicious of any of the finny race, and decidedly the best mode of cooking is that called 'planking,' which consists in nailing the fish to a clean oaken plank, previously heated, and setting it before a brisk fire. By this method the juices of the fish are all preserved.

"They are sometimes treated like hams, viz, by rubbing them with fine salt, saltpeter, and molasses, and smoked for a few days, and in this way are very superior to those cured with salt alone.

"The usual and most efficient method of taking the shad is by means of seines. [The description of the construction of the seine, the laying out, and hauling is similar to the methods now in use, and is not therefore reproduced.] The regular shore-nets vary in length from 150 to 500 fathoms. Formerly they were drawn in by manual labor alone. Of late years, however, capstans have been employed to aid in this laborious operation.

"The number of men required to manage a net varies from fifteen to twenty-five. The whole number employed at the Fancy Hill fisheries, including foremen, clerk, marketmen, tide-watchers, &c., is nearly one hundred.

"Besides the production of such an amount of healthful and delicious food in quantity generally sufficient to supply the States of Pennsylvania and New Jersey, the fisheries give profitable employment to a great number of men at a season when their services are not particularly required in agricultural labor.

"The fisheries therefore constitute an important interest to the States bordering on the river and one that merits the fostering care of their respective legislatures.

"The importance of this species of property was recognized at an early period of our history, when fisheries were comparatively few, and numerous salutary provisions were enacted from time to time in relation to them, whose object was to perpetuate their benefits and secure them to their rightful possessors.

"Amongst others were those protecting the fisheries from unnecessary interruption by vessels and rafts, which are expressly required to avoid the seines while fishing, and prohibited under severe penalties from anchoring within the fishing range of any of the fisheries.

"But of late years the legislatures of these States have been so occupied with political maneuvering and management, that they seem to have lost sight of many of the best interests

of their respective States, and amongst others of the fisheries. For while they are compelled to pay heavy taxes into the State treasury, in common with other real property, and are subjected to several onerous restrictions, which have been artfully imposed upon them upon the ground of preserving the breed of fish, they have been so far neglected by their legal guardians that the river has of late been virtually thrown open to common right, and a class of outlaws—men without a local habitation or a name—are now enjoying privileges and rights, without the shadow of benefit to the respective States, which laws and usages from time immemorial had secured to the riparian proprietor.

"I allude to the gill-net fishermen, who have literally taken forcible possession of the river Delaware under the plea of its being a common highway, and have virtually dispossessed the lawful owners of the fisheries of property which they considered as secure and as much their own as their farms.

"The several rights of fishery had been the fruitful source of litigation in this country from an early period of its history, but it had been so long recognized by legislative enactments and confirmed by the decisions of the highest judicial tribunals that the question seemed to be finally and incontrovertibly settled. This right, too, seemed to be effectually secured to the riparian proprietor, by the circumstance that it was necessary in order to its enjoyment that a foothold should be had on shore, whereon to manage the seine and secure its contents. This, of course, would subject any person who attempted to encroach on the fishing rights of another to an action of trespass, and consequently operated as an effectual protection.

"But the ingenuity of man, ever ready to evade restrictions that clash with his interest, has devised a mode of fishing by which all connection with the shore is rendered unnecessary, and which, although prohibited by statutory enactments, he is able to practice in utter disregard of law or authority. By this method the net is so constructed as to enlarge or to 'mesh,' as it is technically said, and not to inclose the shad, as is the case with the regular shore nets already described.

"The seine used by these freebooters is formed with meshes so large that fish are permitted to pass their heads through, and on attempting to retreat they become entangled by the gills.

"The twine, too, of which the nets are made, is so fine that it is not perceived by the fish until his head is in the toil and it is too late to escape. The nets are kept extended by means of a small boat at each end across the main channels, and thus extended they are permitted to drift for miles until they have become loaded, when they are taken into the boats, the fish secured, and they are again stretched off in the river as before.

"These contrivances are hence denominated drift-nets, or gilling-seines, and although prohibited by law, yet so lame are its provisions that it is morally impossible to enforce it, except in cases where the name of the offender can be obtained.

"These marauders, therefore, emboldened by the impunity with which they are enabled to carry on their predatory operations, have increased to such an extent as already greatly to depreciate the shore fisheries, and if not checked they must ere long render them worthless."

5.—THE FISHERIES OF THE HUDSON RIVER.

By MARSHALL McDONALD.

The sources of the Hudson are in the Adirondack Mountains. Its main tributary, the Mohawk, rises in the table-land which forms the divide between the waters that flow into Lake Ontario on the one side and into the Hudson River on the other, and flows southeast; but, breaking through the Catskills, precipitates itself at Cohoes to the level of the river valley of the Hudson by falls which are about 40 feet in height. These falls, while forming a magnificent water-power for the many factories along the river's banks present an insuperable barrier to the ascent of fish. An obstruction of this kind exists at Glens Falls, on the main river. Indeed, all the tributaries are characterized by similar impediments, and thus may explain the fact that the Hudson is not, and, as far as we can learn from historical data, has never been a salmon river, and yet, strange to say the Connecticut River, similar in physical features to the Hudson, in olden times had important and productive salmon fisheries.

The sturgeon fisheries of the Hudson were formerly of great importance, but now are of comparative insignificance. The shad fisheries have, however, maintained considerable importance, and in annual value are hardly inferior to those on the Albemarle, Potomac, or Susquehanna.

As explanatory of the decrease of certain fisheries on many rivers, it has been frequently alleged that the same is due to such deleterious influences as the disturbance of the waters by passing steamers, the pollution by sewage, and the refuse of the paper, calico, and other factories in operation along their banks. Were these valid reasons for the decrease of the river fisheries, then certainly would the fisheries of the Hudson be reduced to a minimum. Statistics, however, show that on this river, in spite of all these supposed baleful influences, the shad fisheries have fallen off less than in any other river on the Atlantic seaboard. It is manifest, then, that in accounting for the impaired shad fisheries of the Potomac and other rivers, we must adduce arguments more tenable than the disturbance and pollution of the waters. In New York Harbor alone, which is in an incessant state of turmoil, caused by the thousands of vessels daily plowing its waters, over 250,000 shad are annually taken.

The shad appear first in the lower bay, between Sandy Hook and Fort Washington, about March 20. They are taken at the Narrows, below Fort Washington, by gillers from Fort Lee, Hastings, and other points on the river. These men come down to meet the shad, and fish as long as their operations are profitable. The duration of the fishing season here is, however, very short, as the shad soon commence their upward movement. From Jersey City to Fort Lee fishing is carried on entirely by means of stake-nets. These are set in 40 to 60 feet of water. Such deep fishing necessitates very expensive preliminaries. The stakes or poles are cut from 60 to 80 feet long, and cost $7 to $10 apiece. They run out in long rows from the shore and are placed at intervals of 27 to 30 feet, often numbering thirty in a row. The nets are 5½-inch stretch mesh, and are made in squares of one hundred meshes. The nets are lashed to poles, which are fastened to the stakes by rings and ropes. In setting these nets it is necessary that the upper line should be 7 or 8 feet below the surface, so as to prevent being torn by passing vessels. If the fish are running deep the nets must be lowered on the poles, and *vice versa*.

The boats employed in fishing these stake-nets are superior to those usually found in attendance upon shad nets. They cost, according to Mr. John Ludlow, about $150 apiece. The fish are transported to the New York market by sloops and schooners, being vessels of from 12 to 18 tons burden, and costing from $700 to $1,000 apiece.

Between Fort Lee and Troy, as far as could be ascertained, drift-nets are exclusively used, with the exception of four haul-seines, one of which is operated at Troy, and three in the vicinity of Tivoli.

Shad are taken as high up the river as the dam at Troy, about 40 miles below Glens Falls. At that point, however, but few are captured at the present time. This dam is the only artificial obstruction on the river.

Sturgeon fishing on the Hudson is, at the present day, of very secondary importance, and the number of pounds taken annually would not materially increase the aggregate river production. No reliable data, however, were obtained, and therefore statistics of this fishery are not included in the summation for the river given below. The annual catch of sturgeon amounts probably to several hundred thousand pounds. The fish are used for local consumption, or are shipped to Albany and New York. When sturgeon fishing was of great importance on this river Albany was the chief mart, and hence the name "Albany beef." On the James River, Virginia, the meat of this fish is known as "Charles City bacon."

Undoubtedly large quantities of rock, or striped bass, perch, and other species are taken on this river in the summer and fall fisheries. No reliable figures were obtained, as the product of these irregular fisheries is always sent to New York and no accessible record kept of the quantities received.

Summation for Hudson River.

	Number.	Pounds.	Value.
Men employed	711		
Boats	328		$10,630
Vessels	6		4,800
Nets	1,516		*23,320
Products.			
Shad	639,000	2,556,000	142,040
Herring	225,000	75,000	2,250

*This includes cost of poles used in connection with the stake-net fisheries.

6.—THE CONNECTICUT AND HOUSATONIC RIVERS AND MINOR TRIBUTARIES OF LONG ISLAND SOUND.

By MARSHALL MCDONALD.

1. THE FISHERIES OF THE CONNECTICUT RIVER.

FORMER ABUNDANCE OF FISH.—The Connecticut River rises in Lake Connecticut, in the extreme northern part of New Hampshire, flows southward, forming the boundary line between that State and Vermont, crosses the entire States of Massachusetts and Connecticut, and empties into Long Island Sound. The tributaries of the Connecticut are small, flowing down from elevated regions. They are all natural trout streams, and those which have been preserved still afford good sport to the angler. In early days salmon were caught in these streams. In one, especially, the Farmington, which is an important tributary, shad and salmon were abundant, but

have disappeared since the erection of numerous dams along its course. At Bellow's Falls the Connecticut River descends about 60 feet by precipitous slopes. These falls, though effectually obstructing the further ascent of the shad, did not prevent the upward passage of the salmon, many of which ascended above this point to suitable spawning ground. An interesting account of these early fisheries is given in Judd's History of Hadley, Mass., which is here reproduced:

"When the English established themselves on the banks of the Connecticut there was in the river and tributary streams, in the proper seasons, a great abundance of shad, salmon, bass, and other fish, such as the Indians had long used for food. The shad, which were very numerous, were despised and rejected by a large portion of the English for near one hundred years in the old towns of Connecticut, and for about seventy-five years in those Hampshire towns above the falls. It was discreditable for those who had a competency to eat shad; and it was disreputable to be destitute of salt pork, and the eating of shad implies a deficiency of pork. The story which has been handed down that in former days the fishermen took the salmon from the net and often restored the shad to the stream is not a fable. Poor families ate shad, and doubtless some that were not poor, and they were sometimes put in barrels for exportation. Connecticut shad in barrels were advertised in Boston in 1736. The first purchase of shad found in any account book in those towns was made by Joseph Hawley, of Northampton, in 1733; he gave for thirty shad 1 penny each, which was not equal to half a penny in lawful money. Ebenezer Hunt gave 1½ pence for shad in 1736, 2 pence for 'good fat shad' in 1737, and 2 and 3 pence in 1742 and 1743. Ebenezer Hunt bought bass, suckers, pickerels, and common eels. No trout are mentioned. He says of shad in 1743, 'shad are very good, whether one has pork or not.' These prices were all less than a penny in lawful money.

"The early settlers of Pelham bought many shad. After the specie currency in 1750 shad were usually 1 penny each. Josiah Pierce, of Hadley, bought one hundred shad at a penny each in 1762, ninety shad at a penny in 1763, and shad at a penny in 1764, 1765, and 1766. Oliver Smith, of Hadley, gave a penny each for thirty shad in 1767. For forty years after 1733 the price did not exceed a lawful penny. From 1773 to 1776 the price was 2 coppers each, or 1⅓ pence; from 1781 to 1784, from 2 to 3 coppers; in 1788, 2½ and 3 pence; in 1796, 3½ and 4 pence; and in 1797 and 1800, 4 pence half penny. The dams across the river and other impediments diminished the number of shad, and they gradually advanced in value to 6 pence, 9 pence, 1 shilling, and higher prices, and men ceased to buy shad to barrel for family use.

"Field's account of the county of Middlesex, Conn., 1819 (Middletown, Haddam, &c.), says there was such prejudice against shad and some other fish, because they were so generally used by the Indians, or from some other cause, that little effort was made to take them for more than a century after the county was settled. Within the memory of persons living (1863) there was very little demand for salmon, and as for shad it was disreputable to eat them. A story is told in Hadley of a family in that place who were about to dine on shad when it was not reputable to eat them, hearing a knock at the door, the platter of shad was immediately hid under a bed. There is a minute in John Pynchon's account book which shows that shad were not slighted by all those who were in good circumstances in the seventeenth century. In 1683 he sold a fish-net and agreed to receive for pay some shad packed for market, and 'fifty shad for my family spending at times.'

"Shad-eating became reputable thirty years before the Revolution. Shad were caught plentifully in many places in Connecticut before 1760, and were sold at 1 penny and 1½ pence each some years later. They were carried away on horses. Some thousands of barrels of shad were put up in Connecticut for the troops from 1778 to 1781. Shad never ascended Bellows Falls at Walpole, nor

could they ascend the falls of Chicopee River. Salmon passed up both. In 1739 Brookfield petitioned the general court for liberty to make a passage for shad through the bars of rocks across Chickopee River in Springfield, so that they might come up the river into the ponds. Springfield opposed, and liberty was not granted.

"Salmon were used, but were seldom noticed in records in the seventeenth century. Salmon-nets began to appear before 1700, and some salmon were salted in casks by families before and after 1700. They were seldom sold, and the price in Hartford, in 1700, was less than 1 penny per pound. Fish were so plenty in the Connecticut and its branches that laws were not necessary to regulate fishing for a long time. There was a law in Massachusetts against erecting wears or fish-dams in rivers without permission from the court of sessions. Petitions for liberty to erect wears to catch fish in the Hampshire streams began in 1729, and there were several after 1760. These wears were chiefly for the purpose of catching salmon. In Northampton salmon were sold from 1730 to 1740 at a price equal to 1 penny per pound, in lawful money, and some at 1⅓ pence. The price in 1742 was 1½ pence, and from 1750 to 1775 it was commonly 2 pence per pound. Josiah Pierce, of Hadley, bought salmon from 1762 to 1765 at 2 pence, and some at 1*s.* 6*d.*, old tenor, or 2⅔ pence. He bought some years about 70 pounds of salmon. Oliver Smith bought 27 pounds of salmon in 1773 at 2 pence, and Enos Smith 57 pounds in 1776 at 2⅓ pence. The price was from 2 to 3 pence from 1781 to 1787, 4 pence in 1794, and it advanced to 7 or 8 pence in 1798. The first dam at South Hadley, about 1795, impeded the salmon, and the dam at Montague was a much greater obstruction, and salmon soon ceased to ascend the river. Few were caught after 1800. Some of the prices of shad and salmon noted were retail barter prices.

"There were at least three [fishing places] in Hadley. One was below the mouth of Mill River, on Forty Acre Meadow. A more important one was a little east of the lower end of the street, where the river flowed near the street. There was another in Hockanum Meadows. Opposite to the two last, Northampton men had fishing places. (The Northampton and Hadley men were often near each other, and they bantered and joked abundantly, and sometimes played tricks and encroached upon each other. These things proceeded not from ill-nature, but from love of fun.)

"The late Elihu Warner remembered when forty salmon were caught in a day, near the lower end of the street, about 1773, the largest of which weighed between 30 and 40 pounds. (Mr. Pierce and six others owned a seine in Hadley in 1766. The whole income of the seine for the fish season was £22 17*s.*, and the expenses were £14 12*s.* 10*d.*, leaving for gain £8 4*s.* 2*d.* Shad were then 1 penny each.)

"In South Hadley there was a noted fishing place near the mouth of Stony Brook, and another above Bachelor's Brook against Cook's Hill. Many salmon were taken at those places; 24 are said to have been caught at one haul near Stony Brook, weighing from 6 or 8 to 40 pounds. There were other fishing places in South Hadley above the falls.

"The falls of rivers were great fishing places in New England for the Indians and the English. The falls at South Hadley, called Patucket by the Indians, were one of the most favorable places on the Connecticut for taking fish. Though there is no intimation in any old writing that the Indians resorted to that place for fishing, and very little is found recorded which indicates that the English frequented it for that purpose before 1740, yet it cannot be doubted that the Indians caught fish there in early days and the English before 1700. (In 1685, when Northampton and Springfield settled the line between them, west of the river, it was agreed that Northampton might catch fish at the lower falls, below the line. The fishery was then thought to be of some importance.)

"The following account of the fishery at the falls, after the Revolution, was derived from two aged men in 1848, Joseph Ely, in his ninety-second year, and Justin Alvord, in his eighty-fifth year, who had often caught fish at the falls, and from others since 1848:

"Fishing generally began between April 15 and May 1, very seldom as early as April 15. The best fishing season was in May. Shad were caught in seines below the falls, and in scoop-nets on the falls. Boats were drawn to places on the rocky falls, fastened, and filled with shad by scoop-nets, then taken ashore, emptied and returned. A man in this manner could take from 2,000 to 3,000 shad in a day, and sometimes more with the aid of a boatman. These movements required men of some dexterity. There were some large hauls of fish at the wharves below the falls. The greatest haul known was 3,500, according to Ely, and 3,300, according to Alvord. (One man, of South Hadley, gives 3,000 as the largest haul. Connecticut archives contain an account of 3,000 shad taken at a haul in the cove at East Haddam before 1766. The number in these great hauls is probably exaggerated.) It was not often that 1,500 or even 1,200 shad were taken by one sweep of the net. (Morse's Geography, fifth edition, says there were as many as fourteen fishing wharves at the foot of the falls in 1801, and that they sometimes caught 1,200 fish at one haul; it was reported that one company cleared $4,800 in one season.)

"Salmon were taken on the falls in dip-nets, and below, in seines, with shad. Before their day salmon had been taken at the foot of the falls, in places called pens. Ely had never known a salmon taken at the falls that weighed over 30 pounds; some weighed 20, and many from 6 to 10 pounds. They were always few in number compared with shad. The river seemed to be full of shad at times in some places, and in crossing it the oars often struck shad. Ely and Alvord, like other old men, related that fishermen formerly took salmon from the net and let the shad go into the river again, but not in their time, and that people in former days were ashamed to have it known that they ate shad, owing, in part, to the disgrace of being without pork. Alvord sold thousands of shad after the Revolution for 3 coppers each, and salmon were sold from 2 to 3 pence per pound. It was much more difficult to sell salmon than shad. Some bass were caught with hooks after shad time. Sturgeon were taken at the falls with spears. Lampreys, called lamprey-eels, had long been plenty on the falls, and many were taken at night by hand by the aid of torch-lights. Some were eaten in a few towns in Old Hampshire, but most were carried to Granby, Simsbury, and other towns in Connecticut. (Lampreys came above the falls in great numbers, and entered the streams that run into the Connecticut, until the Holyoke dam was built in 1849. They were very numerous in Fort River, in Hadley, below Smith's Mills, and were caught by the light of torches, sometimes several hundred in a night. Men waded into the streams and grasped them with a mittened hand and placed them in a bag. Sometimes the lampreys in the night crawled into and about the flutter-wheel of the mill and into the throat of the gate in such great numbers that the wheel could not be turned in the morning until they were cleared away. In Northampton Mill River, below the lower mills, lampreys were caught in the same manner as in Hadley, and in other ways. In a dark night men might be seen in the river, clasping now and then with one hand a squirming lamprey, and holding in the other a birch-bark torch, which threw light on the river and on all objects on its borders. Very few were cooked in Northampton and Hadley; many were given to hogs. Some were conveyed to other towns in Massachusetts, but most to Connecticut. None are now caught above Holyoke dam.)

"Shad seasons brought to the falls, on both sides of the river, multitudes of people from various quarters. Some came from Berkshire County. All came on horses with bags to carry shad, except a very few who had carts. Some, intending to purchase two loads of shad, led a horse. For

some years there were only two licensed inn-keepers at the falls—Daniel Lamb and widow Mary Pomeroy, but every house on both sides of the river was full of men, and some lodged in shelters and out-houses. Horses filled the stables and many other places. It was estimated one day that there were 1,500 horses on both sides of the river; this estimate is not reliable. A great number of the men brought victuals with them; many cooked shad, and others bought food at the houses. Many were detained one day or longer. They indulged in plays and trials of skill. Where there were so many men, and rum was plenty, there was of course much noise, bustle, and confusion. The greater part were industrious farmers, and after leaving the falls they wound over the hills and plains with bags of shad, in every direction. They were plainly dressed, according to their business. There was another class at these gatherings, composed of the idle, the intemperate, and the dissipated. They came to drink and frolic, and some to buy shad if their money held out. (There were great gatherings at Amoskeag Falls, on the Merrimac, in the fishing season, more than a century since. In 1742 Rev. Joseph Lecombe gave them a discourse, which was published. Judging from the title, it must have suited the merry-makers). Many thousands of shad are still taken annually at South Hadley Falls, though none can ascend the river above Holyoke dam. Instead of a penny each, which was paid one hundred years ago, men now pay at retail for shad brought from these falls and from Saybrook from 25 to 40 cents, and sometimes 50 cents."*

THE CHICOPEE RIVER.—The Chicopee, though one of the principal tributaries of the Connecticut, reaches the level of that river by falls, which have always proved an insurmountable barrier to the ascent of fish, and has never, therefore, been a salmon stream.

EFFORTS TO INCREASE THE SUPPLY.—The fisheries of the Connecticut have always been important, although the annual production is steadily diminishing, owing to the restrictions alluded to and the consequently impaired spawning-grounds. The shad, salmon, and alewife have been the species most eagerly sought after. The salmon-fishery is now practically extinct. New Hampshire, Massachusetts, and perhaps Connecticut, have, however, co-operated in their efforts to restore this fishery by planting salmon fry in the sources of the river. As a result of these experiments, some salmon have now returned to the river, and specimens have been taken in gill-nets at the mouth, at the first obstruction on the Farmington River, and at Holyoke Dam, near Hadley Falls, on the main river. It is not probable that such measures will result in any permanent restoration, since no suitable spawning-grounds are accessible to these fish upon their return from the sea. It was hoped that the very costly fishway erected over the dam at Hadley Falls would open a passageway for both shad and salmon into the Upper Connecticut, and in this way provide for the permanent restoration of the salmon-fishery under natural conditions. There is no evidence, however, that such results have been brought about. Certainly no shad have ascended it, and no salmon, if their capture above that point is to serve as a criterion. This dam being the only obstruction of consequence, it would appear that the importance of the result to be looked for would justify the States interested in the fisheries of this river in making a large expenditure of money in order to secure an open river.

At the present time the alewife-fisheries are insignificant, although their numbers seem to have been increasing since the enactment of a law prohibiting the placing of pound-nets in the river and fixing the minimum size for the mesh of haul-seines; the number of haul-seines fished has been greatly diminished by the restrictions imposed.

*History of Hadley, Mass., by Sylvester Judd, pp. 313 to 318.

THE SHAD-FISHERY.—The shad-fisheries of the Connecticut are still of great importance, though the number annually captured on this river by no means equals that taken on any of the other principal rivers of the Atlantic coast, from which latter, however, we would expect no larger yield than from the Connecticut River.

The following tables, from the report for 1870 of the Connecticut commissioners, giving statistics showing the annual catch of the fishery for a series of years at Griswold's Pier, at Lyme, and of the fishery formerly known as the Parsonage Pier, are interesting, as they show the material diminution which has gradually taken place at these fisheries.

Griswold's Pier, Lyme.

Year.	Number of shad.	Year.	Number of shad.	Year.	Number of shad.	Year.	Number of shad.
1845	10,043	1855	10,125	1860	1,470	1865	3,974
1846	7,850	1856	10,200	1861	6,000	1866	4,445
1847	6,540	1857	3,357	1862	7,000	1867	1,730
1851	10,246	1858	11,646	1863	5,000	1868	830
1854	8,500	1859	10,200	1864	1,943	1869	1,500

The books of this pier are lost from 1847 to 1851; also from 1851 to 1854.

For one or two years previous to 1845 the average catch was 12,000 per year.

Mr. Griswold writes that for the last three years he lost money, and was obliged to abandon this fishery.

Fishery known as the Parsonage Pier.

Year.	Number of shad.	Year.	Number of shad.	Year.	Number of shad.	Year.	Number of shad.
1827	3,091	1838	8,734	1849	19,410	1860	2,045
1828	10,716	1839	9,029	1850	20,401	1861	19,654
1829	7,138	1840	7,230	1851	25,227	1862	6,440
1830	3,917	1841	8,727	1852	14,257	1863	5,675
1831	9,064	1842	7,230	1853	18,138	1864	5,491
1832	11,713	1843	3,415	1854	10,148	1865	10,672
1833	8,070	1844	11,038	1855	8,230	1866	2,100
1834	14,934	1845	16,091	1856	13,940	1867	4,864
1835	23,376	1846	12,798	1857	8,826	1868	1,970
1836	11,050	1847	18,600	1858	9,826	1869	1,796
1837	9,096	1848	13,408	1859	7,846		

No account of the number of shad taken in the pounds is given, as no satisfactory information concerning them could be obtained. It is reported that on the 14th of May, 1870, the pounds yielded from 300 to 1,100 shad each, which is probably above the average.

In this connection also the following statement by R. B. Chalker, of Saybrook, Conn., regarding the yearly catch of a pound-net, located 4½ miles west of the mouth of the Connecticut River, in the town of Westbrook, Conn., furnishes additional information of the same tenor:

Catch of a pound-net at mouth of Connecticut River.

Year.	Number of shad.	Remarks.
1856	3,643	The location of the pound was not changed during the period for which the records are given.
1857	5,183	
1858	6,111	
1859	3,000	
1860	6,000	
1861	6,180	
1862	6,853	
1863	10,730	
1864	12,265	
1865	9,410	
1866	10,594	
1867	12,500	
1868	13,000	
1869	11,000	
1870	16,558	
1871	13,508	
1872	8,271	Laws permitted fishing but three days in each week.
1873	7,343	
1874	9,290	
1875	20,037	
1876	11,041	
1877	10,465	
1878	4,550	1878. Nets destroyed by jelly fish. A good run of shad, but impossible to continue pound fishing after the 5th of May, for the reason stated.
1879	19,175	
1880	17,275	

Aggregate catch for the ten years from 1856 to 1865, inclusive	69,375
Average catch per season	6,937
Aggregate catch for the ten years from 1866 to 1875, inclusive	122,101
Average catch per season	12,210
Aggregate catch for the five years from 1876 to 1880	58,506
Average catch per season	11,701

The above table shows the average increase of catch in pound-nets since their introduction in place of hauling seines. The first pound-net set for shad in Westbrook was in the year 1849.

In the early shad fisheries of the Connecticut River haul-seines were mainly employed. This mode of fishing involved a considerable outlay of capital for their equipment and operation. Gradually gill-nets supplanted haul-seines, and, on account of the unproductiveness of the latter, came into more general use. These again were supplanted to a great extent by the introduction of pound-nets, which, as the law prohibited their being set in the river itself, occupied every available position along the shores of the sound from the mouth of the river to a distance of some 6 or 8 miles west. Practically, however, these nets are in the river itself, being so placed as to intercept the run of the shad. It is curious to note that these pound-nets are exclusively set on the west side of the mouth of the river; and in response to inquiry as to why this was so, the information was given that shad could not be taken in any large numbers on the east side of the river's mouth. This would indicate that the shad run up the shore line from west to east, which conclusion has led to the inferences that the fish enter Long Island Sound at its extreme western end, and also that the shad of the Connecticut, the Hudson, and, of course, of the minor streams lying between these two rivers, are detachments of the same schools of fish.

THE ALEWIFE FISHERY.—The alewife fisheries are insignificant, and are operated only in several coves along the river's banks, the law prohibiting nets from being fished in the main stream. Conspicuous among these fisheries is that conducted at Weathersfield Cove, by Mr.

Winthrop Buck, by whom a small haul-seine is employed. The following statistics of the fishery at this point will be interesting, as they serve to show the extent of equipment necessary to make the operation profitable. The seine (nine-thread) is 75 fathoms long, and is hauled by windlass. The crew consists of four men. About one-twentieth of the fish taken are consumed fresh, the remainder being salted, and packed in barrels, each capable of holding five hundred fish, and shipped to New York. The highest point at which alewives are taken on this river is at Windsor Locks, and all these fisheries lie between there and Middletown. The season commences about the second week in April. In 1880, however, it was earlier than usual, the run beginning in the last week of March.

STATISTICS OF CONNECTICUT RIVER FISHERIES IN 1880.—The following statistics of the fisheries of the Connecticut River for 1880 have been prepared by Mr. R. B. Chalker, of Saybrook, who is extensively engaged not only in fishing but also in buying and marketing the product of the river, and who is therefore eminently fitted to give exact data on this subject:

	Nets.		Number of men.	Boats.		Value of shore property.	Product.			
							Shad.		Alewives.	
	Number.	Value.		Number.	Value.		Pounds.	Value.	Barrels.	Value.
Gill-net fishery	57	$4,275	114	57	$4,275	.....	225,980	$11,299 00	.....	.....
Haul-seine fishery	24	6,450	137	61	2,344	$1,305	176,224	8,811 20	2,700	$10,800
Pound-net fishery	30	29,732	75	30	4,500	1,500	703,136	35,156 80	.....	.....
	111	40,457	326	148	11,119	2,805	1,105,340	55,267 00	2,700	10,800

The larger proportion of the shad product of the Connecticut River is sent to packers in Lyme, Essex, and Saybrook. Thence they are shipped in ice to various points, but chiefly to New York City. There are 10,420,000 pounds of menhaden taken in the pounds. These are composted for conversion into manure.

From the statistical returns made by the pound-net fishermen, in response to a circular issued by the U. S. Fish Commission, has been selected that of Mr. S. A. Chalker, who operated a single pound at Cornfield Point, in Long Island Sound, and 5 miles west of the mouth of the Connecticut. These figures represent a fair average of the necessary pound-net equipment, of the product of the fishery, and of the cost of operating the same during one season.

	Number.	Pounds.	Value.
Men employed	3	.....	.....
Pound-nets	1	.....	$400 00
Boats	2	.....	75 00
Capital invested	.....	.....	497 00
Product.			
Shad:			
Sold fresh on beach	.....	632	37 92
Shipped in ice	.....	22,936	1,376 16
Salted	.....	360	21 60

2. THE HOUSATONIC RIVER.

Formerly valuable fisheries for the capture of both shad and salmon were operated on this river. Those for the latter, however, no longer exist, the species having been exterminated by the erection of dams, and the upward movement of shad is now limited to a reach of about 30

miles of water extending from the mouth of the river to the dam at Derby. Within these limits 11 haul-seines are fished. The following statistics show the extent of the fisheries of this river in 1880:

Haul-seines:	
Number	11
Value	$1,650
Number of men employed	47
Boats:	
Number	11
Value	$220
PRODUCTS.	
Shad:	
Pounds	28,600
Value	$1,430
Miscellaneous fish:	
Pounds	165,000
Value	$6,600

3. MINOR TRIBUTARIES OF LONG ISLAND SOUND.

While some shad and a considerable number of alewives are taken in all these streams, it is not possible to present accurate statistics of the catch for each. In the general summary of the fisheries of Massachusetts and Long Island Sound, however, are included these figures, those for Massachussetts being included in the statistics of the Massachusetts fisheries given by Mr. A. Howard Clark in another section of this report.

7.—THE RIVERS OF MASSACHUSETTS* AND NEW HAMPSHIRE.

1. THE TAUNTON AND COLE'S RIVERS.

BY W. A. WILCOX.

The shad and alewife fisheries of the Taunton River are carried on by 108 men, who use 29 boats, 15 seines, and 1 weir, worth, with their fixtures, about $7,500. The catch in 1879 was 1,718,000 alewives, equal to about 4,000 barrels, and 6,615 shad, weighing 21,498 pounds. The value of these products was $12,090. A portion of the alewives were sold fresh, the rest pickled or smoked. The shad were sold fresh in Boston and other markets.

In Cole's River, in the town of Swansea, 4 miles west of Fall River, at the northern end of Mount Hope Bay, there is a small fishing station. The northern and northwestern ends of the bay are valuable for their scallop and clam beds, which extend from Kickamuit River on the west to Taunton River on the east, a distance of 5 miles.

---

* In the Connecticut River at Hadley, Mass., discussed in the preceding chapter, there are annually captured about 3,500 shad. The total catch of pound-nets, seines, and gill-nets set in the Taunton, Merrimac, and other rivers, and along the shores of the State, during the year 1882 is reported by the State Commissioners of Inland Fisheries to have been as follows (in numbers): Shad, 44,734; sea herring, 1,512,660; alewives, 4,446,280; menhaden, 8,735; mackerel, 3,876,599; Spanish mackerel, 307; bluefish, 325,473; striped bass, 5,929; scup, 2,090,526; squeteague, 71,471; tautog, 46,757; flounders and flatfish, 148,330; eels, 7,049.

In the Mystic River, near Boston, in the Chebacco and Essex Rivers, and in some other streams of the State, alewives were formerly taken in abundance, but these fisheries are now of very little importance.

Eels are plenty in this river, and are taken in a conical basket-work trap, 2 feet long. The catch is sent to New York. A few fyke-nets are used in the winter, and the catch of flounders is used at and near home.

The fisheries of Cole's River in 1879 gave employment to 19 men. The capital, invested in 6 small sail-boats, 40 scallop dredges, and 100 dories, amounted to $960. The products, worth $5,332, included 19,200 pounds of eels, and 3,000 pounds of flounders.

2. BUZZARD'S BAY AND ITS TRIBUTARIES.

By W. A. Wilcox.

The Acushnet, Mattapoisett, and Wareham Rivers, and the minor tributaries of Buzzard's Bay, have always abounded in alewives, eels, and other river species, while the bay itself has been an important fishing ground for menhaden, tautog, oysters, and scallops. About thirty pound-nets are set at various points near the head of the bay. They are worth from $400 to $500 each, their principal catch being menhaden, alewives, tautog, scup, squeteague, bluefish, and eels. A number of unregistered sail-boats, owned at Fairhaven and New Bedford, fish from June 1 to November 1 with hand-lines in the Acushnet River and in the bay, their catch being chiefly tautog, eels, and scup. The oyster and scallop fisheries are discussed in another chapter.

The Acushnet River.—This river is really an arm of Buzzard's Bay for the three miles from its mouth along the Fairhaven and New Bedford fronts. Above New Bedford it decreases in size to a small stream, no larger than a brook, and takes its rise near the south shores of Long Pond and Aquitticaset Pond, in the town of Middleborough, 10 miles distant. There are several islands in the stream; the largest is named Palmer, and is at the entrance to the harbor. The next to the north are Crow, Pope's, and Fish. This last is united to the long draw-bridge connecting Fairhaven and New Bedford. Several other smaller islands, not named, add to the beauty of the river scenery.

Although the bay and river have always been noted as having an abundance and great variety of scale and shell fish, and the flats and near shores for miles have long been known to abound with quahaugs and clams, until lately there appears to have been but little attention paid to them, except in a small way for home use. Within the past twenty years, as the whale fishery has declined, more attention has been paid to the abundance of fish near home.

Eels are abundant in the Acushnet, and are mostly caught in a box-trap of simple and cheap construction. This is four feet long, 10 inches wide, with slatted sides. There is a hole in each end 4 inches square. In the aperture are placed two small wooden slats. The eels slide in with ease, the slats opening as they glide in and immediately closing. The box is weighted with stones and baited with clams. At Sconticut Neck within late years the business has steadily grown, the catch being made with gill-nets, purse and shore seines.

The Mattapoisett River.—Alewives are taken in the Mattapoisett River. One weir is located 4 miles from the river's mouth, and two more at Rochester, 4 miles beyond. For the past 10 years the catch has averaged 900 barrels a year. The catch of 1880, the smallest for twenty years, was 500 barrels, taken at the lower station, and 200 at the upper. The greater portion of them are sold fresh through the neighboring towns. A local law fixes the price for a limited supply to the citizens of Mattapoisett, Marion, and Rochester, at 25 cents for a hundred fish. At the northeast entrance to the harbor, on Pine Island, are two weirs. These are fished by four men for six months in the year. At the fishing stations of Mattapoisett, Pine Island, and

Rochester, in 1880, eleven men were employed for a part of the year. The capital invested in apparatus was $2,130. The catch, valued at $2,275, included 1,000 barrels of alewives and menhaden, 2,000 lobsters, 1,000 squeteague, 8,000 tautog, 9,000 scup, 500 bluefish, and 25 Spanish mackerel.

WAREHAM AND HALF-WAY-POND RIVERS.—At Agawam station, in East Wareham, 3 miles inland from the northern end of Buzzard's Bay, is Half-way-pond River. This empties into the Wareham River, and the latter into the bay. Large bodies of alewives annually pass from the bay up these rivers to spawn, a considerable number being taken at East Wareham. The State law determines the time when they may be taken; this period is between April 1 and June 1. The exact time when they may be caught, the price at which they may be sold to citizens, and other regulations are left to a committee of three from each of the towns of Wareham and Plymouth. This committee sells the exclusive privilege of the catch at auction, and $400 to $500 a season is generally realized by the sale. The price which the citizens must pay is fixed by the committee at 16 cents a hundred fish, or 64 cents a barrel; one barrel is allowed to each inhabitant who may desire it. No fish may be sold to any except citizens for the space of two hours after the fish are caught, but after that time they may be sold to any person at such price as can be agreed upon. Provision is made that citizens shall always be able to obtain a limited supply at the price already mentioned, namely, 16 cents a hundred. The bulk of the catch is sold by peddlers through the neighboring towns. At the present time the catch is not more than two-thirds as large as it was a number of years ago. In 1880 the fisheries of this place gave employment to six men for 2 months. The catch was 700 barrels of alewives, worth $1,050.

THE ALEWIFE FISHERIES OF WAREHAM IN 1815.—The following statement of the condition of the alewife fisheries of Wareham, Plymouth County, Massachusetts, in 1815, is quoted from the Collections of the Massachusetts Historical Society, Vol. IV, 2d series:

"Of the alewife, there are evidently two kinds, not only in size but habit, which annually visit the brooks passing to the sea at Wareham. The larger, which set in some days earlier, invariably seek the Weweantic sources. These, it is said, are preferred for the present use, perhaps because they are earliest. The second, less in size, and usually called 'black backs,' equally true to instinct, as invariably seek the Agawaam. These are generally barrelled for exportation. In the sea, at the outlet of these streams, not far asunder, these fish must for weeks swim in common, yet each selects its own and peculiar stream. Hence an opinion prevails on the spot that these fish seek the particular lake where they were spawned.

"Another popular anecdote is as follows: Alewives had ceased to visit a pond in Weymouth, which they had formerly frequented. The municipal authorities took the usual measures, by opening the sluice-ways in the spring at mill-dams, and also procured live alewives from other ponds, placing them in this, where they spawned and sought the sea. No alewives, however, appeared here until the third year; hence three years has been assumed by some as the period of growth of this fish.

"The popular opinions at either place may or may not agree with the laws of the natural history of migratory fish. The young alewives we have noticed to descend about the 20th of June and before, continuing so to do some time, when they are about 2 inches long, their full growth being from 12 to 15 inches. We have imbibed an opinion that this fish attains its size in a year; but if asked for proof, we cannot produce it. These fish, it is said, do not visit our brooks in such numbers as in former days. The complaint is of old date. Thus, in 1753, Douglass remarks on migratory fishes: 'The people living upon the banks of Merrimack observe that several species of fish, such as salmon, shad, and alewives, are not so plenty in their seasons as formerly; perhaps from disturbance, or some other disgust, as it happens with herrings in the several friths

of Scotland.' Again, speaking of herrings, he says: 'They seem to be variable or whimsical as to their ground.' It is a fact, too, that where they most abound, on the coast of Norway and Sweden their occasional disappearance is a subject of remark, also of early date, in a comparative view. 'Previous to the year 1752 the herrings had entirely disappeared seventy-two years on the coast of Sweden; and yet, in 1782, 139,000 barrels were cured by salt at the mouth of the Gothela, near Gottenburg.'—*Studies of Nature.*

"The herring is essentially different from the alewife in size (much smaller) and in habit. It continues, we believe, in the open sea, and does not seek pond heads. Attempts are sometimes made, by artificial cuts, to induce them to visit ponds which had not before a natural outlet. These little cuts, flowing in the morning become intermittent at noon, as the spring and summer advances. Evaporation, therefore, which is very great from the surface of the pond should probably be considered in the experiment, making the canal as low as the midsummer level of the pond, otherwise it may be that the fish perish in the passage. This may, in other respects, have its inconveniences at seasons when the ponds are full.

"The town of Plymouth for a series of years annually voted from *1,000* to *500* and *200* barrels of alewives to be taken at all their brooks in former years.

"In the year 1730 the inhabitants were ordered not to take more than 4 barrels each; a large individual supply, indeed, compared with the present period (1815), when it is difficult for an householder to obtain 200 alewives, seldom so many.

"In 1762, at a vendue, the surplus appears to have been sold in 25-barrel lots, which sold at 3*s.* 7*d.* and 4*s.* the barrel. In 1763 Plymouth and Wareham took 150 barrels at the Agawaam brook.* Two hundred barrels was the usual vote, down to a modern date, perhaps 1776. Menhaden were also taken in quantity at Wareham, and barrelled for exportation in former years. Agawaam appears to have been a name for several places where migratory fishes resorted. Thus at Ipswich and Westfield River as well as this place. Wood, in his 'New England Prospect,' writes the word Igowam. At the season of fishing the whole population of the country was, doubtless, in motion, resorting to these places. Hence we incline to the opinion that this expression became in several places a fixed and permanent name, and was in some way typical of it. We think 'abundance of food' is understood."

3.—THE ALEWIFE FISHERY OF CAPE COD.

By Frederick W. True.

The alewife streams.—The alewife fishery has been prosecuted by the people of Southeastern Massachusetts from the earliest colonnial days. The regularity with which the alewives visited the coast, and the abundance of the supply, soon caused them to rely upon the products of the fishery for sustenance to a considerable degree, especially in those years when other fisheries suffered decline. The statute-books of the Commonwealth contain many laws and regulations relating to the alewife fishery, whose object is its extension or preservation.

The fishery proper consists in the capture of alewives while ascending the streams to spawn, but large quantities are also taken in the weirs and pounds which are in use at many points along the coast, and likewise in gill-nets and seines.

The interior and higher portions of the territory of Cape Cod and Martha's Vineyard are dotted with numerous fresh-water ponds, from which small streams run down to the sea. In

* Plymouth retains a fishing privilege in this brook within Wareham. The alewives, we are told, were more numerous in 1815 than for some years.

spring large schools of alewives run up these streams and pass into the ponds above to spawn, and it is at this time that the fishery takes place. The fish are taken either while passing up the stream, or while in the pond, but the former is the more usual method. When it is observed that the schools are in motion a piece of fine-mesh net is stretched across the stream, which in many instances is not more than 2 or 3 feet wide, and when a sufficient number of alewives have crowded against it dip-nets are brought into use and the fish are transferred to barrels or other receptacles. On the banks of some of the more profitable streams small fish-houses have been erected, and the portion of the bed of the stream adjacent encased in boards, forming a narrow sluice-way.

In the rivers whose width may be many rods, the fishery is prosecuted by means of seines, strongly made, and having rather fine meshes. These are hauled at certain hours, day by day, until the schools cease to come, or the supply obtained is sufficient. The amount taken by these means is, of course, greater than that obtained in the small streams.

It sometimes occurs that the stream, instead of flowing from a single pond, issues from a chain of ponds lying near each other, and closely connected. Occasionally the number is only two, as, for example, at the head of Bass River; but sometimes it swells to seven or eight, as is the case at the head of the Wellfleet alewife stream. Under these circumstances it is usual to fish in one of the lower ponds rather than in the stream itself. This is done notably at Bass River, where the fishery is prosecuted in the second or lower pond. The method here employed is naturally that of seining. The seines used vary in length and depth according to the dimensions of the ponds. Those employed in Bass River are 100 or 175 yards long, with meshes 2 inches in diameter.

LAWS AND REGULATIONS.—The laws and limitations by which the fishery in the numerous public streams is regulated, vary somewhat in different towns. One rule, however, apparently holds good for all, namely, that the citizens of the town through which any given alewife stream flows shall have the privilege of obtaining a certain quantity of fish gratis, or at a nominal price. The arrangements at Sandwich, which may be regarded as typical of those affecting all the smaller fisheries on the cape and the islands, are somewhat as follows: A "catcher" is elected by the selectmen, whose duty it is to catch the fish, and who receives in compensation the small amount paid by the citizens. Each citizen of Sandwich is allowed to buy one barrel of alewives, by paying from 35 to 70 cents, according as the supply is large or small. Those who are at the river at a certain time in the morning draw lots for their turn in being served, and if the supply comes to an end before all have been served those who are unfortunate enough to stand at the end of the list are forced to go away without receiving any fish. The fishery is prosecuted only for four days each week.

At West Brewster a committee of three manages the affairs of the alewife fishery, and the citizens receive only one-eighth of a barrel each, for which they pay at the rate of 3 cents per dozen fish.

The days on which the fishery may be carried on, and their number, vary in different towns. At West Brewster, until 1879, alewives were taken every day except Sunday, but since then only three days each week. At Wellfleet, too, the number of days is three, namely, Monday, Wednesday, and Friday. At Bass River and at Sandwich, as already stated, fishing is allowed on four days each week.

A number of the more profitable fisheries are sold by the towns to private parties annually at public auction, but in most cases with the agreement that a certain fixed quantity shall be sold to the citizens at a very low or nominal price. At Bass River each citizen of Dennis and Yarmouth may buy four hundred herring, at the rate of 40 cents per hundred, and at Wellfleet the lessees of

the stream pledge themselves to sell fish to citizens of the town at one-half a cent apiece. Citizens of Harwich may purchase fish at a low price at the stream, which flows between that town and Dennis, every evening except Saturday, when the people of the latter town have the sole right.

PRIVATE FISHERIES.—In addition to the public streams there are a number of others, owned and controlled by private parties. They are usually artificially formed, and connect ponds near the shore with the salt water. Such an one was opened at Waquoit about sixteen years ago, and more recently another at West Dennis. The fishery in these artificial brooks is quite as successful as that in the natural streams.

METHODS OF CAPTURE.—At South Yarmouth a number of sweep-seines are employed exclusively for alewives. In 1877 four were used, but in 1878 only one. The men fish off Bass River, but are restrained by law from approaching within one-half mile from its mouth, because they would then affect the success of the fishery in the river.

Large quantities of alewives, together with other species, are taken in the weirs and pounds, especially those located on the south shore of Cape Cod and north shore of Martha's Vineyard. In the weirs of Chatham, and in certain others at Waquoit and Falmouth, in use only in spring, a very large proportion of the total catch consists of alewives, the remainder being principally menhaden and sea-herring. At Harwich and Falmouth a number of gill-nets are employed, in which considerable numbers of alewives are taken, together with two other species, sea-herring and menhaden.

DISPOSITON OF CATCH.—The alewives taken in the streams are almost universally smoked or salted, while those taken in weirs and pounds are generally sold fresh to fishing vessels, to be used for bait. At Wellfleet they are salted and dried and sold in bulk, and the same is the case at West Dennis. About one-half the yield of the Bass River fisheries is pickled, and the remainder smoked. There are three smoke-houses near the pond, together worth about $100. Prior to 1879 the alewives taken in the Centreville stream, in the town of Barnstable, were all pickled, but in 1879 a considerable portion was sold to fishing vessels, and a few were smoked. The "catcher" at Sandwich usually smokes a few fish and sells them to the citizens. In Tisbury, one-tenth of the catch is reserved by the town and sold to pay for keeping the stream free from weeds. This tenth part of the catch is annually purchased by a certain dealer at Holmes Hole, who in turn sells the fish to fishing vessels for bait. At the Harwich River fisheries four men and five women are employed in salting the alewives.

VALUE OF FISHERIES.—The fisheries of Wellfleet and Harwich and Bass River, which are leased at auction, bring different prices in different years, according to the competition among the bidders, and the apparent prospect of a large or small catch. Harwich River fishery was leased in the spring of 1879 for five years, at the rate of $600 per year. The average price paid for the Bass River fishery is $700, but large quantities of white perch are taken in this stream, the value of which is considerable.

The price paid for alewives by fishing vessels is about 1 cent apiece, and of smoked alewives about the same.

The total quantity of alewives taken in Barnstable County in 1879 was 1,150,295 pounds, valued at $7,048.

4. FISHERIES OF THE MERRIMAC RIVER.

Of the two principal tributaries of the Merrimac, one—the western branch—rises in the White Mountains and forms a junction with the other—the eastern branch, which flows from Lake Winnipiseogee—at the town of Plymouth. Prior to the erection of obstructions on the Merrimac

and its tributaries there was an abundant run of shad, salmon, and alewives into the river, which furnished profitable fisheries to the inhabitants. Curiously enough, at the junction of the two rivers, the salmon and the shad separated, the former, entering the colder waters of the western branch, penetrated as far up as its sources in the White Mountains, while the vast schools of shad and alewives turned into the warmer waters of the eastern branch, which they ascended each spring for the purpose of spawning.

The fisheries of the Merrimac are at the present time insignificant, the entire product, according to the reports of the State fish commission, being only 2,139 shad, 32,400 alewives, and 3 salmon. Subsequent to the erection of the Lawrence dam the run of salmon into this stream was entirely destroyed. Energetic efforts for the restoration of this fishery have, however, been made by the New Hampshire and Massachusetts State commissioners, with some prospect of success. The fish-way at Lawrence, over a dam some 27 feet high, has proved available for the ascent of salmon, which, in small numbers, have passed up it each season since its erection, and have thus been enabled to reach their spawning-grounds. It is probable that protective legislation in conjunction with the measures above alluded to, and the erection of an efficient fish-way over the dams at Lawrence, Lowell, and Amoskeag will finally result in the restoration of these valuable fisheries.

5. THE EXETER RIVER, NEW HAMPSHIRE.

During May and June ten weirs are employed in securing the alewives that come up the Piscataqua into the Exeter River. The average yearly catch is 2,500 barrels, but has fallen short the past two years. In 1879 it was about 2,000 barrels, and was disposed of at Portsmouth. There are forty men employed and $3,000 capital invested in the fisheries of those two towns. The fisheries of the Piscataqua are discussed at the end of the next chapter.

8.—THE RIVER FISHERIES OF MAINE.

By C. G. Atkins.

1. GEOGRAPHICAL AND CLIMATIC RELATIONS.

The State of Maine, occupying the extreme northeast corner of the United States, lies between the parallels of 43° and 48° north latitude and the meridians of 67° and 71° 10′ longitude west from Greenwich. Its climate is variable, the thermometer moving sometimes through forty degrees of Fahrenheit's scale within twenty-four hours, changes of wind occurring frequently and suddenly, and the distribution of rainfall through the year being frequently irregular.

The mean annual temperature averages 42°.36 F. The mean of January, the coldest month, is 15°.79, and of July, the warmest month, is 67°.85. As extremes there occur almost every year maximums of over 90° and minimums of —15° to —35°.

The precipitation at Orono* has averaged 43.6 inches annually, including the snowfall, which had a mean annual depth of 92.96 inches and constituted about 44 per cent. of the total precipitation. Near the coast there is less snow and farther in the interior considerably more. The distribution through the year (deduced from the mean of sixteen years) is pretty even, the dryest month being June, with a mean of 3.06 inches, and the wettest, October, with a mean of 4.87

* The generalizations of air, temperature, and rainfall are drawn from observations by President M. C. Fernald at the State College, Orono. This station is near the geographical center of the State.

inches. The fluctuations of the same month from year to year are illustrated as an extreme case by the record of October, which shows a fall of 1.14 inches in 1874 and 9.57 inches in 1869. As compared with other regions, it appears that Maine has a rainfall a little in excess of that of the other Northern and Middle States, less than that of Oregon and the Gulf States, and greatly exceeding that of England, France, or Germany. The evaporation has been estimated at 60 to 65 per cent. of the rainfall, and the remaining 35 or 40 per cent. is discharged through the rivers.

The area of woodland in Maine has probably changed but little since 1869, when Mr. Wells estimated it at 21,200 square miles, or 67 per cent. of the entire surface of the State, of which 61 per cent., is primeval forest.* The latter lies in two principal bodies, which are also contiguous, the first by far the greater, occupying the northwestern part of the State, and comprising the northern portions of Oxford, Franklin, Somerset, Piscataquis, Penobscot, and part of Aroostook Counties; the second in the southern part of the State, in Hancock and Washington Counties, and extending at several points quite to the sea. The head waters of all the large rivers and many of the small ones are in the wooded districts. These forests consist largely of coniferous trees, spruce, hemlock, pine, and arborvitæ. They contribute in several ways to a constancy in the flow of the rivers. The ground is carpeted with moss and leaves, which check the surface flow of water during and after rains, and in the spring the trees shield the vast masses of snow covering the ground from the sun and winds, and cause it to melt gradually. The woodland streams are also free from the mud and other pollutions that are washed in from cultivated fields and drains of cities and villages. Amid these forests, moreover, lie the natural breeding-grounds of the salmon, which are doubtless safer there from pursuit than they would be in populous districts.

The extreme head waters of the largest rivers, the Androscoggin, Kennebec, Penobscot, and Saint John, are within 75 miles of each other along the western border of the State in the highlands forming the water-shed between the Gulf of Maine and the Saint Lawrence River. From this elevated region, of which the valleys are from 1,500 to 2,000 feet above the sea, and the mountain peaks from 1,000 to 2,000 feet higher, streams radiate in all directions, those of Maine flowing towards the northeast, east, southeast, and south.

A secondary water-divide stretches across the State from west to east in latitude 46° 10′ and separating the Penobscot from the Saint John basin. This is not coincident with the Appalachian hills, which lie mostly to the south. The elevations of this divide are from 1,500 feet in the west to about 500 feet in the east. The surface of the State is thus divided into a northern slope of 7,500 square miles, and a southern slope 25,000 square miles. The former has a gentle inclination to the north and east, and is wholly drained into the Saint John. The latter embraces that portion drained by rivers emptying into the Gulf of Maine within the limits of the State, and has in the western portion a southeasterly and in the eastern portion a southerly inclination, with many local irregularities. The southern slope is for the most part accessible naturally to the anadromous fishes, but the greater part of the northern slope, about 5,000 square miles, is cut off from the sea by the intervention of the impassable Grand Falls of the Saint John River, in New Brunswick.

2. CHARACTERISTICS OF MAINE RIVERS.

DECLIVITY.—The rivers of Maine are characterized in the first place by a considerable yet moderate descent. The surface of the main slope rises very gradually from the sea to the head-waters, and the river beds are sunk very little beneath the general plane. A fall of 1,085 feet in 140 miles, or 7.8 feet per mile, may be taken as representing the mean declivity.† Some of the

*Wells, Water-power of Maine, page 24. †Wells, Water-power of Maine.

river beds in the western part have a slightly steeper incline, and some in the eastern a more moderate one. The declivity is in general well distributed through the course of the river, but is in nearly all cases greater at a distance from the sea, and its uniformity is much broken by the occurrence of abrupt falls and lakes. The falls are not often precipitous or sufficient to prevent the ascent of fish, though this sometimes occurs, as at Hiram on the Saco, East Rumford on the Androscoggin, and on several tributaries of the Kennebec.

LAKES.—The great number of lakes that dot the surface of the State forms a striking feature in its topography. On the published maps there are represented 1,620, varying in size from 100 acres to 120 square miles, and it is probable that several hundred more above the minimum in size are unrepresented. Their depths are in no known case very great, but few of them exceed 100 feet, and many with an area of several square miles have in no place a greater depth than 50 feet. One of the deepest is Lake Sebago, which has in one spot 410 feet of water. The lakes exert a favorable influence on the rivers as homes of migratory fishes in various ways. They serve as regulators of volume, preserving from extreme low stages, and as clarifying basins in which the sediment borne by the tributary streams is deposited. They afford breeding grounds for alewives and possibly retreats for salmon during the summer preceding and the winter following their spawning season.

RIVER BEDS.—The stony character of most of the soil of Maine and the rapid flow of the rivers combine to give the latter in general a clear hard bed of rock *in situ*, or of bowlders and gravel, with, however, occasional stretches of muddy bottoms and banks.

In the western part of the State the lowland adjoining the rivers is often composed of sand, which in that case forms the banks and sometimes part of the river bed. As a whole these rivers abound in the gravelly rapids to which salmon resort for spawning purposes.

PURITY OF WATER.—There is in the soil of the State comparatively little material that is readily taken up and held long in suspension by the streams and rivers. The occasional turbidity following a sudden and excessive fall of rain in the disforested districts soon disappears through the precipitation of the earth in suspension. The lakes also are immense clarifying basins, and discharge waters of great purity. The waters are, in most cases, strongly tinged with brown from peaty or earthen solutions, and the general color of the water, both of rivers and lakes, when seen in great depth, is an inky blackness, though when examined in a small receptacle, as in a goblet or pail, they appear of crystal purity.

VOLUME.—Of the total rainfall it may be assumed that 65 per cent. is evaporated and the remaining 35 per cent. is discharged by the rivers into the ocean. This calls for a mean delivery of 67.44 cubic feet of water per minute (35,452,000 cubic feet per annum) for each square mile of area drained. Applied to the Penobscot, this ratio indicates a mean discharge of 498,000 cubic feet per minute.

The fluctuations in the volume of a river are governed by several circumstances, of which we may mention, first, the irregularities of precipitation; second, the variation of the evaporation with the changes of weather and the season; third, the area of storage basins in the shape of lakes, and the extent to which they are brought into use. Many rivers of the second class have such extensive storage basins that the volume is very constant, the variations of level rarely exceeding 2 or 3 feet. But on the Kennebec and Penobscot a variation of 8 feet within four months is not very rare, and a difference of 6 or 7 feet between flood and drought is the rule. For instance,* on the

*These data are furnished me by Mr. W. W. Fellows, engineer in charge of the water works, from personal observations.

first day of April, 1877, the Penobscot stood 7.25 feet above the dam at Bangor; through April it ranged from 7.25 to 4.75 feet; through May from 4.8 feet to 1.9 feet; through June from 1.9 to 1.4 feet; through July from 1.5 to .08; and in August it stood for a few days at the minimum of one-half foot. On the 29th of the following November it had risen to 6.25 feet; in December it fell from 5.9 to 1.5 feet; but through the whole of the following February (1878) it stood at 6 and 7 inches (.5 and .6 foot). The highest stage for the spring of 1878 (6.46 feet) was attained in April; the lowest stage for the summer was 15 feet, in August; the lowest for the year was 6 inches, October 1 (with flush boards on the dam); and the highest for the year was 9.2 feet, December 14. In 1879 the maximum (8.85 feet) was attained May 3, and during that month the water averaged higher than in April; it was low (15 inches) July 17, and still lower (1.3 inches) October 19. In 1880 the highest water was in May and the lowest between August 17 and October 24, during all of which time an extreme drought prevailed, the water standing just at the crest of the dam or an inch or two above or below it. Thus in four years we have seen the water at its highest stages twice in April, once in May, and once in December, and the lowest stages once in February and October (the same year), once in October alone, once in August alone, and once extending from August to October. The data existing on the subject are scanty, and the best generalization to be made must be founded partly on general observation, and would be as follows: The Penobscot is at its highest stages generally, but not invariably, in April or May; it is fairly full from March to July, inclusive, and never experiences a drought during those months. The lowest stages occur in August and September, often extending into October. In the winter there is generally a depression, which in some instances reaches the stage of a drought. The discharge of the Penobscot has been estimated by an expert* at 117,000 cubic feet per minute in a severe summer drought, and at 5,760,000 cubic feet per minute in a heavy freshet.

WATER TEMPERATURE.—Ice from 15 to 24 inches thick covers all the fresh water during the winter. On the lakes it forms about November 15 or 20, and melts out in April, commonly near the close of the month, in the southern part of the State. In the more northerly or elevated lakes it does not melt until May 10 or 15. The larger rivers, the Kennebec and Penobscot, are closed to navigation (at the ports of Gardner and Bangor, respectively) about four months or four and a half. The melting of the snow in the spring produces a flood which clears the rivers of ice in April two or three weeks before the melting of the lake ice.

During the winter the temperature of the rivers is generally within one degree of the freezing point, but after the breaking up of the ice it rises rapidly, and through the summer generally ranges from 60° to 70° or higher, in those parts above the influence of the sea.

TIDAL PARTS OF RIVERS.—The tidal portions of the Maine rivers are for the most part of considerable extent. In the Kennebec the rise and fall of the tide is felt as far as Augusta, 44 miles from the sea, and before the erection of a dam at that point it was perceptible some 10 miles farther. In the Penobscot the influence of the tide extended originally to Eddington, 30 miles above the mouth of the river, or, including Penobscot Bay, 60 miles from the sea. In the other rivers the tidal portions are less extensive absolutely, and in many of them likewise relatively, to the size of the river. The Androscoggin is not affected by the tide above Brunswick 25 miles, and the Saco only to Biddeford, 5 miles from the sea. The actual penetration of the sea-water is confined within narrow limits. On the Kennebec the water does not contain salt enough to support a growth of marine algæ above Bath, 12 miles from the sea, though in seasons of great

*H. F. Mills, C. E., quoted in Wells's Water-power of Maine, p. 105.

drought the water becomes brackish above Richmond, 14 miles farther up, and the flood-tide is strong enough to reverse the current some 10 miles farther still. On the Penobscot marine algæ are not found above Winterport, 18 miles below the natural head of the tide.

The brackish portions of a river have a lower temperature than the fresh portions, varying with the proportions of sea water present. The ocean water on the coast of Maine has a lower temperature than the fresh rivers all the summer season, from May to October, inclusive. When the salt and fresh water meet they do not immediately commingle, but the fresh water, being lighter, flows out on the surface and the salt water sinks to the depths. On the flood tide a strong inflowing current of salt water exists at the bottom often while the surface current is still flowing seaward. The salt water in the lower stratum, exposed over its entire upper surface to the fresh water, slowly commingles with it and rises, to be replaced by the constantly renewed flood from the sea.

The most of the rivers empty into broad estuaries before reaching the open sea. The most notable example is the Penobscot, whose estuary is 30 miles long and 20 wide at its mouth. The most notable exceptions are the Kennebec and the Saco, whose lower courses are confined in narrow channels quite to their entrance into the open sea.

The river fisheries are mainly carried on in the tidal portions, where strong flood and ebb currents alternate. Weir fishing is never attempted above the flow of the tide, and the most common form of weir depends for its working upon the retreat of the tide, which leaves the fish stranded upon a floor.

The tide averages about 11 feet rise and fall, varying from 8½ feet at Saco to 18 feet at Eastport.

ARTIFICIAL CONDITIONS.—The artificial alterations in the condition of the rivers are very considerable. They arise in part from the cultivation of the soil, but mainly from the erection of dams and the throwing of refuse from the saw-mills into the water. The exposure of the bare earth to the action of rains, as in all cultivated fields, especially in hilly districts, results in the washing of great quantities of soil into the rivers, where it settles in all places not swept by strong currents, but more especially near the mouths of the rivers. From the first occupation of the country* until very recent times it has been the general custom to throw into the river all refuse from the saw-mills, including not only sawdust but shavings, edgings, and in many cases even slabs.

* The aboriginal population of Maine does not appear to have been at any time very dense. It has been estimated at 37,000 in 1615, but the data are exceedingly meager and this may be erroneous. About that time they were greatly reduced by intertribal war, and still more by a destructive pestilence, by which it is believed that whole tribes were nearly exterminated. Between 1675 and 1758 they were involved in repeated destructive wars with the whites, by which many perished and many more were driven to emigrate to Canada. By the close of the eighteenth century but a few hundred remained. The coast was much frequented by European fishermen at the beginning of the seventeenth century, and the first settlements were mere fishing stations, located at points convenient for the capture and curing of cod and other marine species. The trade in furs early attracted attention, and many posts were established at accessible points on the coast and larger rivers, mainly with an eye to trade. After the fishermen came the lumbermen, attracted by the magnificent forests of timber which covered the whole land with the exception of the corn fields of a few thousand aborigines; and after all there came the white tillers of the soil. The earlier settlements experienced many vicissitudes; some of them were abandoned after a few years existence, and many were swept out of existence by their savage foes; but there are some settlements that have been continuously occupied from as early a date as 1623, and many others that can claim almost as long an existence, with the exception of a temporary suspension in consequence of Indian hostilities. Yet so slow was the increase in population that in 1675 (just before the beginning of the Indian wars) there were but 6,000 people in the whole State, there being at that time from 120,000 to 150,000 in all New England. In 1675 a desolating Indian war broke out, and the progress of settlement was arrested for about forty years. In 1735 the white population is estimated to have been 9,000; in 1743 there were eleven towns and 12,000 people. Wars with the Indians finally closed in 1758, and a year later fear of their renewal was allayed by the conquest of Canada from France. Immediately after this began an extensive immigration from Massachusetts, which continued uninterruptedly for more than half a century, and brought the population from 24,000 in 1763 to 96,540 in 1789, 298,269 in 1820, and 399,455 in 1830. The population in 1880 was 648,936.

Some of these materials were sufficiently water-soaked to sink at once to the bottom; others floated many miles, some of the coarser sorts even to the open sea; but sooner or later all of the sawdust and a great part of the other refuse sank to the bottom. The coarse and heavy portions resisted the action of the currents much more than the sawdust alone could have done, and the interstices being filled with sawdust and mud, deposits were thus formed that after the lapse of years came even to obstruct navigation.

The degree to which the fisheries are affected by this refuse is not easily determined. So long as it remains in suspension it does not seem to deter fish from ascending a river, though swimming thickly in all the strata of the water from the surface to the bottom. Where it settles to the bottom, however, it undoubtedly destroys all those animals that find their home in the sand and gravel and mud of the natural bottom, and to that extent deprives young fishes of their natural food. It is not unlikely that this may have had much to do with the disappearance of shad and bass from some localities.

Of a more serious character are the changes resulting from the erection of dams. Almost every stream in the populated parts of the State large enough to turn a saw-mill has been thus obstructed at from one to a dozen points in its course. The dams were with scarcely an exception built in utter disregard of their effect upon the fish, and in the majority of cases no adequate fish-ways were provided. The breeding grounds of salmon, shad, and alewives were therefore greatly curtailed in all the rivers, while in others they were entirely cut off. For example, in the Kennebec River the building of the dam at Augusta in 1837 completed a chain of obstructions that reduced the range of shad in that river and its tributaries from 150 to 50 miles, and that of salmon from about 300 to 50 miles. These figures do not, however, represent the injury done to those fisheries, which is measured rather by the reduction of the area of spawning-ground. This, in the case of the salmon, was from perhaps 50 miles of rapids to less than half a mile, and in the case of shad from 100 miles of gently flowing water to about 25 miles. It would be difficult to arrive at an exact estimate of the amount of the injury thus done, but I deem it safely within bounds to estimate the diminution of the productive capacity of the rivers at 90 per cent. from this cause alone.

The revival of interest in the river fisheries, which began in Maine in 1867, has given rise to renewed efforts to facilitate the passage of fish up the rivers. Improved forms of fish-ways have been devised and constructed in many places, yet but a small proportion of the waters affected have been as yet reopened.

3. NATURAL AND ECONOMIC HISTORY OF THE RIVER FISHES.

LIST OF SPECIES.—The river fisheries of Maine aim at the capture of the following species: Salmon (*Salmo salar*), shad (*Clupea sapidissima*), alewife (*Clupea vernalis*), smelt (*Osmerus mordax*), striped bass (*Roccus lineatus*), eel (*Anguilla rostrata*), tom-cod (*Microgadus tomcod*), and sturgeon (*Acipenser sturio*). The blueback alewife (*Clupea æstivalis*) is also caught to some extent in the weirs that are built for the true alewife, and in some cases the two are confounded. White perch (*Roccus americanus*) are rarely taken, this species being in Maine mostly confined to the non-tidal fresh waters. As a neglected species may be mentioned the lamprey, which occurs in nearly or quite every river, but is rarely utilized in any way.

THE SALMON (SALMO SALAR).

NATURAL HISTORY.—The salmon of Maine (*Salmo salar*) is identical with the salmon of all the rivers of Eastern North America and Europe. A brief statement of the principal points in its natural history will suffice. It enters the rivers in the spring and summer, beginning and

completing its run earlier in the central and western part of the State than in the eastern. In the Penobscot it is sometimes taken near Bangor in the month of March, and always early in April. It is more abundant in June, and the catch practically ceases early in July. Those individuals that succeed in escaping capture, reach the upper waters early in the summer and lie there quiet until their spawning season, which is the last of October and the first of November. They lay their eggs at night on gravelly shallows, covering them loosely with gravel. The old fish return to the sea mainly in the spring, spend one entire year in recuperation and further growth, and the second year again visit the rivers for spawning. The eggs lie under the gravel, slowly developing, from November till May, when they hatch. The young salmon feed in fresh water one or two years, then descend to sea, and after the lapse of a period not definitely ascertained, but probably two or three years, revisit the rivers as adults, weighing from 9 to 14 pounds. The general average of adults taken is about 13 pounds, but it varies from year to year, being sometimes less than 12, and sometimes (rarely) as high as 18 pounds. Salmon eat nothing while in fresh water, constantly falling away in weight and deteriorating in quality. They swim mainly by day and near the surface.

It is well ascertained that salmon originally frequented the following rivers, viz: The Piscataquqa, Mausam, Saco, Presumpscot, Royals, Androscoggin, Kennebec, Sheepscot, Medomak, Saint George, Penobscot, Union, Narraguagus, Wescongus (Pleasant River), Machias, East Machias, Orange, Denny's, and Saint Croix. At the present day they are found only in the Androscoggin, Kennebec, Sheepscot, Penobscot, Machias, East Machias, Denny's, and Saint Croix.* In the Androscoggin only a few are found, seeking to ascend the river; in the Sheepscot only occasional specimens are observed; of the Machias about the same may be said; in East Machias the yield is unimportant (only 35 in 1880); the Denny's has of late yielded from 200 to 1,000 yearly, the Kennebec about the same, the Saint Croix from 100 to 500, and the Penobscot from 5,000 to 15,000.

MODES OF CAPTURE.—Salmon are captured with spears, dip-nets, drift-nets, set-nets, weirs and traps, or pound-nets. The spears have only been used by the Indians, and appear to have been their ordinary, if not exclusive, implement for the capture of this fish. An Indian spear of the present day consists of a wooden handle, a straight, plain terminal spike of steel, and a pair of wooden jaws on opposite sides of the spike. When a fish is struck the spike pierces the body, the jaws spring apart, and then close upon the body of the fish and hold it securely. They are plied at night, by torchlight, from a canoe. Dip-nets have been in use since the occupation of the country by Europeans to capture salmon in difficult places about falls; but on nearly all rivers it is now unlawful to take anadromous fishes in such places, and therefore dip-nets are not much used for salmon-fishing.

Drift-nets and set-nets.—Drift-nets and set-nets take salmon (and other fish) by enmeshing them. They have a large mesh, from 6 to 7 inches, and are essentially alike, being simple straight nets, buoyed at the top and leaded at the bottom. The same net may be used in either way, and in early times such was a very common practice. Previous to the present century the salmon of the Maine rivers were taken almost wholly by meshing nets, either stationary or drifting. At points where the shore was bold a net would be set directly from it, the shore end being made fast to a stake and the outer end kept in place by killocks anchored off at proper distance. On a gently-sloping shore the fisherman would build a brush hedge to a suitable distance from shore and set the net at the end of that. The size of these nets was not uniform, but a common length

*Single specimens are indeed sometimes taken in other smaller streams, as the Harrington River, but these are considered strays.

was 40 feet, for use on a bold shore; the prevailing mesh was 7 inches, stretch measure, and the common depth twenty meshes, or about 8 or 9 feet; they were knit at home, of hemp twine of medium weight. In 1814 the length of nets set in the Penobscot River, including any other contrivance to which they might be attached, was limited by statute to one-third the width of the stream where used. The use of set-nets for salmon has been generally abandoned on the Penobscot and Kennebec since the erection of weirs became common, but is continued in Denny's River to a small extent.

Drifting for salmon was formerly practiced in all the salmon rivers. In the Kennebec and Penobscot the drifting-ground was the whole length of the river, though of course the best spots were just below obstructions, on the Kennebec at Waterville and on the Penobscot between Bangor and Oldtown. After the building of dams these grounds were changed, and were always below the lowest obstruction. As the salmon became scarcer drifting on the lower courses of the rivers was gradually abandoned. It is now practiced more or less on the Saint Croix, Penobscot, and Kennebec, but the recent laws forbidding fishing within 500 yards of a dam or fishway have greatly discouraged it.

Angling for salmon has been successfully practiced for many years in Denny's River, and it is probable that the lack of success that has thus far attended its trial on the Penobscot is attributable to transient causes.

The salmon weir.—The most radical difference in the river weirs concerns the mode in which the captured fish are removed. In the most common forms the fish are finally entrapped in an inclosure of rather small size, provided with a board floor, upon which they are left by the retreating tide, and upon which the fisherman comes and picks up his catch. Upon the Kennebec River there is in use a weir of which the "fish-pound" is a large inclosure, with no floor but the bottom of the river, from which the fish are removed by means of a small seine operated from a boat, which is pushed into the inclosure. This is known as a "deep-water" weir, and as its use is mostly or wholly confined to the Kennebec River, where the shad is the main object of pursuit, it will be described in connection with the remarks on shad. The kind first mentioned, which may be called a "floored weir," will first receive description.

For an example of a typical floored weir we may take the Penobscot salmon weir. This generally consists of a "leader" and three "pounds." The leader is a straight fence running out from shore, generally at right angles with it, constructed of stakes driven firmly into the ground 2 or 3 feet apart, and woven with brush or, rarely, hung with nets. Its length varies according to the natural features of the locality. It is always sought to place the pound in the channel, or, in case that is not attainable, in as deep water as can practicably be reached, generally from 10 to 20 feet at low water. In some cases broad "flats" intervene between the shore and the chosen site for the pounds. In other cases the bottom slopes off steeply into the deep water and powerful currents of the channel. The former may require a leader a third of a mile in length; the latter less than 50 feet. The outer end of the leader stands in the middle of the entrance to the outer pound, dividing it into two parts, which occupy the base of the large, symmetrical, heart-shaped figure formed by the walls of the inclosure. The entrance (embracing both sides of the leader) is about 22 feet wide; the pound is about 60 feet in extreme width and 60 feet in length. It is generally built of brush, not rarely in whole or part of netting. It has no floor. At its apex it opens by a narrow entrance into a smaller inclosure, the "second" pound, which has a floor above low-water mark. The second pound is also heart-shaped, is 18 feet wide, is always made of netting, or, as termed on the Penobscot, "marlin." It leads by an entrance but 12 inches wide into an oval "fish-pound." This is also floored and built of the best and strongest netting.

Around the edge of the floor runs a single upright board, the "ribbon board," to which is attached the lower edge of the "marlin," which is thus relieved from the force of the struggles of the fish when they find themselves about to be stranded on the floor. The floor is of rough boards, and the cracks between them are sufficient to allow the water to drain out freely. The entrances of the second and fish pounds are tunnel-form, the sides standing to each other at an angle of about 80 or 90 degrees, and the outer entrance approaches the same form. The stakes employed in weir-building are commonly of black spruce, an abundant tree in the fishing districts, which grows straight, slender, and smooth, and affords strong and elastic wood. The brush is oftenest alder or white birch, but other kinds are also used. The netting is always of cotton, from the twine described as "18-thread, No. 20," with meshes 1¼ inches square, or what is known as a two-inch-and-a-half mesh," and tarred before being put to use. It is woven to accommodate the entire height from the floor to extreme high-water mark. When a new piece is bought it is placed upon the fish-pound, and the older pieces are used on the outer and second pounds, where they last several years.

The ordinary sites selected for salmon weirs are on muddy bottoms, and the entire structure even to the floors, is supported by stakes or posts thrust or driven into the ground by workmen operating from a scow. The brush is woven in with the stakes above water and then pushed down, one piece at a time, by a crotched pole or an iron implement made for the purpose. The closeness of the work varies much, but it is not thought advisable to make a very close matting, as that would hinder too much the passage of the currents through it and would render some parts, especially of the outer pound, too dark. Where netting is applied, it is rarely put below low-water mark, the lower parts being of brush. The substitution of net for brush appears to have operated favorably by facilitating the passage of currents. The old-fashioned fish-pound, woven of brush so close that fish could not escape, was a comparatively dark, stagnant inclosure, and a very inefficient arrangement compared with the modern netted pound.

There are many variations from the typical weir above described, most of them of slight importance. In some cases there are but two pounds; in others there are four. In ordinary sites the pounds project, one beyond the other, into the river; but where the bottom slopes off too steeply for such an arrangement the series is produced parallel with the shore. In some districts the entire bottom is too hard for staking, and the weirs are built in sections with timbered bottoms in which the stakes are fixed, and which are towed to the proper place, sunk, and ballasted with stone. On exposed shores it is sometimes necessary to support the principal parts against the force of wind and waves by guy-ropes attached to heavy moorings. Instead of the shore the outer extremity of a weir is sometimes made the base from which to start the leader of another weir. On the Kennebec floored weirs are for the most part confined to shoal water, another form, to be described below, being employed in deep water, and a slightly different nomenclature prevails.

The cost of building a salmon weir with a long leader, all new, may be put at from $80 to $100, including pay for the labor, which, however, is mostly performed by the proprietor. To keep up the same weir, including necessary repairs, would cost from $50 to $80 per year.

The received theory of the operation of these weirs is that the migratory fishes, moving up or down the river along the shore, are intercepted by the leader, and, in striving to pass it, fall into the outer pound, which is of such form that, once within it, the fish rarely succeed in finding the path by which they came, the curved sides, which they follow, leading them constantly past the outer entrance and directly toward the second pound, which in turn conducts them to the fish pound, the whole arrangement being based upon the propensity of fishes to move in straight lines

until turned aside by some obstruction. Its practical working proves the theory to be well founded; but some uncertainty exists as to the degree of perfection attained by the device and the ratio of fish caught to those encountering the weir and escaping. The testimony of some close observers indicates that a very considerable proportion of the salmon that are enticed into the outer pond, and some even of those that reach the fish pound, find their way out again. Whether there is utility in the two entrances, on the upper and lower sides of the leader, is also a matter of doubt, as it is not known whether as a rule the fish enter the weir on the lower or the upper side, whether with the flood or ebb tide.

The precise location of a weir for most effective work appears to receive less attention than the importance of the subject demands; yet it would not be correct to say that the fishermen are heedless in the matter. In nearly all the fishing districts since weir-fishing first began there have been many experiments tried in the location of weirs, and those sites that paid best have been selected and continuously occupied. The locations that have thus stood the test of experience are strictly regarded by their owners, and many of the best weirs have been built in the same position, with scarce the variation of a fathom, for a generation; for all this, it is probable that a careful study of the tides and currents and the influence upon their movements of the fish would lead to a change of location for the better in many cases. The observations of some intelligent fishermen have led them to the conclusion that the line of contact between a tidal current and an eddy is the place where fish (especially salmon) are most likely to congregate, and that the nearer the entrance of a weir can be brought to this line the greater will be its success, other things being equal. This is not so easy a thing to do as might at first appear. The position of an eddy line varies with the strength of the tides, the volume of the river, and the force and direction of the wind; so that a weir which is to-day in just the most favorable position may not be so again for a month. Sometimes for a whole season the mean position of an eddy line may be some rods away from its normal position. More generally recognized are the direct influences of the winds. Almost any fisherman will say "such a wind is favorable for me, but with such another I catch nothing." In general, it appears that a lee shore is better than a sheltered shore. Perhaps the wind influences solely by roughening the surface of the water, which in nearly all kinds of fishing is a favorable circumstance. Calms are universally unfavorable.

The pound net, or trap.—The pound net or "trap" (the ordinary term) in use on the Penobscot consists of the "run," the "inner pound," and the "outer pound." The run is a straight net running out into the water at right angles to the shore. It is 11 or 12 feet deep, and its length depends somewhat on the character of the site; 25 fathoms is the common length, but in very "bold" water 18 or 20 fathoms will answer. At the extremity of the run is the inner pound, which is shaped like an obtuse arrow-head, the two barbs being styled "hooks." The entrance of this inner pound, 6 feet wide, is between the barbs or "hooks," and at its tip is an opening 1 foot wide, which leads into the outer pound, an inclosure about 18 feet square. Both pounds have bottoms and are of the same depth as the run, 11 or 12 feet. The whole is supported by wooden floats, so that it rises and falls with the tide, and is held in place by anchors planted at the extremities of long "warps." The mesh employed is 6 or 6½ inches long, being 3 or 3½ inches square. This mesh is too small to enmesh a 22-pound salmon and too large to catch one of 6 pounds. It is supposed that if small salmon ever enter these nets they pass out through the meshes. The majority of the medium-sized and large salmon do not mesh, but remain free in the pound, being too wary to strike the meshes. The bottom of the net is commonly several fathoms above the ground; and were not the salmon that encounter its run persistent surface-swimmers, they would dive under it and escape without entering the pounds. The three parts first described constitute what the fishermen call a "hook

of nets." Sometimes from the outer extremity another run is set with pounds at the end of it, constituting another "hook of nets," and this combination is called a "gang of nets." Sometimes as many as four hooks are set in a single gang. The invention of this style of net is ascribed by the fishermen to one "Halliday, an Englishman," with reference, doubtless, to the same Halliday who introduced the use of netting or "marlin" on the weirs in the Penobscot River. The net in use before the introduction of the present form of trap had only one pound, corresponding to the inner pound. It was much inferior, as a great many salmon escaped by the entrance, which had to be wide to induce them to enter at all, and in this way the very largest salmon were always lost, being too large to mesh. Still farther back the pound was represented by a mere bend of the net at its outer end, and this was also preceded by the simple straight gill-net which was in common use for the capture of salmon in Penobscot River and Bay in the eighteenth and early part of the nineteenth centuries. The improvements were very gradually made, and as late as 1850 fishing with nets with only the bend at the extremity was common. The trap is used only in Penobscot Bay, and with the exception of a single net set in 1880 at Searsport, it is confined to the west side of the bay below Belfast, and to Long Island.

CURING AND MARKETING.—In the early days of the Maine salmon-fishery the bulk of the catch was either salted down in barrels or smoked. For smoking, the salmon were prepared by first splitting, removing the backbone, but leaving the head on, and salting for two or three days, according to the size of the fish. When sufficiently salted they were washed off, spread by applying thin braces of cedar or spruce across the back, and then hung up in the highest part of a little domestic smoke house. Constant exposure to the smoke for two or three days completed the process.

Salt salmon were to some extent consumed in local markets, but it appears that the greater portion was sent out of the State. Smoked salmon became early in the present century an article of traffic with the larger sea-ports of other States. Many were shipped on vessels laden with lumber and miscellaneous produce. Small vessels belonging in Southern New England used to visit several of the larger rivers annually and load with pickled shad and smoked salmon, buying a part of their salmon already smoked and smoking part themselves. This trade died out before 1850.

With the growth of the modern demand and the modern facilities for preservation and transportation, the practice of marketing fresh increased, and for many years it has been exclusively employed. For this purpose each fisherman has an ice-house and puts up a supply of ice every winter. As soon as caught the salmon are placed on ice. The dealers have like facilities, and in transportation the salmon are always packed in ice. There is a considerable local demand for salmon in the cities and villages of Maine, but this is partly supplied from the rivers of New Brunswick, and much the greater portion of those caught in Maine is shipped to Boston, where most of them are retailed.

THE SHAD (CLUPEA SAPIDISSIMA).

NATURAL HISTORY.—This is the common shad of the Atlantic rivers from the Saint Lawrence to the Gulf of Mexico. It is the finest in quality of all those members of the herring family that frequent fresh water, as it is of all the Clupeidæ of North America. In Maine it attains a size of 12 pounds, but this is extremely rare, the average being not far from 3 pounds, and the ordinary range from 2 to 5 pounds.

The shad is mainly a marine feeder, but it reproduces its kind exclusively in fresh water, spending several weeks in the rivers for that purpose in May, June, and July. The earliest shad

are taken in the Kennebec or tributaries during the last days of April, but the main run is in May and June. Before the erection of mill-dams the shad ascended the Kennebec and tributaries to a distance of 100 miles, and the Penobscot to a distance of 170 miles from the sea; and it is probable that their spawning-grounds in those days were largely in the quiet stretches of river above the influence of the tide. But in recent times their migrations have been restricted to the tidal portions of both those rivers, as also of nearly all the rivers in the State, and their eggs are all laid in water subject to the action of the tides, yet entirely free from salt. The earliest ripe spawn is observed the last week in May. Spawning doubtless begins before June 1, but is mostly performed in June, while the latest shad are not ready till July—possibly a few individuals not until August. The poor and shrunken shad that have completed the work of spawning are first seen on their return to the sea about June 20, and they are constantly met with through July. They begin to feed before reaching the open sea, and recover a good deal of fat and flavor before disappearing.

The eggs of shad have a slightly greater specific gravity than water. Extruded into the open waters, protected by their transparency, swayed hither and thither by the currents, they develop with great rapidity, and in three or four days, according to the temperature of the water, give birth to living fish. The young shad descend very shortly to sea.

Shad are believed to attain maturity in three or four years. A portion of the males have active sexual functions when a little larger than an alewife, and probably a year old. A more numerous class of immature individuals feed about the bays and in the mouths of the rivers during the summer later than the ascent of the main body of breeders. They are of smaller size, fatter, more numerous, with sexual functions dormant. The fishermen call these "sea shad," and consider them quite distinct from the "river shad" or "spring shad," but there is abundant reason to believe them merely the common shad at a particular stage of growth. They never ascend the rivers so far as the spawning shad, rarely showing themselves in any great numbers above the reach of brackish water. They frequent some salt bays entirely removed from fresh rivers; for instance, the northeast branch of Casco Bay, where fisheries for them have existed for many years, and have sometimes been quite productive. But these localities are in the vicinity of the Kennebec River, and I know of no instance of their occurrence at any great distance from a shad river.

The original range of shad in Maine included almost if not quite every river in the State; but in the smaller rivers it does not appear from the scanty evidence attainable that they were ever very plenty. From nearly the whole extent of some of the larger rivers they were excluded by impassable falls, and from many of second size they were shut out by mill-dams at so early a date that their former presence is attested only by a dim tradition. In short, there are only three rivers in the State in which it is quite certain that there ever existed an important shad-fishery. These are the Saint Croix, Penobscot, and Kennebec, and in the Kennebec alone has the fishery continued to be of considerable importance to the present time, while in but three other rivers and a few salt bays is there now any attempt to fish for shad.

Modes of capture.—Shad are caught in weirs, seines, drift-nets, and dip-nets.

Weirs.—The weir mainly employed at the present day for the capture of spring and summer fish in the Kennebec River, in which shad are the most important fish taken, differs from the salmon weir already described, in that the fish are not left by the retreating tide on a board floor, but in a deep and spacious inclosure, from which they are taken with a seine. They have been generally termed "deep-water" weirs, but, from the mode of operation, may be better styled "seine-weirs." The seine-weir commonly consists of three pounds, denominated, "first pound" or "pasture," "second" or "middle" pound, and "third" or "fish pound." The latter is an inclosure

of about 120 feet circumference, surrounded by a strong net running quite to bottom, its lower edge being weighted down with a heavy chain. When the tide is out the water in this inclosure is from 2 to 15 feet deep. It is "fished" about low water by sweeping it with a small seine,* and hauling the fish into a boat. The method of construction is similar to the floored weir above described, but more net and less brush is used. The net is of cotton twine from sixteen to twenty-four thread, meshes 2 to 2½ inches *in extenso*, is kept tarred (pine tar being preferred for fresh water), and lasts several years. These weirs were introduced on the Kennebec about 1852, and have proved far more effective than the floored or "pocket" weirs that preceded them. The most important advantages possessed by them appear to be the following: First, the fish can enter the fish pound readily at all stages of tide and on a level with the bottom of the river; second, the fish pound is more capacious; third, if fishing is omitted for a tide or two, the fish do not die, but have plenty of water to swim in until next tide.

The floored weir, already described as a salmon-weir, was, early in the century, the instrument of the capture of immense numbers of shad, along with alewives and salmon, in both the Kennebec and Penobscot. At the present time they furnish all of the few shad taken on the Penobscot, and many of them are still built for the mixed fishery of the lower Kennebec. Half-tide weirs, such as are described in connection with the alewives, were also formerly much employed for the capture of shad and alewives, especially on the Penobscot, but with the diminution of the supply have almost wholly gone out of use.

Seines.—A seine, in the common parlance, is a movable net by which fish are surrounded and captured either by pursing up the bottom or drawing both seine and fish ashore. All the seines employed in the river fisheries of Maine are of the latter class, and of a size requiring four men to each seine. The ordinary method of operating is to coil the net on the stern of a large seine-boat, from which it is "paid out" or "shot," as the boat is rowed out and back in a semi-circular course. From each end of the seine lines run ashore by which it is "hauled." All fish within the inclosed area are brought ashore except those small enough to slip through the meshes. Salmon, shad, alewives, bass, perch, and sturgeon may all come in together. It is necessary to have a smooth bottom and smooth shore, and be in close proximity to the channel where the fish run. Nature has fitted but few seining grounds on Maine rivers, and most of the grounds that have been used have been cleared up for the purpose, with a more or less considerable expenditure of labor. In consequence of this lack of facilities seines have never been extensively used. On the Kennebec and tributaries fourteen seining berths are enumerated as having been occupied in former times, but nearly all of them are now abandoned. On other rivers seines have been still less employed.

Drift-nets.—Drift nets were formerly largely employed for the capture of shad in all the rivers frequented by them, especially the Penobscot and Kennebec. This was an important industry down to 1840, or a little later, since which date it has entirely ceased in the Penobscot, and lost nearly all its importance in the Kennebec. At the present time 56 drift nets are plied in Eastern River, a branch of the Kennebec, and 66 more in the Kennebec and its other tributaries. In Casco Bay there are 90 drift-nets in use, but only for a few nights each season. The shad drift-nets of the present day are of about 4½-inch mesh, varying slightly in different localities. This size is adapted to sea shad. In Casco Bay they are knit of fine linen twine, from thirty-five to forty-five meshes deep and of various lengths, from 100 to 300 feet. When fishing in a broad

*The seine is a net fixed on two poles or "staves" at either end, with corks at top and leads at bottom. By means of a line running through rings around the bottom it is "pursed" or "tucked" after the ends are brought together, and the fish are thus bagged.

channel a single boat will sometimes put out 3 of these nets joined together. At Georgetown, on the lower Kennebec, they are 30 fathoms (180 feet) long and fifty-five meshes deep. In early times, when the large river shad were alone taken, a much larger mesh was used, 5¼ inches being the rule on the Penobscot. Drifting for shad is done only at night. In the rivers the ebb-tide is chosen, but in Casco Bay the state of tide is considered a matter of indifference.

Dip-nets.—Before the original abundance of shad had been much affected by the operations of man, productive dip-net fisheries for them existed at many points on the rivers where natural obstructions existed, which were nevertheless not impassable. Among these stations may be mentioned Waterville and Skowhegan Falls, on the Kennebec, and Salmon Falls, on the Saint Croix. At the latter point there was in use, in 1825, "a large dip-net attached to a long swinging pole like a well-pole. It was heavily leaded to make it sink in the swift water; it was then swung round, and it was not at all uncommon to take two or three barrels of shad at a single dip of the net."*

The only instance of a dip-net fishery for shad in recent times is in Nonsuch River, a very small stream, not over 20 miles in extreme length, in the town of Scarborough. The nets here used are about 9 feet deep and hung on wooden bows, 3 to 5 feet in diameter, with a long and heavy pole. When in use the bow rests on the bottom of the stream in the middle of the channel, which is very narrow, and the pole is supported by a crotched stake planted on the bank. The stake serves as a fulcrum on which to lift the net out of the water when the striking of a fish is felt.

METHODS OF CURING SHAD.—Three-quarters of all the shad now caught in Maine are marketed fresh. The rest are pickled. The proportion pickled has been constantly diminishing since about 1840 or 1845, at which date it embraced substantially the entire catch of the Kennebec and other shad rivers beyond those used in the local markets.

PROCESS OF PICKLING.—The inspection laws of Maine require pickled shad to be assorted in three grades, denominated "mess," "No. 1," and "No. 2." For the highest grade the fish is opened along the belly, the entrails removed, the body split so as to lay it out flat on its back, and the anterior two-thirds of the backbone cut out. As fast as dressed the fish are thrown into a tub with water, from which they are shortly removed to another tub of clean water (either fresh or sea water) in which they are laid, flesh side down, to facilitate the escape of blood. After lying here about two hours and being swashed about to wash off the blood and gurry, they are salted down in a hogshead tub to "strike." They are first thrown upon salt in a shallow box, rubbed in it, and, with the salt sticking to them, are placed in the tub flesh side up. If the crew is working fast and there is any danger of not getting on salt enough, more is thrown on as the filling progresses. There is no danger of getting too much salt. The "striking" takes one bushel to a hundred fish. The length of time required for this process depends upon the weather. If warm, three days is enough; if cool, four to six days may be necessary. If necessary the shad may be left in the striking-tub a month without harm. They are packed 4 inches above the top of the tub, but as the pickle makes they settle down to 1 inch below the top. As soon as they reach a certain point in the process of striking, commonly in two or three days, the fish rise in the pickle. The upper layer is then turned flesh side down, two or three quarts of salt spread on top and a moderate weight put on, just enough to keep them under the pickle. When the striking is completed the salt is rinsed off in the pickle, and 200 pounds of fish are weighed off for a barrel. As they are placed in the barrel salt is thrown on occasionally, half a bushel being thus employed for a barrel.

*Perley's Report on Sea and River Fisheries of New Brunswick, 1852, p. 125.

A convenient quantity of pickle is now poured in, the barrel is headed up, and then completely filled with pickle through the bunghole. The pickle used is the same in which the fish were struck.*

No. 1 differ from the mess shad merely in having the backbone in and the tails on. The third grade, No. 2, embraces thin and poor fish, but these, as well as the two higher grades, must be well preserved. An inspector must attend as the fish are packed and see that it is properly done. His brand is placed upon the head of the barrel, and if any purchaser finds the fish of inferior quality or in bad condition he can recover damages of the inspector.

It takes nowadays from one hundred and twenty to one hundred and thirty Kennebec River shad to make a barrel of mess. Previous to 1820 it took but ninety shad to the barrel. From 1820 to 1840 one could rely upon one hundred shad filling a barrel. After that there was a decline in size until one hundred and thirty were required to the barrel, which was the rate for some years previous to 1880. In the latter year, however, there has been an improvement in size, and one hundred and twenty are now sufficient.† The sea shad are much smaller. Of those caught in Casco Bay a barrel will hold one hundred and seventy-five. One informant estimated the number in a barrel in 1853 at one hundred and thirty or one hundred and forty, showing that these fish as well as the river shad have deteriorated in size.

The barrels now in use are almost wholly of spruce staves and pine heads, bound with twelve hoops, which are commonly of white ash. The law allows the use of white oak, white ash, pine, chestnut, and poplar for staves, and prior to 1850 pine was generally employed. Both Cadiz and Liverpool salt are in use. One experienced packer prefers to strike shad in Liverpool salt and use Cadiz in the barrel, considering the latter of superior strength, but the former better adapted to striking because finer.

The price obtained for salt shad varies ordinarily from $9 to $11, but as extremes may be mentioned $6 and $16.33 per barrel. The latter price was obtained for some lots at Richmond in 1867 or about that time. The high price combines with other circumstances to forbid the consumption of many salt shad at home. They are consequently nearly all shipped out of the State. For about twenty-five years previous to 1867 almost the entire catch went into the hands of a single firm in Boston, but since that date a considerable portion is shipped direct to Philadelphia, which market is reputed to ultimately absorb most of those sent to Boston and other points. At present this business is of little importance, but 384 barrels of shad having been packed in Maine in 1880. As an illustration of the decline in recent years may be adduced the statement that at Dresden as late as 1860 to 1865 there were packed from 200 to 400 barrels yearly, against 75 barrels in 1880.

THE ALEWIFE (CLUPEA VERNALIS).

NATURAL HISTORY.—The range of this species is from Florida to Newfoundland. In Maine it has a more gregarious character than any other river fish. It pushes up the rivers in dense bodies, which appear to seek unerringly each their native lakes, and the young descend to sea in solid columns. Before the obstruction of the streams by far the greater part of the alewives deposited their spawn in lakes and ponds. No stream seems to be too small for them if its waters are derived from a pond, and there can have been hardly an accessible pond in the whole State they did not visit. The inaccessible waters were those rendered so by the interposition of insurmountable falls or too great a distance from the sea. They are known to have ascended the

* Statement of W. W. Walker of Dresden. In other districts there may be some difference in the details.
† Statement of John Brown, W. W. Walker, and others.

Sebasti-cook, a branch of the Kennebec, to Newport, 100 miles from the sea, in great numbers, and on another branch, the Sandy River, tradition says that they bred in Temple Pond, about 120 miles from the sea. It is not probable that their migrations were more extensive than this in any part of the State, except on the east branch of the Penobscot, where tradition says they reached a point nearly 200 miles from the sea.

The main body of the alewives enter the rivers late in May; some rivers not until June. They move almost exclusively by daylight and especially in bright sunny weather. An unusual flow of water deters them from entering a stream. They are very courageous in the passage of falls, venturing into very small channels that promise to lead them past obstructions, and often forcing their way up inclined planes where the depth of water is not enough to cover their bodies. After spawning, the old fish soon return to sea, and the young follow them between July and September, when from 2 to 4 inches in length. The time that they require to attain maturity is estimated at three or four years. They do not appear to ascend the rivers more than once in a lifetime for any other purpose than to spawn.

The alewives frequenting the same breeding place are remarkably uniform in size and appearance, but between those of different streams there are remarkable differences, mainly in the matter of size. Among the largest are those of the Kennebec, of which three hundred and fifty will fill a barrel, while of the Damariscotta alewives a barrel holds four hundred and twenty-five, and of the Brooksville alewives seven hundred and fifty. The latter are the smallest known, but are very good fish.

There is another species (*Clupea æstivalis*) that is sometimes confounded with the alewife, *though nearly all fishermen recognize it as distinct. It enters the mouths of the rivers* several weeks later than the true alewife, does not appear to breed in fresh water, is of slightly different shape, smaller, of finer quality, but on account of excessive fatness is cured with difficulty and generally treated as refuse, to be employed as bait or as a fertilizer for the soil.

The ovaries of a Maine alewife contain about 165,000 eggs. With this high degree of fertility they combine a considerable degree of hardiness in both adult and young compared with other members of their family, and to these characteristics we may attribute the fact that they increase with remarkable certainty and at a rapid rate when afforded even ordinary facilities. The placing of a few hundred adults in a pond at the season of their ascent is surely followed by the descent of a throng of young a few weeks later, and the return of a considerable body of mature fish *after the lapse of three or four years. It is doubtful whether there is another among our whole* list of fish that will so well repay efforts at cultivation.

MODES OF CAPTURE.—Alewives are caught in weirs, seines, drift-nets, set-nets, and dip-nets. The weirs do not differ essentially from those already described as built for the capture of salmon and shad, along with which the alewives are taken in such waters as are frequented by those species. This method is in use in the tidal part of every river where alewives abound. The seines are the same as the shad-seines already described. They have recently almost wholly gone out of use, but are plied in a few localities, among which may be mentioned the lower part of Damariscotta River. Drift-nets, with a mesh of 2¾ inches, have been employed for catching alewives down to recent times in the Kennebec River, but have now been abandoned. They were cast *from a boat at night, the banks of the channel just outside of the weirs being considered the best* ground. There has never been a time when many alewives were taken in this way, and they are not known to have been so taken in any other river. Set-nets have been used only in a few localities and to a very limited extent.

The dip-net fisheries for alewives are next in importance to the weir fisheries. It is by this method that the alewives are taken at Damariscotta Mills, Warren, East Machias, and Dennysville. The dip-net is a very economical piece of apparatus, and requires no very expensive fixtures, but for its effective use it is essential that all the alewives shall be compelled to pass a narrow or difficult place within reach of the nets. This only happens in rivers where their spawning grounds lie above tide-water, and where obstructions, natural or artificial, exist.

The form and construction of the dip-net vary considerably in different localities. Those found of late in use at Damariscotta and Warren have wooden bows bent into an oval form 2 feet wide and seized on to wooden handles, the bag being knit of coarse cotton twine and hung about 3 feet deep; they are plied in narrow basins or artificial inclosures which the fish are allowed to enter. At East Machias, where the fish are dipped directly from the open river, they use larger nets 5 feet deep, hung on a steel bow 3½ feet in diameter, at the end of a pole from 16 to 17 feet long. Platforms are erected at points most convenient for dipping; generally along side a pool just below an obstruction, where the fish congregate. It is necessary that the water be swift and somewhat broken, otherwise the fish will dodge the net. Upon the platform are also the tubs or bins into which the fish are thrown as they are dipped. These fisheries are operated almost wholly in the afternoons of pleasant days. In cloudy weather the alewives are very backward about attempting the ascent past difficult places, and at night they invariably fall back into quiet pools, where they lie until the next day is well advanced. The run of fish lasts about a month, but the most of the catch is often effected during a single week at the height of the season.

The alewife fisheries have in numerous instances been from an early day held as municipal property by the towns in which they are located. They have been generally, if not always, appropriated in accordance with an enabling act of the legislature, which describes in detail the way in which they shall be managed. In some cases, the towns are to choose "fish committees," who shall capture the fish, personally or by proxy; in other cases the privilege of taking them is to be sold at auction to the highest bidder, but in either case it is generally provided that citizens of the town shall be allowed to buy limited quantities of fish at a fixed price, and certain poor people are supplied gratis. If there is a surplus the committee or the lessee can dispose of them as they see fit. These town fisheries in most cases nominally include also salmon and shad, but on the small rivers both of those species have long since been practically exterminated.

UTILIZATION.—Alewives are used as bait for deep-sea fisheries to a small extent, but by far the greater part are used as food for man. The prevailing methods of curing are, first to salt and smoke them, second, to pickle and afterwards pack them in barrels. The former method is generally regarded as more profitable for fishermen who are able to retail the products of their fisheries, and is therefore most employed by them, each man having a little smoke-house of his own. Where great quantities are taken by one party, as by the lessees of the Damariscotta fisheries, they are barreled and sent to the wholesale markets. On the Kennebec, about seven-eighths of the alewives caught are smoked and consumed locally, and smoking has been the prevalent mode of curing for many years. On the Penobscot, at Bucksport, previous to 1830, the most of the alewives were pickled, but the practice of smoking came into general use shortly after that date and has for many years entirely supplanted pickling.

For smoking, alewives are first prepared by salting lightly in a large tub, without scaling or any other dressing; they are treated with about 8 quarts of salt to a barrel of fish. Some add 2 ounces of saltpeter. In three days the fish are sufficiently "struck," and they are then, after rinsing in clean water, impaled on straight sticks of split cedar or spruce, which are thrust through the gills, ten on a stick (formerly twelve), and hung up in the smoke-house. On the ground beneath

them a fire is made, generally of hard wood and smothered with saw-dust. After four to six days in the smoke-house, during which they may be actually exposed to smoke less than half the time, they are ready for sale. This is an outline of the practice of a Kennebec fisherman. The practice of individuals varies not a little, and the finished product is of many grades of excellence or inferiority. They are most palatable when lightly salted and smoked, but in that condition cannot be kept long. Selling at 40 to 80 cents per 100 and retailing at a cent apiece, they form a cheap and toothsome article of food, much sought for in all parts of the State.

For barreling, alewives are "struck" with 1½ bushels of salt to the barrel, without dressing or scaling, and after lying from four to six days they are packed closely in barrels with half a bushel or more of new salt per barrel, and filled up with sweet and strong pickle. Alewives keep better in pickle than other fish, and are therefore exceptionally well fitted for exportation to warm climates. Great quantities of them are exported to the West Indies and other warm countries. The practice of packing them without pickle has prevailed at times in some localities.

THE SMELT (OSMERUS MORDAX).

NATURAL HISTORY.—The smelt ascends the rivers for the double purpose of feeding and of depositing its spawn. On the eastern part of the coast it may be caught with hook and line in the harbors all through the summer season; farther west it is not to be caught until September or October, being probably a short distance off shore. In October it begins its advance all along the line, and as soon as the law permits (now October 1) the fishermen begin to set their fykes and bag-nets and ply their seines in the mouths of the rivers. With the first strong ice in December the fish are found already present in the fresh tidal parts of the rivers, and during the whole of the winter there are smelts to be found everywhere from the mouths of the rivers to the head of the tide. The smelt is a ravenous feeder at all times of the year except about the spawning time. At Robbinston it begins to take the hook about May 1, and continues to bite through the summer, autumn, and winter.

The spawning time is in April and May, a week or two after the ice leaves the river. Phenomena observed indicate that it is extended through the greater part of both months. In several brooks in Bucksport the smelt spawns from May 20 to 25, but in certain brooks in Dear Isle just a month earlier. The eggs are adhesive, and stones, sticks, weeds, and any rubbish furnish receptacles. Sometimes they are deposited on the stony or weedy bottom of a tidal river, either in fresh or brackish water, and sometimes in the pure, fresh water of small brooks.

Owing probably to over-fishing, the smelts now caught are in most rivers much smaller than formerly. Those of the Saco are nearly or quite the largest in the State; they are said to weigh from 2 pounds to 2½ pounds per dozen (five or six fish to the pound). Those taken in New Meadows River in weirs and seines count fourteen to the pound; those taken by hook in the Kennebec at Gardiner sixteen to the pound. The smallest marketed (but not the smallest caught) from Bucksport are adults 6 inches long and weigh about 1 ounce; among the larger specimens are some weighing 4 ounces and measuring 8 to 9 inches in length.

MODES OF CAPTURE.—The modes of catching smelts now or formerly employed in Maine comprehend the use of weirs, seines, bag-nets, gill-nets, dip-nets, and hook and line. All of these modes are in use at the present time except gill-nets.

Weirs.—The weirs used for smelts are generally "half-tide" weirs. They are built sometimes in a narrow cove, which they completely span, and sometimes at the head of a broad and shallow bay, where they receive the form of a tunnel with the apex pointing outward. At high water the smelts pass freely over them into the bay or river, but on the ebb-tide are intercepted by the spread-

ing wings of the tunnel and fall into the pounds at the apex. Such weirs are employed in the Kennebec, Sheepscot, Piscataqua, and Casco Bay. They are generally erected in early autumn and kept in operation until broken down by the ice of winter.

Seines.—Seines are but little used, and only in the vicinity of Brunswick and Harpswell. They are small affairs, 15 to 20 fathoms long, and of 1-inch mesh, and are used in narrow creeks and coves from October to December, and occasionally in the spring.

Bag-nets.—The bag-net fishery for smelts is of considerable importance, a larger aggregate quantity being caught this way than by any other method except hook and line. Its principal seats are the Kennebec and Penobscot Rivers, but it is also carried on in the Wescongus, Harrington, and Tunk Rivers to a small extent.

The bag-nets used in different localities vary some, but those of the Penobscot may be taken as the type, and will be described in detail. These nets are plain bags, knit of strong cotton twine, of 1⅛-inch mesh. The mouth of the net is rectangular, 25 or 30 feet wide and from 12 to 18 feet deep. The "trail" or length of the bag is 30 or 35 feet. The bottom and top commonly taper toward the trail to half their width at the mouth, and the sides taper to a point. The fixtures to which this net is attached and the mode of attachment vary according to circumstances, the fishing being pursued sometimes in the open water, sometimes in the spaces between the piers of a bridge, and sometimes beneath the ice.

For an open-water fishery the bag-net is hung upon a rectangular wooden frame a little larger than the mouth of the net, to the corners of which are attached four guys, running to a slightly buoyant log of wood, which, in its turn, is chained to a heavy stone, dropped to the bottom of the river. Thus anchored the net swings freely in the tide, but with a current of moderate strength it is pressed down until the bottom of the frame rests on the bed of the river. The attachment of the net to the frame is by means of large rings, which slide freely up and down on the upright sides of the frame. Ropes passing over pulleys at the top and bottom serve to open the net and draw it down to its place in the frame, or to close its mouth and draw it up, while the same lines running to the surface and suspended by small buoys mark the place of the net, and enable the fisherman, working from his boat, to draw it up. In some districts this frame is called a "wrinkle."

If ice covers the fishing grounds a very different arrangement must be resorted to. A narrow hole, as long as the net is wide, is cut in the ice at right angles with the current, and at either end of it is planted, upright, a stout pole something over 40 feet in length, running down 35 feet, more or less, into the water, and secured in position by guys attached to both top and bottom, and anchored in the ice. Ropes running through blocks draw the net down to its place at the bottom of the poles, or draw it up through the ice to be emptied of its fish. The whole arrangement rises and falls with the tide. The net is therefore, when set, at a constant depth beneath the ice, and at a varying height above the bottom of the river. Nearly the same arrangement is employed at a bridge as at Bucksport, but in this case the fixtures are attached to the bridge, and the net is at all times, when fishing, close to the bottom.

The bag-net, whether used on a frame in open water, beneath the ice, or at a bridge, is drawn entirely out of the water to secure the fish. It is made fast to the standing fixtures securely, but so as to be easily cast off and taken ashore. The fishing is done both by day and night, but, in general, the night tides are by far the most productive. Flood tide is at Verona bridge much more productive than ebb-tide, but at Sparks's Point, 3 miles below, a frame fishery finds the opposite to be true. Spring tides are more favorable than neap tides.

Fykes.—Fykes are double bag-nets, the large open-mouthed net in front leading by a narrow opening at its apex into a smaller one, termed the "pocket," from which, as from a weir, fish escape with difficulty. The fish are taken out by drawing up the "pocket," through a separate hole in the ice, and unlacing an opening at the bottom, the main part of the fyke remaining under water for weeks or months. The fyke has been used in various parts of the State, but does not appear to have given entire satisfaction. There is complaint of its being more difficult to clear of rubbish, anchor ice, &c., than the plain bag-net, which has in some cases superseded it.

The various forms of bag-nets have been in use on the Kennebec since 1852, and in the Penobscot for a shorter period.

Gill-nets.—The only form of gill-net known to have been used for the capture of smelts in Maine was in use in the Kennebec before the introduction of bag-nets. It was a small affair, stretched on a frame about 6 feet square, and set through a hole in the ice. A great many of these were used in small tributaries of Merrymeeting Bay, and were quite effective while smelts were plenty and large.

Dip-nets.—Dip-nets are only used in the spring, in brooks where the smelts spawn, or at points where their ascent of the rivers is obstructed. The product of this fishery is of small amount, and contributes very little to the supply of the markets.

Hook and line.—The hook and line fishery has always been the most important mode of taking smelts, whether we regard the gross product or the number of persons employed, though when it is brought into direct competition with bag-net fishing on the same ground, it is found less productive. Smelts can be taken with hook and line during the autumn months, but it is not until winter that any considerable numbers are thus taken. As soon as the ice forms on brackish and fresh tidal waters the line fishermen begin to ply their vocation. Through December and January the work is generally brisk, but in February the catch begins to slacken, and very few fishermen continue their efforts in March. Smelts can be caught through the ice as far up the fresh rivers as they ascend, but the most productive fisheries are located on brackish estuaries and bays, as Nequasset Bay in Woolwich, Damariscotta Bay, the Medomak River in Waldoborough, and Bagaduce River in Brooksville.

The outfit of a hook fisherman for smelts formerly embraced only a hook and line, an ax or ice-chisel for cutting holes, and perhaps a pail for bait and a few boughs to stand on. A thrifty fisherman would, after finding a good location, protect himself from the cold winds by means of a clump of evergreen bushes, and a progressive development in the direction of comfort produced finally the present smelt fisher's house with its dry board floor and stove.

In the Damariscotta fishery (which has been selected for description as representing the prevailing style), the smelt houses were at first built of heavy boards, then with wooden frames and walls of clapboards, and finally a few years ago other coverings gave place generally to cloth. They are commonly 5 feet long and 4 wide, cost about $5 all complete, with stove, and can be easily moved about on a hand-sled. Each house is occupied by one man, who uses two lines with one hook, or sometimes two, on each line. The lines are of cotton, either plain or laid in oil, and Kinsey hooks, Nos. 13 to 16 are used. For bait they employ generally pieces of marsh minnows, which are caught in the fall and kept alive until used. When minnows cannot be had they cut up smelts for bait. In old times the fishing was always in shoal water, but it is now found that the smelts can be taken in water of any depth from 2 to 20 feet and on either ebb or flood tide. The fishermen do not agree as to what part of the bay is best nor do the smelts appear to be constant in frequenting any particular spots; in searching for them the houses move about a great deal, often changing location several times a day.

In other localities experience and practice vary a little from those of Damariscotta. At Woolwich they use clam-worms for bait; at Waldoborough, clam-worms, smelts, eels, fresh beef, and minnows. At Saco there are more ambitious houses, 6 feet long and nearly as wide, with walls, 5 feet 9 inches high, and costing $17 to $20; in such a house a man uses six lines made fast to a bar overhead and dropping through a hole 6 feet long; fishing mainly at night, he places a kerosene lamp with a white paper shade, at each end of the hole to attract the smelts, and in one corner stands a coal stove.

The hook fishery is pursued by people of many different callings, who find a lack of employment in the winter—farmers, laborers, and mechanics of various trades, comparatively few of whom are engaged in fishing at other seasons. Some of them are strictly amateurs and catch merely for their own tables; many others dispose of their surplus in the local markets, but a very large number follow the occupation steadily and send their fish to distant markets, mainly Boston and New York. Altogether there is no branch of the river fisheries that contributes so much to the comfort and well-being of the local population as this.

MARKETING SMELTS.—Smelts are all marketed and consumed fresh. It is the common practice to freeze them, and then forward to market in boxes and barrels. It has been recently discovered that a partial freezing, leaving the fish flexible, is a better preparation for transportation than freezing them stiff; besides, a much larger quantity of the flexible smelts can be put into a barrel or a box of given dimensions. It is also a recent discovery that without freezing smelts can be shipped to Boston or New York in a tight fish barrel filled with iced water, a large lump of ice being placed in the middle. This is a very satisfactory method to the dealers, the fish opening in fine condition with a very fresh appearance and meeting with a ready sale; but it involves the transport of a great deal of water and ice, and for that reason is not much employed except in time of warm weather when freezing cannot be effected, and dry packing is not safe.

Probably the quantity of smelts consumed in Maine does not exceed 10 per cent. of the total catch. Of the remainder nearly all find a market in Boston and New York, the latter taking more than half. Thus, of 254,000 pounds shipped to those two points from Bath, Woolwich, Waldoborough, Warren, and Thomaston, 138,000 pounds went to New York, and 116,000 pounds to Boston.

STRIPED BASS (ROCCUS LINEATUS.)

NATURAL HISTORY.—The data for a complete account of the natural history of this species do not exist, and as there is a special lack of knowledge of its life in Maine rivers, the present notice will properly be very brief. The bass is found in substantially all the brackish waters of the State, and ascend the rivers a short distance at various seasons of the year. On the Kennebec it used to ascend the main river as far as Waterville, and the Sebasticook a short distance above its mouth; but since the building of the dam at Augusta that place has been the limit of its migration. The principal run is in the month of June, at which time it feeds greedily, apparently ascending the rivers for that purpose. It continues to feed in weedy coves and bays till November. In the winter great numbers of young, 2 or 3 inches long, are found in the rivers, and many of them fall into the bag-nets and are captured along with smelts and tom-cods. Larger individuals appear in many cases to retreat to quiet bays and coves of fresh water in the lower parts of the rivers, and pass the winter in a state of semi-hibernation.

There are some facts that favor the view that bass spawn in the rivers. For instance, a male with ripe milt has been observed on the Kennebec as far up as Augusta about the 1st of July. The fishermen of Merrymeeting Bay think that they spawn in the summer, because they are to be found

there in June full of spawn, which is not, however, found ripe during the shad-fishing season, which extends sometimes into July; while in the fall they contain no spawn unless in the very first stages of growth. Bass sometimes attain a great size in Maine, though they do not appear to average so large as farther south. The largest reported, weighing 100½ pounds, is said to have been taken some years ago in Middle Bay, an arm of Casco Bay, and specimens of over 50 pounds in weight are not very rare,* yet the average weight of all caught is probably less than 5 pounds. Those caught in the weirs will hardly exceed 2 pounds. Those taken in gill-nets under the ice at Sheepscot Bridge weigh from 3 to 12 pounds, rarely 30 to 40.

MODES OF CAPTURE.—Bass of marketable size are caught in the spring weirs, but to no great extent at the present time. The fishermen say that they are difficult to catch, being cunning enough to find their way out of the weirs. Four methods appear to have been specially employed for their capture: (1) Dip-nets, set under the ice. (2) Stop-nets, set in summer and autumn across the mouths of coves. (3) Gill-nets. (4) Hook and line.

Dip-nets.—These were used many years ago in the mouth of Eastern River, Dresden, specially for bass. They were plain bags, 7 or 8 feet wide at the mouth, hung on a semicircular bow at the end of a large pole which was held in the hand, and were operated by pushing down through holes in the ice and resting on the bottom. As soon as a bass struck the net it was immediately pulled out. This fishing was done in the edge of the evening on the "dark" of the moon. As many as sixty nets were counted at one time fishing at that place. This fishery was discontinued in consequence of scarcity of bass, about 1850. In Winnegance Creek, just below the city of Bath, one winter a man who was spearing eels in the mud took, by accident, a bass. Nets were immediately brought into use and "tons and tons" of bass taken out.†

Stop-nets.—The "stopping" of coves is a modern method. At high water a stout net, generally 12 feet deep and of 2½ to 3 inches mesh is stretched at high-water directly across the mouth of a cove, and kept in place until low water. Bass doubtless frequent such places for the purpose of feeding. They move very quietly and close to the bottom, and their presence is not easily ascertained till the tide has left them. This method of fishing, therefore, proceeds entirely at random as to the presence of the prey. Sometimes it is entirely unsuccessful, and at other times great hauls are made. It was first practiced‡ by Thomas Spinney and John Marr, of Georgetown, who made their first attempt with salmon nets at Preble's flats, opposite Bath, somewhere between 1844 and 1848. On that occasion they took out 11,000 pounds of bass, and during that year shipped 52,000 pounds to New York. Another instance of a successful haul occurred at Butler's Cove, an arm of Merrymeeting Bay, one autumn about 1850, on which occasion fifteen cart-loads of bass were secured. Eighty-five barrels of them were sent to New Orleans and sold for $8 per barrel. This method of fishing is employed irregularly, and no one appears to have been engaged in it in 1880.

Gill-nets.—These are used, among other places, in Sheepscot and Dyer's Rivers, above Sheepscot Bridge, in the winter, under the ice. The nets used at this place are commonly 35 feet long, 12 to 15 feet deep, and of a 4-inch mesh, furnished with ordinary floats and very heavy sinkers, costing, complete, about $4. In operating, a narrow opening is cut through the ice across the channel (whose width is about equal to the length of the nets, though quite deep), and the nets

*Mr. M. B. Spinney, of Georgetown, who has made a business of fishing for bass with stop-nets, says that he once took a bass of 80 pounds, and another, which, after dressing, weighed 62½ pounds, equivalent, he thinks to over 90 pounds live weight, and of specimens that exceeded 50 pounds he has taken hundreds. Mr. S. is also the authority for the capture of the bass weighing 100½ pounds.

†Statement of John Brown.

‡Statement of M. B. Spinney.

set in without any frame. The tide is so strong that the nets can only be drawn out when it is rather slack; so they are drawn only at high and low water, and kept in place all the rest of the time. This method has also been in use at some points on the Kennebec River, and indeed is probably a very ancient method.

Hook and line.—The hook and line fishing for bass is practiced as a pastime at a few points, especially near obstructions at the head of the tide, as at Augusta, on the Kennebec.

MODES OF CURING.—The only mode of curing bass employed in Maine is salting in barrels. Some parties once dried a large lot of them in Casco Bay, but they are said to have been too fat to keep, and all were lost. With the exception of an occasional large haul all the bass are now marketed fresh.

HISTORICAL NOTES.—Bass were undoubtedly quite plenty in early times in most of the rivers west of the Penobscot. In the latter river the old fishermen speak of them as having been "plenty," but the degree of abundance was by no means equal to that existing in the Kennebec, and at no time has this species been marketed in any considerable numbers from the Penobscot or any river farther east. In the west they were early subjects of legislation, indicating not only that they were plenty enough to be thought worthy of attention, but also that there was an actual or apprehended diminution of their numbers. The preamble to an act of the New Hampshire legislature "to preserve the fish in Piscataqua River," recites that the fishing for bass and bluefish* in winter "hath almost destroyed the bass and bluefish in said river." In 1800 the legislature of Massachusetts passed an act "for the preservation of fish called bass in Dunstan River in Scarborough, in the county of Cumberland." On the Kennebec at Abagadasset Point, as late as 1830, bass were so plenty that the fishermen were troubled to dispose of those taken in the weirs. A single weir has been known to take 1,000 pounds at one tide. There was no demand for them. Sometimes hired men would take them in pay. When plentiest they were given away. Mr. John Brown says that about the time of their first diminution he obtained a contract with General Millay, the keeper of the Bowdoinham town poor, to furnish 1,600 pounds of bass at three-quarters of a cent per pound, but the fish were not plenty that year and he caught only 800 pounds. The extent of the diminution is illustrated by comparing the above statement with the statistics representing the present condition of the bass fishery. The total catch of twenty-two weirs on and about Abagadasset Point in 1880 was but 3,510 pounds; the Kennebec River yielded a total of 12,760 pounds, and the entire State 26,760 pounds.

THE EEL (ANGUILLA ROSTRATA).

NATURAL HISTORY.—The common eel is found all along the coast of Maine and in all the rivers accessible from the sea, as well as in some fresh waters which would appear to be absolutely inaccessible in their present condition.† In waters communicating with the sea the young eels move up-stream in early summer to the fresh water of lakes and streams, where they feed and grow. At the beginning of this migration the young eels are very small. In the month of July they can be found 4 or 5 inches long climbing dams at the head of tide waters. They are able to crawl many feet up a perpendicular wall down which the thinnest sheet of water is trickling, and it is probable that they pass many dams that are insuperable to all other fishes, and thus reach some waters very remote from the sea. The adult females, or a portion of them, are found

* The term "bluefish" must refer to some other than the marine species now known by that name.

† This is still debatable ground, some observers maintaining that all eels, however remote from the sea they may be found, reached their abode by ascending the rivers.

descending the rivers to the sea in the autumn very large and full of spawn. In winter eels are found bedded in mud at the bottoms of rivers and bays in fresh, brackish, or wholly salt water. In some cases they leave the salt water in autumn and push up into fresh-water streams, even into very small brooks, and there pass the winter in the mud.

Observations made in other countries indicate the probability of these conclusions: that the female eel alone ascends the rivers, the males staying behind in the salt water; that the females when mature always go down to sea and pass out beyond the reach of observation, where they are joined by the males, and lay their eggs early in winter; that after spawning once the females die. Unlike the salmon, shad, and alewife, the eel is a predatory fish while in fresh water, greedily devouring all animal substances. At the beginning of their seaward migration, however, the females cease to eat.

METHODS OF CAPTURE.—Eels are taken with spears, in traps and pots set for the most part in tidal rivers, and in weirs built across the streams that they descend in the autumn.

Weirs.—An eel-weir has much the form of a smelt-weir, two wings running out from the opposite shores of the stream obliquely downward and converging to form a tunnel; at the apex is a long narrow spout leading into a box from which the eels cannot escape. Rough weirs are occasionally made of brush and stakes, but the most efficient have the wings constructed of sawed slats combined in racks, which, when in place, rest on a close piling, affording the eels not the slightest opening for escape, and effectually preventing their undermining the structure. The best specimen of an eel weir, and indeed the only systematically conducted fishery of the sort that has come under the writer's observation, is found on the Cobbosseecontee stream, at Gardiner, on the Kennebec. Mr. T. H. Spear, the proprietor, has extended his operations to the collection of young eels as they enter the river in summer and their transfer to the waters above.

Eel-traps.—An eel-trap, known only among the fishermen of the lower Kennebec, is a diminutive eel-weir, planted on the flats in a favorable position to intercept eels in their movements along the shores. They are generally set so as to make captures on the ebb tide. When the trap was first invented, about the year 1875, it was set with a view to taking eels as they descend in the spring, from their winter bedding places in the mud of fresh-water marshes on the small brooks near tide water, and the most of the traps are still constructed so as to take eels descending with the ebb tide; but experiment has demonstrated that they can be successfully caught with the arrangement reversed so as to take only those that are ascending the river; and it is probable that the fish that fall into the traps are merely working their way along the shore, either up or down, in search of food. A good eel-trap costs about $25.

Eel-pots and baskets.—Pots and baskets of various forms are much used in some districts. The most approved form of late is made from a barrel by substituting funnel-formed screens for the heads. Baited with fresh fish, free from taint, these are sunk to the bottom in favorable positions often alongside fish-weirs. The eels, probably scenting the bait, push their way in by the tunnel-formed entrance, but are unable to escape. This is a very old method of fishing.

Pots and traps are often used in conjunction by the same fishermen, as they are available at the same season. On the Kennebec they are used from May 10 to the last of September.

The spear.—The implement most widely known and used for the capture of eels is the spear. The form in common use in Maine consists of a spatula-formed center piece with three teeth on either side, each tooth having a single barb on the inner side. The teeth are of steel, about 8 inches long, slender, elastic, spreading at the tips about 8 inches. With this implement at the head of a long wooden pole the fisherman industriously prods the soft muddy bottom through a

hole in the ice, or sometimes from a boat. Each several thrust is made entirely at random, but experience guides to a choice of the proper kind of bottom and the topographical location and extent of the beds.

At Dresden, in the mouth of Eastern River, are some beds much resorted to now and for the last eighteen years. The water there is entirely fresh. The fishing is, as a rule, done on the channel banks, but sometimes quite out in the channel, so that at low tide the depth of water over the different parts of the beds may vary from 5 to 25 feet. Some observers are led to the conclusion that mud meeting in all respects the requirements of the eels occurs only in patches, and when they find one of these patches they will bed in it to whatever depth it may carry them. So the fishermen come armed with two spear poles, one of which is often 28 or 30 feet long.*

Another locality for eel-spearing is in Quohog Bay, in the town of Harpswell. Here in 1876 an eel-bed was discovered which is famous as being the most productive one ever known in that region. It lies in 13 feet of water at low tide, just outside the eel-grass zone, and extends over about 10 acres. When first discovered it was so densely inhabited by eels that a spear often brought up four or five at a time. This still continues to be more productive than any other bed in the vicinity, and yields about three-quarters of all the eels taken in Harpswell.† The time when the fishing can well be carried on is limited to about six hours at each low tide, and is practically confined to the tide occurring in the daytime and to the first two months after the ice forms. Later the labor of cutting through the thick ice becomes too great.†

There are doubtless many such beds yet to be discovered. The more thinly inhabited beds are well distributed all along the coast.

Marketing eels.—The eels taken in summer with pots and traps are for the most part packed whole ("round") with ice in barrels and shipped to New York. The demand is very lively during the first part of the season, and shippers receive about 6 cents a pound, free of freights and commissions. The product of the spear fisheries and of the fall weirs is, on the other hand, dressed before marketing, and brings about 7 cents per pound in New York. As the shipper has to pay freight and charges, and as 200 pounds live weight will not dress more than 140 pounds, it will be seen that the round eels, the product of pots and traps, give the best profits.

STURGEON (ACIPENSER STURIO).

NATURAL HISTORY.—The common sturgeon of the Atlantic rivers is the only species known to visit the rivers of Maine. It ascends the larger of them for the purpose of depositing its spawn, which it does in midsummer. Some intelligent observers think their natural spawning grounds are almost wholly above the flow of the tide. On the Kennebec it is believed that they were mainly between Augusta and Waterville, a view which is supported by the fact that the closing of the river by a dam at Augusta was followed by a great decrease in the number of sturgeon. Very little is known about the growth of the sturgeon in Maine. The earlier stages are rarely seen, except that a considerable number about 18 inches in length are caught in the smelt-nets of the Kennebec in winter; they are very slender and sharp-nosed, and are termed by the fishermen "pegging awls." The adults caught in the Kennebec average not far from 120 pounds in weight.

METHODS OF CATCHING.—Sturgeon ascending the rivers in company with shad, alewives, and salmon fall often into the weirs built for those species, and to fishermen who have not made arrangements for utilizing them they prove sometimes a very great nuisance. But the only means specially or regularly employed for taking them is the drift-net. Those now in use on the

* Statement of W. W. Walker.
† Statement of Stephen Kemp, of Harpswell.

Kennebec are of cotton (sometimes hemp) twine of 12-inch mesh (occasionally varied, but always between 10 and 13 inch), 25 to 30 meshes deep, 80 to 100 fathoms long, corked and leaded like any drift-net. These are set by night on the ebb tide from a large punt worked commonly by two men. The ordinary fishing grounds on the Kennebec extend from Bath to Richmond, but sturgeon can be and sometimes are caught as far up as Augusta.

UTILIZATION.—At the present time no portion of the sturgeon is saved but the clear flesh, which is cut from the trunk, packed in ice and sent to New York, where it is smoked for use. About half the fish is refuse, including the entrails, head, skin, and vertebral column. The preservation of the roe for the making of caviar, and the trying out of the oil with which the refuse abounds have been sometimes practiced in former years, but at present all but the clear flesh is thrown into the refuse heap and employed only for fertilizing the land.

HISTORICAL NOTES ON THE STURGEON FISHERY.—Sturgeon were apparently more highly esteemed in the early days of American history than now. They were specially mentioned in the original grant of the King of England to Ferdinando Gorges, conveying a large territory in the southwestern part of the State inclusive of the Kennebec River. In the early part of the eighteenth century there existed a flourishing sturgeon fishery in the province of Maine, which employed some years over twenty vessels, and was esteemed an important branch of industry. It does not appear, however, to have been prosecuted continuously. Very early in the present century a company of men came to the Kennebec, and, locating themselves on a small island near the outlet of Merrymeeting Bay, since known as "Sturgeon Island," engaged in the catching of sturgeon, which they soused, packed in kegs, and shipped to the West Indies, where they sold at $1 a keg.* This business was, however, suspended, for what reason is unknown, and though sturgeon were very abundant in the Kennebec during the early part of the present century, at least until about 1840, no attempt was made to utilize them except occasionally for home use, until 1849.

In 1849 a Mr. N. K. Lombard, representing a Boston firm, came down to the Kennebec, established himself at "Burnt Jacket," in the town of Woolwich, between Bath and Merrymeeting Bay, and undertook to put up the roe of sturgeon for caviar, and at the same time boil down the bodies for oil. A large number of fishermen engaged in the capture of sturgeon to sell to Lombard. The price paid was 25 to 50 cents apiece. The first year there were obtained 160 tons of sturgeon.† They yielded oil of fine quality, superior to sperm oil for illuminating purposes, in the opinion of the inhabitants of that vicinity, who have been accustomed to use it when attainable. The attempt to utilize the roe was at first unsuccessful. It was put into hogsheads, very lightly salted, and all spoiled. The next two years the roe was cured by salting heavier, drying, and laying it down with a little sturgeon oil, and was pronounced satisfactory. However, the business was discontinued after 1851. That year the sturgeon were quite scarce.

From this time there was a suspension of the sturgeon fishery until 1872, when some of the local fishermen of the Kennebec took it up again. In 1874 a crew of fishermen, headed by one John Mier, of New York, went into the business, catching and buying all they could, and shipping them to New York, where they proposed to smoke the flesh and utilize the roe for caviar and the sounds for glue. They aimed to catch the sturgeon early in the season, while the roe was yet black and hard, and to keep the fish alive until the proper time arrived for opening them. For the latter purpose they constructed a great pen, in which they at one time had seven hundred live sturgeon. After five years the sturgeon again became scarce, and the business was relinquished

* Statement of John Brown.

† Statement of Jos. Partridge, of Woolwich.

to local fishermen, who still continue to ship the flesh to New York, but throw away all other parts. In 1880, the least successful season in recent times, 12 fishermen were engaged in the business on the Kennebec, and the total catch was about 250 sturgeon, producing about 12,500 pounds of flesh, which sold in New York at 7 cents and returned the fishermen about 5 cents per pound.

4. DESCRIPTIVE AND HISTORICAL NOTES ON LOCAL FISHERIES.

SAINT CROIX RIVER.—The Saint Croix is remarkable, even among the rivers of Maine, for the great extent of the lake surface among its tributaries. On the best maps are represented 61 lakes, of which the smallest has an area of three-quarters of a square mile and the largest of 27 square miles. Their aggregate area is about 150 square miles, which is about 15 per cent. of the entire basin of the river. These lakes afforded breeding ground for great numbers of alewives, and, in the main river and its branches, here the salmon and there the shad found their favorite haunts. The exact limit of the upward migration of all these fishes is very naturally unknown with any degree of exactness, the entire upper portions of the basin being a wilderness till long after the occupation of the lower banks and the erection of artificial obstructions; but the fact of their existence in great numbers in the river shows that they must all have passed the only serious obstacle to their ascent, the natural fall at Salmon Falls near the head of the tide, and found their breeding grounds in the upper waters.

The best accessible testimony as to the former condition of these fisheries is found in Perley's "Report on the Fisheries of the Bay of Fundy."* The testimony there adduced may be thus summarized: From the first settlement of the country till 1825 there was annually a great abundance of salmon, shad, and alewives. Vessels from Rhode Island, of 100 to 150 tons burthen, followed the fishing business on the river and were never known to leave without full cargoes. There were also several seines belonging to the inhabitants, which were worked in the rideway of the river, the owners of which put up annually from 1,500 to 2,000 barrels of alewives for exportation, besides a sufficiency for country use. At the same time shad were caught in great numbers, often more than a hundred of them being caught in a small net in a single night. Salmon were so plenty that, according to testimony, a boy of fifteen has been known to take 500 in a single season with a dip-net, and a man has been known to take 118 salmon with a dip-net in a single day. The dipping place, both for salmon and shad, was at Salmon Falls. The prevailing price for salmon was 4 or 5 cents per pound. About 1825 the building of dams had reached such a stage as to seriously interfere with the ascent of fish, and they began rapidly to decline in numbers. In 1850 it was estimated that not over 200 salmon were taken. The decline in the alewife fishery had been equally great, and in the shad fishery still greater.

At the present time the condition of things is not much better than in 1850. The three dams at Calais and Baring, notwithstanding the construction of fishways, are very serious impediments, partly because they facilitate the work of poachers, and but few fish reach their spawning-grounds. Salmon are now taken in sufficient numbers to encourage the continuance of the fishery, and as incidental items there are taken a few alewives, a very few shad and bass, and small quantities of smelts and eels. The implements of capture are five weirs in the tidal portions and an uncertain number of drift and dip nets at Calais and Saint Stephen.

The weirs are similar to those in use on the Penobscot and Kennebec; two of them, those farthest up river, are half-tide weirs, and the others are "high weirs," with two pounds each, built of netting and stakes. They are all built in the spring and removed in the autumn. The half-

*Made by M. H. Perley, esq., to the Government Emigration Office, Saint John, New Brunswick, March 12, 1851.

tide weirs take smelts, alewives, a very few bass, sometimes a shad or a salmon, and miscellaneous fish, such as herring, bluebacks, &c., which are utilized to fertilize the land, but no shad or salmon were taken in them in 1880.

The high weirs, three in number, are built mainly for the capture of salmon, but take also alewives, smelts, shad, bass, herring, and a few cod and other sea fish. These weirs are all built in Calais; one of them just above Devil's Head, the other two near Red Beach. Farther down the river are weirs for the capture of herring, and in these, too, a very few salmon are taken.

The drift-nets are used solely for the capture of salmon, just below the lower dam in Calais and Saint Stephen. They are generally 75 feet long and 8 feet deep, with a 6-inch mesh. There are known to have been as many as seven of these nets in existence in 1880, but as they are often used covertly and illegally in immediate proximity to the dam, there is no means of ascertaining how many were in actual use at any time.

The dip nets are used for the capture of smelts and alewives about the falls, but all this fishing is exceedingly irregular, no one pursuing it as a regular industry, and all the product being consumed locally.

The salmon fishery has been in a low condition for many years, and the yield for the year 1880 ranks among the poorest of the last decade. The total number taken by all modes appears to have been 300, averaging in weight 12 pounds, and aggregating in value about $750.

The shad taken are mostly of the small size, termed "sea shad," but these are not taken in any considerable numbers. Sometimes a weir will take 500 of them in a season, and market them fresh along with alewives in Calais. Of the adults, to which the term "shad" is restricted among the fishermen, merely a few specimens are taken. The best weir sometimes takes twenty or thirty in a season, but in 1880 did not get half a dozen.

Of alewives about 115 barrels were taken in 1880, of which about 10 barrels were sold fresh, 30 barrels smoked, and 75 barrels salted. There are considerable quantities of bluebacks taken; they are not distinguished by the fishermen from alewives, but the above figures are believed to represent the numbers of true alewives.

Of bass (*Roccus lineatus*) very few are taken, about as many as of the river shad. One weighing 27 pounds was taken in one of the weirs in 1880.

Smelts are caught in the weirs in small numbers and in dip-nets at the Union dams in Calais. They are consumed locally, and the total quantity marketed probably does not exceed in value $150 yearly. The dip-net fishery is limited to two or three weeks in the spring. Smelts in plenty can be taken with the hook all through the summer in the lower part of the river.

Messrs. Lewis Wilson & Son have been engaged since 1853 in fishing in Calais just above Devil's Head, with a weir, always in the same spot and of the same form, without any perceptible interference from other weirs. Their experience may fairly be taken as indicating the relative abundance of the fishes that they catch. Their record of salmon has been very carefully kept, and shows that the years of the greatest abundance of that species were, in order, as follows: 1862, 1871, 1877, 1866, 1867, 1863, 1868; and the years of least abundance, in order, were 1859, 1874, 1869, 1853, 1865, 1864, 1857. Perhaps the most noteworthy fact disclosed by Mr. Wilson's record is that salmon run much later in the season on the Saint Croix than in the central and western rivers of the State. Fifty-two per cent. of the catch for the entire period was obtained later than the month of June, 21 per cent. was taken in August, and 3 per cent. in September. Similar generalizations can be made from the recent record of a weir at Red Beach, farther down the river, and the salmon are also known to run late in the Machias and East Machias Rivers. These are all in

marked contrast with the Penobscot River, where the principal catch is in the month of June, and where the number of salmon to be taken after the first ten days of July is rarely enough to warrant the fishermen in keeping their weirs in working condition.

PENMAQUAN RIVER.—This little tributary of Cobscook Bay drains a small territory in the towns of Charlotte and Baring, not exceeding 50 square miles in area, and affords an outlet to Pennaquan Lake and several smaller bodies of water. It is naturally well adapted to the growth of alewives, which formerly abounded in it, and tradition also says that there were once a good many salmon here. But very far back in the history of the country dams were built without suitable provision for the ascent of migratory fish, and the usual result followed. The salmon have entirely disappeared and very few alewives remain.

DENNY'S RIVER.—This is the first considerable stream west of the Pennaquan, and is the principal tributary of Cobscook Bay. It drains a basin of about 150 square miles, including two considerable lakes, Meddybemps and Cathance. The character of both the Denny's and its principal branch, the Cathance, is favorable for the breeding of salmon, and alewives find a breeding ground of great extent in Meddybemps Lake. Both of these species are known to have abounded in the river anciently, and tradition says that shad, too, frequented it. The shad disappeared early, but the salmon and alewives continued to ascend the river until 1845. Since the first settlement of the country there has been a dam at Dennysville, near the mouth of the river, but fish were able to pass it. In 1846 another dam, quite impassable, was built a mile farther up the river. The effect of this was to nearly exterminate the alewives, and the salmon, though they continued to breed in the river below this dam, were reduced to very small numbers. In 1858 this dam was destroyed by a fire which consumed the mill, and fish were again admitted to the upper waters. The alewives were still shut out from Meddybemps Lake, but in 1863 a fishway was constructed there which admitted them to the lake.

After the reopening of the river the salmon increased but slowly, owing to their persistent persecution at the dams and the setting of gill-nets at the mouth of the river. The alewives, however, increased very satisfactorily; in 1865 the number taken was estimated at 2 barrels; in 1866 at 15 barrels, and in 1867 at 240 barrels (about 125,000 fish). Since then the passage of the river has been a second time obstructed by a difficult dam, and a falling off in the number of fish resulted. At present the alewives are increasing, and it is estimated that in 1880 there were taken about 75,000, of which 30,000 were pickled and shipped to New York, and the remainder mostly smoked and consumed at home. The only mode of fishing for alewives employed here is with the dip-net.

Salmon are taken occasionally by spear and dip-net at the dams, now and then with the hook, but mainly in set-nets at the mouth of the river in tide-water. In 1880 there were four of these nets in use, and the total number of salmon taken is estimated at 200.

Denny's River is noted as the only river in the United States where fly-fishing for salmon has been practiced. In 1867, and for some years previous, it was the resort of several gentlemen from Portland, who succeeded fairly well, and the sport has been continued down to the present time by residents of Dennysville.

COBSCOOK OR ORANGE RIVER.—This is a very small river, lying almost wholly in the town of Whiting. It was in primitive times inhabited by many salmon and alewives, and according to tradition by shad also. Near the head of the tide three insurmountable dams were built many years ago, utterly exterminating the salmon, and reducing the alewives so that the catch was barely a dozen a year. In 1861, and subsequent years, an effort was made to restore both alewives and salmon, but it was only partially successful and at present the river is entirely unproductive.

EAST MACHIAS RIVER.—Naturally well adapted to the growth of alewives, this river continues to produce more of them than any other river in Maine east of the Penobscot. A few salmon are taken and scattering specimens of shad. In the winter smelts and tom-cods are caught in small numbers.

The spring and summer fisheries are carried on mainly by means of dip-nets at the falls in East Machias village, a few are caught in the same manner at a point 2 miles farther up the river, and a very small catch is secured by a few weirs in the tide-way. In 1880 but two of these weirs were built.

The dip-net fishery employed regularly, the whole or part of the time during the fishing season, about forty persons, besides an indefinite number of men and boys who took part in it occasionally. *The site of this fishery is between the two dams that here cross the river, and just below the lower* one. The fishermen build platforms at convenient points along the river's edge, and swing their nets in the foaming rapids. The nets in use are very well made and efficient. The best of them *have steel bows 3½ feet in diameter, poles 10 to 17 feet long, and nets of fine twine 5 feet deep.* The East Machias alewives are of good size, 400 of them filling a barrel when salted and packed for market. Of the 399 barrels caught in 1880, there were salted, 234 barrels; smoked, 135 barrels; and used fresh, 30 barrels.

Salmon are not known to have ever been very abundant in this river, and at the present time but very few are taken. For many years past there has been no decided increase nor decrease, though many fluctuations. In 1880 just 35 were caught, all of them in dip-nets by the alewife fishermen. This was much below the average catch.

Smelts are taken by night in April and May for home use and local market in dip-nets, differing from the alewife nets only in having a smaller mesh. They rarely ascend as far as the dams, but are caught along shore farther down. The smelt fishing commonly lasts ten or fifteen days. The yield in 1885 was but 15 barrels, and they appear to be decreasing. Tom-cods are taken in the winter with dip-nets to the extent of 55 barrels a year. Shad yield only occasional specimens now, though within twenty-five years they have been plenty enough to be of some importance. Some are now taken in the herring weirs of Holmes Bay.

MACHIAS RIVER.—In its original condition the Machias abounded in salmon. It yielded also shad and alewives, though in less numbers than the East Machias, owing, perhaps, in part to a very difficult natural fall at the head of the tide, and in part, so far as alewives are concerned, to the comparatively smaller area of lakes on this river. The difficulties of the falls at the head of the tide were further increased by the erection of a dam by the earliest white occupants, probably not later than 1784, the date of the incorporation of the town of Machias. Shad and alewives could no longer ascend the river, but the alewives were maintained in the river for many years by transferring a large number from the lower to the upper side of the falls each year. Salmon continued to breed and be caught in the river, until other and impassable dams were built, when they too disappeared along with the shad and alewives. At the present time the river is almost utterly unproductive of fish, the entire catch not exceeding 2 barrels of alewives and 5 barrels of tom-cods.

CHANDLER'S RIVER.—This little river, draining about 50 square miles of territory, once yielded, tradition says, salmon, shad, alewives, smelts, &c. Alewives and smelts are still taken in small numbers, as are also tom-cods, but salmon and shad have long since disappeared. Of alewives but five barrels yearly are taken by means of dip-nets. One bag-net is set for smelts in early winter, and some few dip-nets plied for them in spring, with an aggregate product of about 40 barrels yearly. A dip-net fishery for tom-cods in December yields about 200 bushels yearly.

WESCONGUS OR PLEASANT RIVER.—The drainage basin of the Wescongus measures about 110 square miles, the greater part of which is, like the basins of all the rivers thus far mentioned, covered with forest. The country about its mouth has been occupied by civilized people for more than a century, and is at present organized in two towns, Addison and Columbia Falls. The latter contains the most important village, which is located at the head of the tide, and was founded as early as 1765. At this village were found facilities for the building of mills for the sawing of lumber, which engaged the attention of the first settlers.

Salmon, tradition says, were once very abundant in this river, and notwithstanding the serious impediments placed in their way by the dams, continued to struggle up to their breeding grounds for many years after the settlement, and even at the present day are not utterly exterminated, a very few being yearly taken. About 1820 it was possible for a man to take a dozen in a day with a dip-net, which was the ordinary mode of capture, though gill-nets were sometimes used. In 1880 but a single one is known to have been caught. Salmon used to appear at Columbia Falls rarely earlier than June 1, but from that date they continued to ascend the river till January.* They ranged in weight from 6 to 18 pounds, the latter size being more common than the former; 7 and 8 pound fish were common. Their ascent of the main river is believed to have been stopped by an insurmountable natural fall 6 miles above Columbia Falls, and they are said to have spawned in a fine, gravelly tributary called "Lower Little River."

Alewives were pretty plenty sixty years ago, and were then of good size, whereas they are now small. Though they have not been able to surmount the dams at Columbia Falls for many years, they still come there yearly, about the middle or last of June (say two weeks later than at East Machias), and about 30 barrels yearly are dipped and smoked.

Shad are taken to a very limited extent in the three weirs built in the river and occasionally in drift-nets, of which several are owned in Addison, but none regularly used. They do not appear to have been plenty in the river within the memory of old inhabitants.

A very few eels are taken with spears. Tom-cods are caught with the smelts in very small numbers, but rarely sent to market. No sturgeon or bass are caught.

The most important place among the fishes of this river is now held by the smelt. About 15 tons of them are taken in weirs and bag-nets in Addison, 25 bushels are dipped at Columbia Falls in the spring, and perhaps an equal quantity in the brooks all up and down the river.

The weirs, which were introduced about 1872 or 1873, are all built of stakes and brush, standing with their tops 3 or 4 feet below high-water mark, the tide flowing over them. They are in the form of the letter L, the long arm running straight ashore and the short arm pointing up river; at the angle is a small pound constructed of wooden pickets. There were 3 of these built in the census year, all below Addison village.

The smelt-nets are in part plain bags, such as are used farther west, but most of them are fykes. They are set by attaching them to poles, which are planted through the ice into the mud in a location where the water is 8 feet deep at low tide. The nets are set both on the flood and ebb tide, and hauled at both high and low water. Fishing begins as soon as the ice will bear, which is generally about December 10 or 15, and continues till near April 1, the limit fixed by law. The first attempt at bag-net fishing was made by H. E. Willard, of Portland, in 1868. For the last eight years it has been carried on continuously. In the early years of the fishery smelts were plentier than now, prices were higher, and great returns were sometimes realized; in one instance, $58 for a single barrel of smelts. They are now marketed in Boston and New York, about two-

* Statement of Gowen Wilson, of Columbia Falls.

thirds of them in the latter city. They are uncommonly large. Some of the fishermen say they will average 6 or 7 to the pound, and that the largest will weigh 7 to 9 ounces; but it will not do to accept these figures without question.

HARRINGTON RIVER.—This is a tidal estuary lying wholly in the town of Harrington, and fed by a single fresh-water stream, a mere brook. The fisheries followed are: 1st, a summer fishery, with weirs for miscellaneous fish, in which a few alewives and shad are taken; 2d, a winter fishery for smelts, with bag-nets and weirs; 3d, a winter fishery for eels, with spears.

The summer fishery employed in 1880 but one man, who built a single weir.

The smelt fishery employed sixteen men, who set 18 bag-nets and built 4 weirs. They took 11½ tons of smelts, which were marketed, one-half in New York, three-eighths in Boston, and one-eighth in Philadelphia. The weir fishery for smelts has been carried on here for thirteen years, and the net fishery for ten years.

The eel fishery is not pursued persistently. The spears took about half a ton and a ton was obtained from the weirs. Some of them are salted, but most of them are sold fresh. They average, alive, half a pound in weight. The largest known weighed 4 pounds.

NARRAGUAGUS RIVER.—This river is larger than the three last mentioned, draining a territory of 215 square miles. In early times great numbers of salmon, shad, and alewives were taken here, but the dams at Cherryfield long ago destroyed them. Smelts have been taken in bag-nets in recent years, but this fishery also has been suspended, and the weir is this year quite unproductive.

TUNK RIVER.—Another very small stream, draining only 60 square miles of territory. There are some alewives, eels, and tom-cods caught and now and then a salmon, but the only fishes taken in numbers enough to be of any importance are smelts, which are fished for with weirs and bag-nets. There was but one weir built in 1879–'80, but 10 nets were in use, giving employment to nine men. The nets are plain bags, and are set in a line up and down the narrow channel, but, in obedience to local custom, never across it. The total catch was 4⅘ tons of smelts.

WEST BAY (Gouldsborough).—This is not an established fishing ground, but in the winter of 1879–'80 two men fished here with a bag-net for smelts, and caught 3,000 pounds.

WEST GOULDSBOROUGH.—Here is a fishery for alewives in the stream, which forms the outlet of Jones Pond, which is held as private property and claimed to be originally and always an artificial fishery. One Colonel Jones, one of the early settlers and proprietor of the mills at this place, about 1794 got some alewives from Mount Desert and put them into the mill-pond, thus establishing the brood in the stream. From that time down to the present it has been maintained wholly by carrying up and turning into the pond a few of the alewives caught. It has been the ordinary practice to carry up a basketful (one-third of a bushel) for each barrel killed. When the father of the present proprietors was in possession, they once caught a great quantity, estimated at over 200 barrels, but during the past twenty years the catch has ranged from 40 to 100 barrels, and in 1880 was as low as 30 barrels. They are all smoked and marketed locally.

SULLIVAN RIVER.—Some of the tributaries of this river have in former times supported alewife fisheries, as attested by tradition and by the record of legislation. In 1831 the legislature passed an act to regulate the alewife fishery in the town of Franklin, and in 1833 it passed another with reference to the town of Sullivan; but all these fisheries suffered the common fate—extinction by dams. In the expansion of the river known as Hog Bay smelt fisheries on a small scale have been carried on occasionally, but not regularly, and eel fisheries of some local importance exist at the east end of the bay in Donnel's Stream. The entire yield for the census year amounted to but 4,000 pounds of smelts and 5,000 pounds of eels.

MOUNT DESERT ISLAND.—Several ponds on this island formerly afforded breeding ground for alewives, but they are now almost extinct and afford no statistics. In 1821, and again in 1828, these fisheries were thought worthy of legislative protection.

UNION RIVER.—No river fisheries now exist here, though formerly salmon, shad, and alewives abounded. Especially good facilities are found at Ellsworth for the erection of dams, and they were improved at a very early date. A settlement was made here before the close of the last century and the corporate existence of the town of Ellsworth dates from the year 1800. In 1815, 1816, and 1823 the legislature passed acts regulating the fishery, but they were not sufficient to keep it alive many years.

In Patten's Stream, a tributary of the lower part of Union River, alewives have continued until the present time, but, owing to the obstructions offered by the dams, in numbers too small to afford statistics. Smelts, too, are caught, but in very small numbers.

BLUEHILL.—Here was formerly an alewife fishery, which was the subject of legislation in 1816, but it has long since been extinct.

PENOBSCOT RIVER.—The Penobscot is the largest river of Maine; its basin has an area of 8,200 square miles, extending almost entirely across the central portion of the State, a distance of 130 miles, and thence narrowing up rapidly as it approaches the sea-coast, where it is limited to the bed of its estuary. Thus it happens that though in its lower course it traverses a well-populated country, yet about half its basin, its entire upper portion, is covered by the original forest, where are neither tilled fields nor manufactories to foul its waters, nor lofty dams to limit the range of the salmon. In its western and southern portions the Penobscot Valley embraces several hilly and even mountainous districts, but, taken as a whole, it is much flatter than any of the river valleys to the westward of it. The elevations are very inconsiderable, and the rivers for the most part rather sluggish. The headwaters of the main branch are in the highlands on the western border of the State, from 1,600 to 2,000 feet above the sea, and about 300 miles from it by the river's course. But the river-bed falls off rapidly, and three-quarters of the descent to the sea is accomplished in half the distance. At Mattawamkeag, about 80 miles from the sea, the elevation of the river is but 190 feet. A descent of 98 feet is distributed over the 45 miles intervening between Mattawamkeag and Oldtown, and the remaining 92 feet fall is accomplished in the short distance of 15 miles between Oldtown and Bangor, where the river attains tide-level, though still 30 miles above the mouth of the river as fixed by the charts, but near 60 miles from the open sea. At the head of the tide and for some distance above, the river is 800 feet wide. At Mattawamkeag it is 500 feet wide after receiving the waters of the Mattawamkeag River, which has a width of 300 feet at its mouth.

The annual discharge of the Penobscot, exclusive of the tributaries below Bangor, is estimated at 278,800,000,000 cubic feet of water. The discharge at different seasons of the year is however, very unequal. In a heavy freshet 5,760,000 cubic feet of water pass Bangor per minute, while in time of drought the discharge at that point is but 146,000 cubic feet per minute, or about *one-fortieth as great.**

The principal branches of the Penobscot are: on the east side, the Passadumkeag, 35 miles long; the Mattawamkeag, 85 miles; the Mattagamon or East Branch, 63 miles; on the west side, the Piscataquis, 71 miles long. The smaller tributaries are very numerous, but, while nearly all of them contributed in olden times to production of fish, few remain open to them now except on the headwaters, which are beyond the reach of any but salmon. Of the lower tributaries there are

*For the most of the facts as to the elevations and volume of the Penobscot I am indebted to Wells's Water Power of Maine.

but two which are now accessible to anadromous fishes, the Bagaduce in Castine and Brooksville and the Eastern River in Orland, and even in these, especially in the former, there are serious hindrances to the ascent of the alewife, the only species that visits them.

Taken as a whole, the upper waters are well fitted for the propagation of salmon, as they abound in gravelly rapids, alternating with quiet stretches and deep pools, in which the salmon may bide their time, and to which they may retreat after spawning. The quiet waters of the main river and its principal branches are well adapted to the breeding of shad, and of the numerous lakes, whose number is 467 and aggregate area about 585 square miles, a sufficient number were naturally accessible to alewives to afford them very extensive breeding grounds. There are no insurmountable natural obstacles to the ascent of shad and alewives on the main river for 120 miles from the sea, and in some of the tributaries the way was open for nearly as great a distance, while salmon were able to push many miles farther up. At the present time both the main river and nearly all its branches are greatly obstructed by dams, which prevent the ascent of shad beyond tide-waters, which have extinguished the ancient broods of alewives that bred in the main river or tributaries above Bangor, and still shut them out from nearly all tributaries, and which have greatly hindered salmon in their ascent. All the principal dams on the main river are provided with fishways, which serve to keep the way open for salmon to their natural breeding grounds on the headwaters, but of neither alewives nor shad have new broods yet been established.

Present condition of the Penobscot fisheries.—The river fisheries of the Penobscot are now conducted for the capture of salmon, alewives, eels, and smelts. The few shad and bass taken are merely incidental to the salmon and alewife fishery, and the tom-cods to the smelt fishery.

Salmon.—Salmon are fished for with pound-nets or "traps" in the bay, with weirs in the upper bay and river as far up as Orrington, and with drift-nets at Bangor. The pound-net fishing is limited to the east shore of the island of Isleborough, and to the towns of Camden, Lincolnville, and Northport, on the western side of the bay. Nets of similar but simpler construction were formerly used on the eastern shore of the bay in the town of Brooksville, but since 1850 they have been abandoned.

The Isleborough salmon fishery is confined to the upper part of the eastern shore of the island, centering about Sabbath day Harbor; some berths formerly occupied with nets toward the south end have been abandoned as unprofitable. The entire western shore of the island is bare of nets, no profitable "berth" having been discovered. In 1880 there were 14 gangs of nets set *on the island, comprising a total of 17 traps, and the aggregate catch that year was 900 salmon.* As compared with 1873, this is a slight falling off in the catch, the number of gangs and traps remaining the same.

In Camden, Lincolnville, and Northport, salmon nets are scattered along the coast a distance of about 12 miles, but they are plentiest and most productive on the north side of Duck Trap Harbor, in the town of Lincolnville, where on a single mile of shore are nine gangs, of which one has four traps and four others have three traps each. In all there were in this district 27 gangs of nets, embracing 45 traps. The catch in 1884 was 1,398 salmon, being 163 less than in 1873.

Above Duck Trap Harbor there are no fisheries for a distance of 12 miles along the shore. At Moose Point, near Searsport, and at Castine, on the east shore of the bay, begin the weir fisheries, which extend, with occasional interruptions, as far up the river as Orrington. These weirs are built all on essentially the same plan, that of the ordinary floored weir, in some places exclusively for salmon and in others exclusively for alewives, but in most cases both species are taken in numbers enough to divide the interest of the fishermen between them.

In the district stretching from Moose Point eastward to Fort Point, including Searsport Harbor, Brigadier's Island, and Cape Gellison, the fishing is mainly for salmon. The shore of Cape Gellison trends about east-northeast, and is exposed to the full violence of southerly storms, which, together with the hard character of the bottom, necessitate greater care in building than in most districts. The use of frame foundations is common. The fishing is wholly with weirs, except two traps that were used in Searsport in 1880, but not regularly. The natural features of the district are favorable to the capture of salmon, and some of the most productive berths on the river are found here. Ninety per cent. of the money yield of these fisheries is derived from the salmon. In 1880 there were 20 weirs and 2 nets in this district, and their aggregate catch was 1,398 salmon.

From Fort Point north to Fort Knox, opposite Bucksport, weirs only are used, and 20 of them were built in 1880. The incline of the bottom being mostly steep, they are with one exception, built on separate hedges. Salmon are here also the most important fish caught, constituting in value 88 per cent. of the catch. The aggregate product of these 20 weirs in 1880 was 1,000 salmon.

On the eastern side of the bay salmon fishing now begins at Castine, where there has been a fairly productive fishery since early times near the light-house on Dice's Head. Between this point and Morse's Cove a few weirs are built, but they are not very productive. From Morse's Cove to the mouth of Eastern River the shore is thickly studded with long-hedged weirs, which are fairly productive of salmon, and take nearly twice as many alewives as the weirs on the opposite side of the bay. Within the mouth of Eastern River few salmon are taken, the yield falling off rapidly, while that of alewives increases as we ascend this river. The yield of 31 weirs and one net in the towns of Castine and Penobscot (the latter extending a mile up Eastern River) was 1,000 salmon.

Directly in the mouth of the Penobscot (or according to the pilot books, 8 miles above the mouth) is the island of Verona, formerly known as Orphan's Island or Whitmore's Island. This is one of the best salmon districts, but the salmon fishing is mainly confined to the south end, and to the west side, which is washed by the main channel. Weirs alone are employed. In 1880 there were thirty-four of them built, including one on Odom's ledge, and their aggregate yield of salmon was 2,053.

The town of Orland, including all of Easton River above the town of Penobscot, and all that part of Bucksport lying on the "Thoroughfare" (or channel that separates Verona from the mainland on its northeast side), make up a district little interested in salmon, 37 weirs taking but 420.

Above Fort Knox, on the west side, and Indian Point (formerly known as Mack's Point), on the east, are built 30 weirs, which are, however, far less productive than those below, their total catch being 1,044 salmon. The most of these weirs are located in the towns of Bucksport, on the east side, and Winterport, on the west. Above Winterport Village the yield rapidly diminishes, and 2 miles below Hampden Village we find the last weir.

Above Hampden there is no fishing done except by gill-nets, which are commonly employed in drifting, but are sometimes "set." Their operations in recent years are much limited by protective laws, which have driven them from their former grounds near the Treat's Falls dam. In 1880 there were eight fishermen thus employed in Bangor and Hampden, using 16 set-nets, but not constantly. At Veazie and Eddington there were six men, with 10 drift-nets, and their catch was 100 salmon. On the east branch of the Penobscot there were 10 set-nets used, and 686 salmon taken. This was an illegal fishery, was never followed to such an extent or so successfully before, and is not likely to be permitted in the future.

The totals of the Penobscot salmon-fishery are as follows: Number of weirs built 172, including the alewive weirs, of which all but 7 take some salmon, though 20 of them take so few that they are not considered of importance; traps (or pound-nets) set, 65; gill-nets in use, 36; number of salmon caught, 10,016.

Alewives.—The alewife fishery extends on the west side of the bay and river, from Moose Point to Hampden, and on the east shore from Castine to Orrington, but centers at Orland on Eastern River above the ordinary range of salmon. From early times the alewife fishery was far better on the east than on the west side of the bay and river, a fact which may be taken to indicate that the eastern tributaries originally contained more extensive or more favorable breeding grounds than those on the west. However this may have been when all the tributaries of the west side were accessible, it is certain that for a half a century the best and nearly all the breeding grounds have been on the east side. For nearly that length of time the lakes and ponds in Orland have been the principal breeding places of the alewife. At the present time the only other accessible pond is Walker's pond in Brooksville, which, however, has no appreciable effect on the fishery except in Castine Harbor and in Bagaduce River, where it is quite insignificant. Of the total of 730,000 alewives taken in 1880, only 95,900 (equal 13 per cent.) were taken on the west side.

The implements of the alewife fishery are the weirs, mainly the same engaged in the salmon fishery. Those built especially for alewives in Eastern River have no important peculiarities. There is also at Orland a small dip-net fishery, in which about thirty persons engage irregularly during the few days occupied by the alewives in ascending the dams.

The alewife fishery of the Penobscot may be summarized as follows:

District.	Number of weirs.	Number of dip-nets.	Number of alewives caught.
Castine to Penobscot	31	.....	65,000
Orland and Thoroughfare	37	20	302,000
Verona	34	.....	177,700
Searsport and Cape Gellison	20	.....	37,900
Fort Point to Fort Knox	26	.....	37,000
Above Indian Point	30	.....	21,000
Total	172	20	730,600

A few of the alewives are consumed fresh and a very small number salted (in 1880 only 17 barrels), 95 per cent. are smoked, and the most of these are disposed of in local markets.

Shad.—Nearly everything that can be said about shad in the Penobscot is of a historical character, and will be found on another page. At the present time the catch of shad is an incident, and a very unimportant one, of the weir-fishery for salmon and alewives. Only 800 were taken in 1880, as ascertained by careful inquiry.

Smelts.—The fishery for smelts ranks in importance next to that for salmon, the aggregate product being 266,875 pounds, valued at $14,579. It is carried on by means of weirs, bag-nets, and hook and line.

The weir fishery for smelts is confined to 4 small weirs, built in Eastern River and the Thoroughfare.

The bag-net fishery is the branch by which by far the greater part of the smelts are taken. It is confined to a few localities, mainly Eastern River and the Thoroughfare, the main river from Winterport to Mill Creek (South Orrington), and Marsh River, in Frankfort. The style of the

nets and the mode of setting them vary a little, to adapt them to the presence or absence of ice. In open water the nets are attached to frames which swing at heavy moorings. When the ice is strong enough to bear, the net is attached to a pair of long poles pushed down through a hole in the ice, with which the whole fixture rises and falls with the tide. In the Thoroughfare, and in the main river at Winterport, though the ice sometimes forms, it is too uncertain and unstable to be made use of to support the fixtures. But farther up the river, above Mill Creek, the ice-fixtures are in exclusive use. From Mill Creek down to Hurd's Brook fishing begins before the ice forms, and when it does form the nets are removed from the open-water fixtures and the ice-fixtures brought into use.

At the Bucksport and Verona bridge is a fishery of nets which are set between the piers of the bridge, substantially in the manner of the ice-nets of Orrington, but with the poles resting on the bottom.

In the winter of 1879–'80 there were 15 bag-nets in use in Orland; 31 in the Thoroughfare (including 8 at the bridge); 10 at Frankfort; 20 at Winterport Village; 13 at the "Bolan" ground some 2 miles above Winterport Village; 25 in Orrington.

The only dip-net fishing for smelts now existing on the Penobscot is at Orland, and that has long ago ceased to be of any importance.

Fishing for smelts with hook and line is occasionably tried in the main river near Mill Creek and at some other points, but is regularly employed only in Belfast Harbor and in Bagaduce River. In the latter locality it is followed by nearly one hundred persons. The fishing ground extends from Johnson's Narrows upward about 5 miles. The smelts are at hand in the fall, and in November the fishermen sometimes fish for them from rafts. But it is not until December that the river freezes up and the regular fishing begins, in little cloth huts on the ice. The first of the season only the ice above the toll-bridge at North Brooksville is strong enough to bear, but later operations extend down to the vicinity of the narrows. The fishing is followed at any time of tide, but only by day. The catch in 1880 amounted to about 61,000 pounds.

The total yield of all branches of the fishery for the year is estimated at 306,875 pounds of smelts.

Historical notes on the fisheries of Penobscot River.—Of the great immigration into Maine that set in from the other colonies, especially from Massachusetts, shortly after the middle of the eighteenth century, the Lower Penobscot Valley received its fair share. The early settlers found salmon, shad, and alewives very abundant, and engaged in their capture on a limited scale with such implements as they could command. Across the mouths of a few shallow coves they built, with stakes and brush, half-tide weirs to catch alewives, and with them took many shad. They knit nets with which they caught salmon, either by drifting in mid-stream or by setting the nets out from shore, secured by stakes and killocks. In the small streams and at convenient points in the larger ones they plied the dip-net. Notwithstanding the primitive character of their methods and apparatus, they took great quantities of fish. The local consumption was small; there were no good facilities for sending fish to the larger markets. The surplus salmon were mostly smoked, the shad pickled, and the alewives dry-salted and packed in barrels. These cured fish were forwarded to market by schooners bound for Boston, New York, or more southern ports. The demand for shad was limited, and they were less objects of pursuit than salmon and alewives; at first they were only taken in the cove-weirs built for alewives, and as accidental captures in the salmon nets, but after a while a better demand arose, and nets were knit and plied especially for them.

In the village stores salmon, shad, and alewives were bought and sold, and the merchants' books give us some information about prices.* The storekeeper paid for fresh salmon 2*d.* per pound, for salt salmon 2½*d.* and sold salt salmon at all seasons of the year for 4*d.* per pound. A half barrel of salmon is charged at £1 4*s.* Shad were bought in May and June at from 1½ to 3*d.* each, and sold in March at 6*d.* each. The selling price of a barrel of shad was from 30*s.* to 36*s.* Alewives are bought in May at 3*s.* per barrel, and retailed in December and February at £1 4*s.* The same merchant was retailing dry codfish at 4*d.* to 6*d.* per pound; salt pork at 10*d.*; salt beef at 4*d.*; flour at 6*d.*; corn at 8*s.* per bushel; sugar at 1*s.* per pound; sheeting at 2*s.* 6*d.* per yard. Thus the fisherman bartering his salmon for store goods would give 2 or 3 pounds of salmon for a pound of codfish; 5 pounds of salmon for a pound of pork; 2 pounds of salmon for a pound of beef; 3 pounds of salmon for a pound of flour; 48 pounds of salmon for a bushel of corn; 6 pounds of salmon for a pound of tea, and 15 pounds of salmon for a yard of sheeting. A comparison with the modern prices for these articles shows us that when salmon are sold by the fisherman at 12 cents per pound (and the price rarely goes lower) their purchasing power has increased, in exchange for codfish about 6 times; for pork, 5 times; for beef, 2 times; for flour, 10 times; for corn, 8 times; for sugar, 6 times; for sheeting, 22 times.

Shortly after the year 1800 weirs with three pounds, substantially of the modern form, were introduced. They were constructed wholly of stakes and brush, or in some cases partly of woven cedar mats. They had no floor but the bottom of the river, and were not extended beyond low-water mark because the fisherman must take his catch out with a dip-net. Such a weir in latter days would be a total failure, but in those times took a great abundance of fish. Their introduction is attributed by several authorities to one Hawley (or "Hollis") Emerson, of Phippsburg, in 1811 or 1815. The latter year he appears to have built such a weir at Treat's Point, on the west side of Marsh Bay, and it inclosed at one time such a mass of fish that its sides burst open and let them out. This form of weir came into immediate use, and in the river from Castine and Searsport to Orrington supplanted set-nets generally, though these have never passed wholly out of use. About the same time, or a few years later, floors were made for the fish-pounds, and one Halliday, said to be a Scotchman, and to have come from New Brunswick or Nova Scotia, introduced the use of netting for the walls of the fish-pound. To him is also by some attributed the introduction of floors. He built a weir on the west side of Orphan's Island (now Verona), and that was the first weir with "marlin" (netting), or with a floor, that was built in that neighborhood. The use of netting was, however, only gradually adopted, and we know that as late as 1829 some productive weirs were built at Bucksport without it. In Penobscot Bay, below Castine and Searsport, weirs were never adopted, but set-nets continued in use until comparatively recent times, when they were gradually transformed into the "traps" or pound-nets of the present day.

About the date of the introduction of three-pound weirs there sprung up a better demand for shad, which now became the leading fish for sale. Small vessels from Southern New England, some also from Portland, came and passed the fishing season in the Penobscot, buying salmon and shad to smoke and salt, and also buying the cured fish, not only of these species, but of alewives, salted or smoked. A considerable part of the catch found its way to market through their hands.

Fish were not continuously plenty; 1820 was a year of great scarcity, which continued several years after that date. In 1822 fish were scarce in Marsh Bay, but about the 1st of July, there was an extraordinary run of salmon which gave good fishing in Penobscot Bay, and as far up the

* Data from the books of Mr. Robert Treat, who kept a store in Bangor from 1786 to 1790.

river as the north end of Orphan's Island. The year 1820 is also noted as having been a year of complete failure of the shad fishery of the Kennebec. The recovery of the fisheries from this depression was, however, rapid and complete.

From 1823 to 1832 may be considered the palmy days of the Penobscot River fisheries Not that the fish were more plenty, for it is quite likely, especially in the case of alewives, that the closing of the tributaries was already beginning to tell on their numbers, but the gross quantity of fish taken and utilized and the profit received from them were probably greater than at any other time. Weirs were built through all the districts where they are now built, in some cases in greater and in others in less numbers than now, and there were flourishing drift-fisheries for both salmon and shad all up and down the river, 200 of them fishing between Mill Creek and Odom's Ledge, and a more extensive net-fishery for salmon on the shores and islands of the bay than now.

Bucksport became the most important center of the fish business. Dram Point flats, on the eastern side of Marsh Bay, became the site of a productive weir-fishery for alewives and shad. Weirs were built in imitation of Emerson's weir on the opposite side of the bay. In 1832 there were 17 weirs on these flats where in 1812 there was but 1 weir, and in 1873 but 3 weirs. Five firms were engaged in the capture and packing of the fish caught. Alewives were in less demand than shad, and it was sometimes necessary to get rid of them by giving them away or by turning them back into the river. When the number of fish exceeded the capacity of the packing houses, it was sometimes the rule to throw the alewives into the river direct from the weir. Dipping shad and alewives together from the pound, if the fisherman found that he had in his net mostly shad he would throw them into his boat, but if alewives predominated he would throw them overboard. The greater part of the fish caught were cured and packed, and sold to the small vessels engaged in the fish trade. The salmon were largely smoked, the shad all salted, the alewives dry-salted or smoked, the latter method having come into general favor. The following are quoted as prevailing prices: 5 to 7 cents per pound for salmon, $6 to $7 per barrel for shad, and $2.50 per barrel for salted alewives.

In 1832, however, this period of prosperity was rapidly approaching a disastrous end. Spurred on by the increasing demand for lumber and the profit to be derived from it, the operators were no longer contented with the mill-power derived from the tributary streams, but sought to bring the main Penobscot itself into their service. Up to 1830 there was no fixed impediment in the way of fish ascending the main river, but in that year a dam was built at Oldtown which seems to have seriously hindered the passage of shad and alewives, and in 1834 or 1835 there was another dam built at Veazie which for several years constituted an impassable barrier. By the gradual washing away of the left bank of the river there was uncovered a crevice in the ledge which enabled salmon to ascend, and they were thus preserved from complete destruction, but shad and alewives never recovered, though there is evidence that shad have sometimes, in small numbers, passed both of the above dams. Very soon after the building of these dams a rapid decline in the fisheries began. The shad fishery was in a few years utterly extinguished. The alewife fishery above Bucksport was also destroyed, no breeding ground now remaining but in Easton River, which alone did not even suffice to prevent deterioration of the fisheries in its immediate vicinity. The salmon continued to decline till about 1860, when their lowest point was reached.

The town records of Orrington afford some data which indicate in a general way the relative productiveness of the fisheries for a long series of years. In 1807 the legislature of Massachusetts passed an act authorizing the town to exercise exclusive control of the river fisheries, and it was

the practice to sell the right to fish annually at auction. There were three sites for weirs, which were all sold when fish were plenty, but in times of scarcity some of them occasionally stood idle. The blanks are understood to indicate, in most cases, a failure to effect any sale. As a record of special interest it is presented entire.

Year.	Rental.	Year.	Rental.	Year.	Rental.
1814	$48 50	1837	$361 37	1859	
1815	68 50	1838	124 00	1860	$1 00
1817	138 00	1839	13 70	1861	2 65
1818		1840	37 22	1862	4 50
1819	85 25	1841	42 70	1863	4 50
1820	150 50	1842	54 85	1864	
1821	68 25	1843	22 25	1865	18 00
1822	12 53	1844	7 69	1866	21 25
1823	15 00	1845	2 47	1867	9 50
1824	157 05	1846	9 61	1868	26 50
1825	210 95	1847	6 30	1869	10 50
1826	359 00	1848	33 15	1870	2 50
1827	410 00	1849	32 72	1871	
1828	492 00	1850	4 04	1872	
1829	440 00	1851	15 25	1873	
1830	445 60	1852	50 50	1874	27 75
1831	530 75	1853	14 62	1875	
1832	481 00	1854	15 00	1876	1 55
1833	171 25	1855	22 62	1877	2 00
1834	40 70	1856	31 38	1878	13 00
1835	144 83	1857		1879	6 00
1836	335 88	1858	7 00	1880	5 00

In 1814 it is probable that the implements employed in fishing were of a very primitive character, and that the same incentives to effort, a brisk demand and the remunerative prices of ten or fifteen years later, did not yet exist. The price obtained in 1829 indicates that the result of the fishery of 1819 was encouraging, but the scanty catch of 1820 and 1821 (which rests on satisfactory direct evidence from other sources) finds its natural result in the sudden dropping off in the bids in 1821 and 1822. The rapid recovery of the fishery is shown by the rise of the rental after 1823. Prosperity continued to attend the fishery till 1832. The result of the fishery that year was evidently disappointing, and the next year the rental fell off 62 per cent., and in 1834 there was a further drop of 66 per cent. from 1833. In this we see the result of the decline of the alewife and shad fishery. The revival of 1835, 1836, and 1837 was, it is fair to presume, the result of the excellent condition of the salmon fishery, which, according to another authority,* was at this time showing an increase, which culminated in 1836. The general decline of the salmon fishery is shown by the falling off of the rental from 1837 to 1845.

Since 1860 there have been various fluctuations in the numbers of salmon and alewives, but the shad have remained steadily at low-water mark. The years 1867 and 1868 were good years for salmon; so also were 1872 and 1873. In 1867 the State commissioner of fisheries estimated the catch, from imperfect data, at 8,000 salmon and 1,000,000 alewives. In 1873, after careful inquiry, the number of salmon caught was estimated at 15,000.† The latter year was beyond question the best since 1860, and probably the best since 1850.

SAINT GEORGE RIVER.—The Saint George is a small river, draining only 210 square miles of territory. Its water surface, however, embraces seventy-two lakes and lakelets, of which the

* Mr. Amos Treat, of Frankfort.

† Rept. U. S. Fish Com. 1872–'73, p. 313.

sixteen largest have an aggregate area of 14.35 square miles. All or nearly all of these were naturally accessible to alewives, and, as may be inferred, the river produced this species in great abundance. Shad and salmon were also found there, and tradition says in plenty, but it does not appear how plenty. At any rate, since the beginning of the present century, salmon have been rare and shad not abundant.

Alewives, smelts, and eels are now caught in this river in sufficient numbers for market purposes; the alewives in weirs in Thomaston and Cushing, and in dip-nets in Warren; the smelts in weirs in Thomaston, in bag-nets under the Cushing Bridge, and by hook in Warren; the eels are taken with weirs, pots, and spears.

The alewife fishery at Warren is controlled by the town. The weir fishery is free. There is also a free fishery with drift-nets, which is believed to be mainly illegal.

The town fishery at Warren dates as far back as 1802, when it was established by act of the legislature of Massachusetts. It was the practice until 1879 for the town to appoint an agent, who, with his deputies, captured the fish and dealt them out according to law. Tickets were issued to heads of families, each ticket entitling the holder to 300 alewives on payment of the fixed price, which was generally 20 cents per hundred. The order of precedence of the tickets was determined by lot. Certain poor were supplied gratis. After all the tickets were supplied, the remainder were sold for the town to any buyer. From these sales large sums were formerly realized, and one year it amounted to $2,300, which paid the town tax for that year, the minister's salary, and left something over. The gradual curtailment of the area of their breeding grounds by the closing of tributary lakes and the difficulty of passing the dams at Warren caused a decline in the number of the alewives. From 1849 to 1858, inclusive, the average amount received from sales was $511 yearly; the best returns being $1,146.16 in 1854, and the poorest $144.25 in 1850. During eight years, from 1859 to 1867, inclusive (excepting 1865, when no sales were made), the average of receipts was $219.87. The lowest ebb appears to have been reached in 1864, when but $65 were received. For some years the fishery continued to yield very little, and in 1873 was almost a total failure. Since then, however, there has been a great improvement, the sales in 1875 amounting to $526.28, and subsequent years having been quite productive. The improvement may be reasonably ascribed in the main to the construction of improved fishways.

The total catch of alewives in 1880 in the river by all methods was 515,000. There were 400,000 smoked and 134 barrels salted.

The smelt fishery of the Saint George is of greater pecuniary importance than the alewife fishery, though its origin dates from no further back than about 1870 or 1868, when several weirs were built for them in the river just below Thomaston. At present there are 8 weirs built on the river, and nearly all the smelts are caught in them. There are, however, 3 bag-nets used at the Cushing Bridge, and a few men fish with hook at Warren. The product is shipped by rail to Boston and New York, the latter taking commonly 80 to 90 per cent of the total. The census year was the best year in the history of the fishery, 95,000 pounds of smelts having been sent to market. The next best year was 1875–'76, when the shipments amounted to a little over 60,000 pounds. In other years since 1872 they have amounted to from 25,000 to 42,000 pounds.

No tom-cods of consequence are caught in this river, and the eel-fishery, followed with pots and a few spears, produces but about 8,000 pounds a year.

MEDOMAK RIVER.—A small river, draining but 62 square miles of territory and less than 3 square miles of lake surface, the Medomak has never been a very important producer of fish. It

was closed to the anadromous fishes by legislative sanction in 1800. At present it has only a few smelts. There is a prospective alewife fishery, the result of the encouragement given this species through the construction of fishways and restricted fishing, but in 1880 the capture of alewives was still forbidden.

The smelt fishery is limited to the operations of 3 weirs built in Broad Cove, and a large number of hook fishermen, of whom about 80 are estimated to have fished for them for sale in cloth huts similar to those used in other places. The total catch in 1879–'80 was 33,910 pounds. The smelt fishery of the Medomak dates from the year 1871, when one George Preble came from the Kennebec and built a weir about 1½ miles below the village on the east side of the river. He met with good success, and the next year two weirs were built. From this the weir fishery suddenly developed itself until the hedges were forbidden by law as impediments to navigation. About 1877 it was discovered that smelts could be taken here with hook, and there was an immediate development of that fishery. The fishing grounds are at various points within 2 miles of Waldoborough village.

PEMAQUID RIVER.—This is a very small stream, having a drainage basin of only some 10 or 15 square miles. An alewife fishery of some local importance once existed here, but it was destroyed by impassable dams and improvident management.

DAMARISCOTTA RIVER.—This is also a small river, having a drainage basin of little more than 50 square miles, and a lake surface of 10 square miles. In the matter of fisheries it is, however, the most important river in the State after the Penobscot and Kennebec. The river has its source in a lake of 10 miles area, known as "Damariscotta Pond," which is fed by many small brooks. From the outlet of this lake to the sea is about 19 miles, of which less than a quarter of a mile is fresh water, the rest being a tidal brackish estuary. From the lake the river plunges at Damariscotta Mills down over a steep rocky descent, at the foot of which it enters Damariscotta Bay, a sheet of slightly brackish water about 2 miles long, which is connected with the lower and salter part of the river by a narrow and rather shallow passage. This bay appears to be especially well fitted for a winter home for smelts and eels, and here all the fisheries for those species are plied.

The alewife fishery is claimed and generally believed to have been in its origin wholly artificial, but there is some evidence to the contrary, and it must be regarded as an unsettled question whether alewives ever succeeded in ascending to the lake before they were assisted by man. This much, however, seems to be established, that if such was the fact the extermination of the original brood (doubtless by dams which were very early erected here) was effected so long ago that its existence was unknown to those living in the vicinity seventy-five years ago. The tradition is that up to 1803 no alewives had ever ascended the falls. A few stragglers came yearly to the foot of the falls and by plying the dip-net industriously a man might get a mess of them, but as they were unable to reach any breeding ground, they did not increase. In 1803, however, some of the citizens got a lot of alewives from Pemaquid River (some say from Warren) and put them into the lake, and when their descendants in due course of time came back from the sea a rude fishway was constructed of loose stones for them to ascend. The result was the establishment of a flourishing fishery. In 1810 the towns of Nobleborough and Newcastle, whose boundary is formed by the river at the falls, assumed control, under legislative sanction, of this fishery, and have continued to manage it down to the present time after the manner of town fisheries in other parts. Until 1865 the fish were taken by the fish committee and sold to the citizens and the public at 25 cents per

hundred. From 1865 to 1880, inclusive, the committee has sold the privilege of taking fish at auction, and the price was in 1866 raised to 50 cents per hundred. Receipts from the auction sales, and the estimated number of fish taken each year, have been as follows:

Year.	Proceeds of auction sales.	Number of alewives taken.
1866	$1,200	700,000
1867	1,900	1,300,000
1868	2,800	800,000
1869	2,040	750,000
1870	2,245	1,000,000
1871	1,875	350,000
1872	1,340	400,000
1873	1,840	600,000
1874	2,040	800,000
1875	2,056	800,000
1876	2,050	600,000
1877	1,845	600,000
1878	2,040	856,000
1879	2,100	737,000
1880	2,100	1,700,000

From this it appears that the best catch since 1865 was that of 1880. But this was sometimes exceeded in the first half of the century. The year 1843 is remarkable as the most productive ever known. The spring of that year was a season of exceptionally large rainfall, and the water in the river was very high. The product of the sales at 25 cents per hundred was about $3,000, and a great many were taken by private parties who did not pay for them.

The above statements refer only to the fishery at Damariscotta Mills, which is managed by the towns, and the implements of which are dip-nets exclusively. There, however, exists a weir fishery of early origin and now embracing 13 weirs on the lower part of the river in Bristol and Edgecomb, a gill-net fishery with about 20 nets in the same vicinity, and a seine fishery at Rutherford's Island. By all these methods there were taken in 1880 about 2,300,000 alewives, or about 5,400 barrels, of which 2,950 barrels were salted, and 2,400 barrels smoked.

The earliest alewives make their appearance in the vicinity of Damariscotta Mills at the end of April or the first of May, and they continue to ascend the stream for five or six weeks. The first captures are generally made from May 5 to 10, and the principal run is expected about May 20 to 25. Of the early runs 400 fill a barrel, but at the close of the season it takes 500.

The smelt fishery of the Damariscotta has sprung up within the last twenty years. It has always been exclusively a hook-and-line fishery through the ice of Damariscotta Bay. In its earliest stages the fishermen stood by their holes without shelter. Then they resorted to clumps of brush to break off the cold winds. The next step was the building of a heavy wooden shanty, and these have finally given place to neat, comfortable, and easily-movable cloth huts, of which in the winter of 1879–'80 there were in use 154—the greatest number ever known. Each house is occupied by one man with 3 lines, and each line generally carries a single hook. The favorite and ordinary bait is the marsh minnow, which is collected in the fall and kept in springs or in pits in house cellars. The smelts bite on either tide, and their movements about the bay are so irregular that the fishermen are unable to agree as to best location for fishing, and the huts are often moved about to find better ground. The catch of 1879–'80 aggregated 70,500 pounds, of which about one-third was sent by sleds into the country in various directions, and the remainder forwarded by rail to Boston and New York. The prices obtained averaged to the fisherman 4½ to 5 cents per pound.

The eel fishery of this river is also located in Damariscotta Bay, and employs no implement but the spear. The product has fallen off some in recent times in spite of a protective law which limits the fishery in point of time to the four months of December, January, February, and March. In 1879–'80 the yield was 18,200 pound.

SHEEPSCOT RIVER.—The Sheepscot drains about 200 square miles. Its tributary lakes are few and small, and it seems to have been, as tradition asserts, frequented by salmon and shad to a greater extent than any other river between the Kennebec and Penobscot, while alewives were relatively less abundant. Impassable dams at Alna, at the head of the tide, have for many years shut the migratory fishes out from nearly its entire course. The main river was exempted from the operation of the fish law by act of legislature in 1800. This exemption did not extend to Dyer's River.

At the present day the fisheries of the Sheepscot are of little importance, the total value of the product being but $2,540, which is about the ninth part of the product of the Damariscotta. About 1,000 shad are taken in traps arranged for them in the river near Alna. One or two salmon are commonly taken in these shad-nets, but none in 1880. No alewives of consequence are caught, there being no fishing specially for them, and no summer weirs built. Bass, smelts, and eels are the species taken for market.

The implements employed in the smelt fishery are 11 weirs, 3 bag-nets, and the gear of about thirty-five hook fishermen. The weirs are built at various points both above and below Wiscasset, and operate in the fall and winter. The bag-nets were set at three bridges, on the tributary known as Back River. The hook fishery is located near Sheepscot Bridge, from half a mile above to 2 miles below, varying from year to year, according to favorable or unfavorable condition and extent of the ice. This fishery dates from the winter of 1876–'77. About $1,000 worth of smelts have been taken out yearly, except in 1879–'80, when, on account of the unstable condition of the ice, there was little fishing done at this point, and the total catch of smelts in the whole river was but about 22,000 pounds, valued at $1,100.

Bass are taken in summer with hook and line at Flying Point, in Wiscasset, and in winter in gill-nets, above Sheepscot Bridge, in both the main river and its principal tributary, Dyer's River—mostly in the latter. This fishery began about 1873, some men from the Kennebec being the first to engage in it. In the channel of Dyer's River, which is here uniformly very narrow and of even depth, they set gill-nets about 35 feet long, 12 to 15 feet deep, and with a 4-inch mesh, through the ice across the channel, which they in general completely span. The bass taken are ordinarily from 3 to 12 pounds in weight, but some of 30 to 40 pounds are now and then caught. The catch of the gill-nets is estimated at 5,000 pounds and of other methods at 3,000 pounds.

Eels are plenty in Dyer's River. They are taken with spears to the extent of about 4,000 pounds yearly.

KENNEBEC RIVER.—The Kennebec is the second river in the State in size, and second in the importance of its fisheries. It drains 5,800 square miles, of which 450 square miles is lake surface. About two-thirds of the basin is covered by forest, and nearly the whole of it is hilly or mountainous. Far the greater part of its volume is contributed by its western tributaries, several of which, the Sandy, Carrabasset, Dead, and Moose Rivers, take their rise in the mountainous district on the western border of the State. The Kennebec proper takes its rise in Moosehead Lake, 155 miles from the sea. This lake is the largest in the State, having an area of about 120 square miles. The sources of some of the tributaries are from 2,000 to 3,000 feet above the sea, but the main river issues from Moosehead Lake at an elevation of about 1,023 feet. As the descent thence to the sea-level is accomplished in the 112 miles between the lake and Augusta, the Kennebec is a very

rapid river. There is very little dead water, the current averaging near 3 miles per hour. Rapids abound, and at several points there are important falls, as at Waterville, Skowhegan, Carritunk, and several points near the lake. Below Augusta there is a 20-miles stretch of water affected by the tides, but which is nevertheless in ordinary summers entirely fresh, ending in Merrymeeting Bay, where the Kennebec is joined by the Androscoggin and by several smaller rivers. From Merrymeeting Bay to the sea the river flows in a narrow channel, and, unlike the Penobscot and most of the other rivers of the State, it discharges into the ocean by a narrow mouth.

The tributaries of the Kennebec are of various character. Some of them are characterized by extensive chains of lakes, and others by long stretches of gravelly rapids. They are nearly all free from serious natural impediments, the most important exceptions being the Mussalunskee (Emerson Stream), draining the Belgrade lakes, which has a perpendicular fall of 38 feet at West Waterville, 8 miles from its mouth, and Dead River, or the West Branch, which has a similar fall of 28 feet, 15 miles from its mouth.

The artificial obstructions to the ascent of the Kennebec and its branches by migratory fishes are numerous and formidable. On the main river there are dams at Augusta, Waterville, Fairfield, Somerset Mills, Skowhegan, and Madison. All of the tributaries are dammed at frequent intervals. On the Cobbosseecontee there are 8 dams within 1 mile of its mouth. On the Sandy there are 3 dams within the natural range of fish, the same number on the Carrabasset; on the Sebasticook and branches 15 or more. The damming of the tributaries dates from the last century. The main river remained open till 1838, when the completion of the Augusta dam shut them out from all waters above that point. Previous to 1838 fishways were maintained on the Sebasticook and some of the lesser tributaries, but no adequate provision for the ascent of fish was made at Augusta until 1879, and meanwhile all the other fishways had been neglected.

In other respects the Kennebec has been less unfavorably affected by the influence of civilization than the Penobscot. Neither river has been polluted with sewage nor the waste of manufactures, and the discharge of sawdust and other mill refuse has been on a smaller scale on the Kennebec, and has not, so far as can be seen, exerted any unfavorable influence.

Salmon.—The original limit of the range of salmon in the Kennebec was probably about 12 miles above the "Forks," or junction of the West Branch, or Dead River, with the main Kennebec, and 144 miles from the sea. On Dead River it was at Grand Falls, 147 miles from the sea. Owing, however, to early sparsity of population very little information on this point has come down to us. The most serious natural obstruction in their way was Carritunk Falls, where they were obliged to surmount a perpendicular fall of 16 feet, and although it is certain that many succeeded in doing so, it may well be doubted whether they constituted a majority. In the Carrabasset and Sandy they ascended many miles from their mouths, and it is supposed that these two rivers afforded their principal spawning grounds. They are known to have ascended the Sebasticook, though only in small numbers, and they are said to have been sometimes found in the Wesserunsett and Cobbosseecontee.

The aborigines doubtless pursued the salmon, but very few facts about it are known. In 1754 a military force ascending the river found a few Indians at Norridgewock, and fresh salmon in their possession. Records of the year 1773 show that salmon in barrels were sent as articles of merchandise from Fort Halifax (near the present town of Waterville) to Fort Western (now Augusta).* It was probably not many years after the latter date that drift-net and dip-net fisheries sprang up at Showhegan and Carritunk. The latter continued to be the best fishing

* North's History of Augusta, page 115.

ground above Waterville as long as salmon were able to pass Augusta. There was at the same time a drift-net fishery of less importance at Augusta, several seine-fisheries, in which some salmon were taken at various points up and down the river, and a weir fishery near its mouth. An eye witness* estimated the number of canoes fishing with drift-nets at Ticonic Falls since the beginning of the present century at about forty yearly, each canoe employing two men and one net. On one occasion as many as eighty-two canoes were counted at work at the same time. These canoes were all log dug-outs. Their ordinary catch was estimated at one hundred and twenty salmon for each canoe for the season, which would give a total of forty-eight hundred. Another witness† estimated the number of drift-nets fishing at Augusta in 1820 at twelve, and their catch at four thousand salmon. These are, however, off-hand estimates, and are liable to be far out of the way. In 1837 and 1838 the dam at Augusta was built, completely blocking the way of migratory fishes, and extinguishing all the fisheries of the upper waters. Of the salmon fishing below Augusta, we know that it was in a flourishing condition as late as 1814, when an old-fashioned shoal-water weir at Abagadasset Point, in Merrymeeting Bay, took one hundred salmon in a single season,‡ whereas in recent years a far more efficient weir on the same spot rarely or never takes as many as half a dozen in a season. From 1826 to 1835 the yield of salmon continued good, though by no means averaging so well as in 1814, which may have been an exceptional year. From 1837 to 1842 there was a decidedly higher yield, which was especially noticeable at Augusta. After this there was a sharp decline, which continued till 1855 or 1860, when the lowest point was reached, just short of utter extinction. The only breeding ground remaining accessible to the salmon was on the gravel beds within the first half-mile below the Augusta dam, and to this opportunity is the continuance of the brood in the river doubtless due. Since 1860 there have been several fluctuations, 1868 having been the best year then known since 1850, and 1873 having been still better. The number taken in 1867 was estimated by the state commission at twelve hundred, but this is regarded by some as too high an estimate. The data obtained by a careful inquiry (but not a thorough canvass) in 1873 led me to estimate the number taken in that year at fifteen hundred, of which nine hundred were taken below Bath and six hundred above that point. In latter years there has been a gradual decline, with some minor fluctuations. The total catch in 1880 was two hundred and sixty-nine salmon.

For the past twenty-five years the fishery for salmon has been little more than an adjunct of the shad and alewife fishery. It is probable that not a single weir would be built or seine operated on the river were it not for the shad and alewives, and the drift-nets at Augusta, the only implements used expressly for salmon, have rarely numbered more than two in a season, and have sometimes been suspended for a whole summer.

---

* Mr. William Getchell, who owned an island at Ticonic Falls, and carried on a dip-net fishery there, mainly for shad, from 1804 to 1837, and who was in 1867 still living in Benton.

† Mr. William Kennedy, of Augusta.

‡ The authority for this statement is Mr. John Brown, of Bowdoinham, who was at that time a boy living on the point. Mr. Brown has a daily record of his own fishing, extending, almost without interruption, from 1826 to 1861. With his free permission I draw the following facts therefrom; Mr. Brown's location was not favorable for salmon; no more, indeed, was any part of Merrymeeting Bay. The shad and alewives were the principal fish taken. The average number of salmon taken in his weir during the ten years ending in 1835 was 21.6 yearly. In 1837 there was an increase to 41, a greater number than any previous year since the record began. In 1838 there was a still greater number, 65. The four following years the catch was 46, 27, 49, and 27, respectively, and the average for the six years ending with 1845 was 42.5. This is held by Mr. Brown to show very plainly the effect of the Augusta dam in detaining the salmon, and even impelling them to retrace their course from Augusta toward the sea, at least as far as Merrymeeting Bay. From this time there was a sudden falling off, the average catch for the next five years being but 14. In 1850 it was but 5, the lowest point yet, and in 1855, 1857, and 1858, but one each year, notwithstanding that a more efficient weir had taken the place of the old one.

In early times the salting and smoking of salmon were common, and probably the greater part of the catch was disposed of in this way. Smack vessels from Connecticut visited the Kennebec, as well as the Penobscot, to buy salmon. This was practiced as late as 1814 or later. But since 1825 it has been almost or quite the universal practice to market salmon fresh. The average price received in Bowdoinham in 1826 was about 9 cents per pound; in 1827, 15 cents per pound; and between these extremes it remained until 1845, with the exception of 1834 and 1840. Since 1845 there has been a considerable augmentation.

Shad.—The shad is the most important of the products of the spring fishery, yielding a pecuniary return sixteen times as great as salmon and nearly twice as great as the alewife. It is taken in weirs and drift-nets. Nearly every weir on the river depends more on shad than any other fish, but the most productive shad weirs are those of Merrymeeting Bay and vicinity, which are of the form already described as "shad weirs," whose distinguishing characteristic is the capture of the fish in a large pound of deep water, from which they are taken with a seine. This form of weir is exclusively used in this vicinity, as on the lower part of the river the weir with a board floor is almost the only form in use. The principal reason for the difference in practice of the two sections is the difference in the condition of the river and the currents, a seine-weir requiring a gentle current for its successful operation. The form of weir has doubtless something to do with the fact that four-fifths of all the shad are taken in the Merrymeeting Bay district, including the Androscoggin arm of the bay and its tributaries, but it seems that while in the cooler and saltier water of the Georgetown district they are more inclined to avoid the shores and pass up the river. Of the 140,000 shad taken in the Kennebec in 1880, 108,000 were taken in the Merrymeeting Bay district, 5,800 above Richmond, 16,744 between the bay and Bath, and only 10,000 below Bath, including the Sasanoa or east channel, between Woolwich and Arrowsic. The approximate averages are as follows: In the bay district, 44 weirs averaged 2,045 shad; below Bath, 29 weirs averaged 345 shad. All included in the above statements are the breeding shad, called by the fishermen "river shad," or "spawn shad." The sea shad are mostly taken with drift-nets in the lower reaches of the river, but to some extent in the weirs. In 1880 the catch of sea shad was exceedingly small, and only about 80 barrels were cured. The drifting below Bath is wholly for sea shad; above Bath, for river shad.

In early times shad appear to have ascended the main river to Norridgewock Falls, Sandy River, a few miles from its mouth, and the Sebasticook in small numbers to Newport. Tradition also assigns the shad a place in the fauna of the Cobbosseecontee. There were productive shad fisheries at several points above the flow of the tide, among which we may mention Ticonic Falls (Waterville) and the Lower Sandy River. At Ticonic Falls there is an island in mid-stream, where great facilities existed for catching shad with dip-nets. This island was private property. The proprietor, from 1804 down to the extinction of the fishery, has stated that in the early days of his fishing he used to take $500 to $600 worth of shad yearly. As remarkable feats he mentioned that with the assistance of his three boys he had taken 1,100 shad and 20 salmon in an afternoon, and that one day four men dipped out and hoisted ashore 6,400 large shad. There was a similar but less productive dip-net fishery on the falls at Skowhegan.

The drift-net, seine, and weir fisheries in the tidal waters were very productive. It is in evidence that in 1822 a seine at Augusta was known to take 700 shad in a day; that about 1837 there were about 100,000 shad taken in Eastern River (Dresden) alone. It is known that the shad fishery was by no means uniformly productive. A period of scarcity occurred about 1870. That year the weir at Abagadasset Point took but 150 shad; its catch in after years ranged from 3,000

to 10,000 yearly), and another weir, on the eastern side of the bay, took but a half-hogshead tub full. A drift-net fisherman took but 20 shad. It was thought that shad-fishing was at an end; but the next year the shad were found to be increasing in numbers, and in a few years they were again plenty. The year 1831 was one of the best years ever known in Merrymeeting Bay; a seine at Beef Rock, on the east side of Swan Island, took 30,000 shad.* To what causes to attribute these fluctuations we are unable to say, but they must of necessity have been natural causes. From 1830 to 1836 there were inspected in the three towns of Bowdoinham, Dresden and Woolwich 6,079 barrels of shad, an average of 868 barrels yearly. Inspection of packed and exported shad was compulsory, and it is safe to say that these figures represent seven-eighths of the shad caught. We may therefore estimate the catch in those towns at about 1,000 barrels, or 100,000 shad, yearly. There were at that time only 2 weirs in Merrymeeting Bay, and a few in Eastern River, all shoal-water weirs. The most of the fishing was done with drift-nets in the small rivers, like the Cathance and Eastern, and with 4 or 5 seines. In 1867 in the same district the catch of 40 deep-water weirs, several seines, and an unknown number of drift-nets was about 180,000. In 1880, 44 weirs, 2 seines, and some 60 drift-nets, covering nearly the same district, took about 105,000 shad. It appears, then, that the product of the Merrymeeting Bay shad fisheries is as great now as in 1830–1836; but this catch has been accomplished by the use of a great number of far more efficient implements.† The seine-weirs were introduced in 1851 and 1852, and soon almost entirely replaced the shoal-water weirs. In other parts of the river, where their construction was impossible, the catch of shad has fallen off remarkably since 1830, and the entire fishery of the districts above Augusta was of course extinguished in 1841, when the Augusta dam was finally closed.

Alewives.—All the weirs take alewives along with shad and salmon, and at the present day none of consequence are taken in any other way, the use of drift-nets having been discontinued since 1867, and the fish no longer ascending to places where they can be taken with dip-nets. As with shad, the most productive weirs are those of the Merrymeeting Bay district, especially in Eastern River and the main river on the east of Swan Island, where 7 weirs took, in 1880, 147,820 alewives, an average of over 20,000 per weir. In the bay, north of Abagadassett Point, 15 weirs averaged 12,500; south of Abagadassett Point, including the Androscoggin, Cathance, &c., 22 weirs averaged but little more than 5,300 alewives; between the bay and the city of Bath, 14 weirs averaged about 7,500; below Bath, in the main river and branches, 29 weirs averaged but 1,862 alewives. Thus the catch of alewives increased with distance from the sea in the main river, but fell off in the Androscoggin arm of the bay. The total catch in 1880 is estimated at 675,000. Only 20 barrels (part of the catch of Eastern River) were salted, and 600,000 were smoked.

Perhaps the earliest mention to be found of the alewives of the Kennebec is in a letter of the French priest Rasle, writing from the village of Norridgewock in 1723: "At a particular season of the year," says he, referring to the customs of the natives, "they repair to a river not far distant, where during one month the fish ascend in such numbers that a person could fill 50,000 barrels in a day, if he could endure the labor. They are a kind of large herring, very agreeable to the taste when fresh. Crowding one upon another to the depth of a foot, they are drawn out as if they were water. The Indians dry them for eight or ten days, and live on them during all the time that they are planting their fields."

* Statement of Mr. John Brown.

† Mr. Brown's weir produced in the ten years ending in 1835 an average of 5,961 shad yearly; in the twelve years from 1837 to 1848 (1844 being omitted from the record) the average was 3,120 per year, a little more than half the former yield.

Fifty years later than this the whites had taken posession of the country and began to build saw-mills. They found the alewives ascending the river in immense numbers, extending their migrations to Norridgewock Falls, 91 miles from the sea, and up the Sandy River some 20 miles farther. Their principal breeding places were, however, in the lakes and ponds of tributaries nearer the sea, especially Cobbosseecontee stream (at Gardiner), Seven-mile Brook (in Vassalborough), and the Sebasticook River. The first of these afforded an extensive breeding ground in its 21 square miles of lakes and ponds, and must have contributed an important quota to the population of the river, but it was early closed. In 1787 we find the town of Wales (then including *Monmouth*) appointing a fish committee, which the next year was designated a "committee to see that the fishways are kept open according to law." The dams at Gardiner, however, were impassable, fishways were not maintained, and very early in the present century this brood of alewives was extinguished. A similar fate overtook the alewives of Nehumkeag and Worromontogus streams, two small tributaries on the east side of the river. At Seven-mile Brook and in the Sabasticook the alewives continued to breed until 1837, when the dam at Augusta finally cut them off.

The Sebasticook was probably the principal nursery of alewives for the Kennebec. It has a lake surface of 48 square miles, nearly every mile of which was accessible. After suffering great diminution while running the gauntlet of the tidal fisheries, there still remained a vast throng of fish to attempt the ascent of the Sebasticook. Fishing in this river was at first entirely free to the public, but after some years it was found that there was a diminution in the numbers of alewives, and protective legislation was then obtained for the most important points, which were at the falls, natural and artificial. The fisheries at such places were generally put into the hands of the towns. It does not seem that these measures were entirely effective, but that there was a gradual decline from obstructions and excessive fishing. There was a dam at the upper falls in Clinton previous to 1775, but it was provided with a fishway and the alewives continued to ascend in great numbers as far as Newport, on the main Sebasticook, and to the principal lakes on the tributaries. In 1809 a more formidable dam was put across the river at Benton. A serious falling off of the fish was soon perceptible and the dam was cut away to allow them again to ascend. In 1814 the town of Benton took charge of the fishery under legislative authority, and by a more careful management effected a substantial improvement. The right to take the fish was sold at auction yearly and brought from $500 to $1,500, though under the condition that the poor should be supplied gratis and all townsmen at a set price. The last year of the fishery (about 1837) it sold for $225; one or two years earlier, for $500.

Thus one by one the feeders of the river were cut off, with only one exception, that of Nequasset stream, in Woolwich, which remained open until very recent times, and, indeed, is not regarded now as permanently closed. The breeding ground in the main Kennebec was also largely curtailed, and is now limited to the tidal portions of the river in and above Merrymeeting Bay, and of the small tributaries centering in Merrymeeting Bay. So far as they go, however, these waters are very good nurseries, and in its yield of alewives the Kennebec now stands third among the rivers of Maine, only the Damariscotta and Penobscot surpassing it.

Of the number of alewives caught yearly in early times we are no better able to form an estimate than in the case of salmon and shad. There can, however, be no reasonable doubt that tradition is right in assigning them numbers far greater than has been known to any one now living. There must have been a great decline in their numbers consequent upon the erection of impassable dams across the streams by which they were wont to reach some of their best spawning

grounds. Yet measured by the standard of recent years they were still abundant in 1830. During the ten years ending with 1835 Mr. Brown's single shoal-water weir in Merrymeeting Bay took on the average nearly three times as many alewives as two deep-water weirs in the same vicinity took in the year 1880. The average catch of the same weir for the twelve years ending with 1848 shows a decline of about 40 per cent. In 1867 the State commissioners of fisheries estimated the aggregate catch of the river to have averaged about 1,200,000 alewives for some years previous, there being then eighty-six weirs, eight seines, and a few drift-nets in operation. In 1880, with eighty-seven weirs and two seines in operation, there were taken about 675,000 alewives. The latter estimate does not include bluebacks, of which some 400,000 were taken in 1880, an unprecedented number. The estimate made in 1867 is supposed to include few if any bluebacks.

Smelts.—The capture of smelts in the Kennebec was carried on on a small scale with hook and line and also with small gill-nets as early as 1814. Both these methods were in vogue in Eastern River at that time, and the hook and line fishing was probably common in other parts of the river, especially farther up, but it does not seem that the use of gill-nets was known elsewhere. The use of nets extended to other parts of the Kennebec, and this continued to be the most productive mode of taking smelts until the introduction of bag-nets, about 1852. The most of the smelts taken fifty years ago were for home consumption, but even then there was a small trade in them for the supply of local and inland markets. One cent per dozen is quoted as the price received by a fisherman for his entire winter's catch. About 1850 there sprang up a brisk demand for smelts to supply the large cities, especially New York, which has always taken the greater part of the catch of the Kennebec since that time. The introduction of fykes and bag-nets dates from 1851 and 1852. Both these nets were used in the Kennebec for many years, but the fykes have gradually gone out of use and plain bag-nets taken their places.

With the exception of two nets on tributaries in Georgetown and Arrowsic, the bag-net fishery is confined to the district between Bath and Richmond. There were one hundred and fourteen nets employed in the winter of 1879–'80, and their catch was about one-third of all the smelts taken in the Kennebec.

Weirs for smelts are employed only below Bath, mainly in the mouth of Back River, between Georgetown and Arrowsic. They are half-tide weirs, built and put in operation in autumn, and if not earlier broken down by ice they fish until the smelts are all gone past up the river, which varies from year to year, but averages about the middle of January. The total product of the fishery in Georgetown and Arrowsic in 1879–'80 was about 52,000 pounds.

The hook fishery is carried on in two districts: first, in the Sasanoa, at Preble's Point (the northern extremity of Arrowsic); second, in Gardiner and Hallowell. The latter locality is an old one, having been occupied with little or no interruption, though with all degrees of success, from very early times. About 1850 it was very productive, but, according to local testimony at Gardiner, it has fallen off greatly since the introduction of bag-nets in the Bay district. In 1879–'80 there were about a hundred persons who fished for sale, but not more than a dozen followed it persistently; the aggregate catch was about 19,650 pounds, all of which were disposed of in local markets. The fishery at Preble's Point has just sprung into existence, the discovery that smelts could be caught here having been first made in the winter of 1878–'79. The next winter there were one hundred and fifty men, with 50 cloth-houses and 350 lines, at work most of the fishing season, and their catch is estimated at 45,514 pounds of smelts.

Eels.—This fishery in the Kennebec, as in most other rivers, has been carried on very irregularly, and little can be said of its history. Eels have been marketed from the Kennebec from very early times. About 1840 a fishing smack from New London, Conn., followed for several years the

business of buying eels in the Kennebec at one cent per pound and carrying them alive to New York. At present, though followed by a few persons at other points, it is mostly confined to Phippsburg, Georgetown, and Dresden. In Phippsburg and Georgetown there is a summer fishery, with traps and pots, employing a portion of the time some fourteen men and yielding 28,000 pounds of eels, of which about half were shipped "round" (packed alive in barrels with ice), and the rest dressed, nearly all to New York. The fishery at Dresden is a winter fishery, conducted on the ice with spears by some twenty men, whose catch, however, is only about 4,000 pounds. The only other eel fishery worthy of mention is an autumn weir fishery at Gardiner, in the Cobbosseecontee stream. The catch here consists solely of gravid female eels on their way to the sea. The proprietor, Mr. W. H. Spear, has sometimes practiced transferring the young eels found so plentifully in early summer in the Kennebec to the lakes above, hoping thereby to increase his catch.

Sturgeon.—All essential facts with reference to the sturgeon fishery of the Kennebec are stated above in connection with the description of the natural history of the sturgeon and modes of catching it. The catch of 1880 is estimated at 250 sturgeon, weighing 12,500 pounds.

Striped Bass.—The principal points in the bass fishery of the Kennebec have already been stated (see p. 693). The only modes of fishing expressly for bass that have been employed on the Kennebec are the stop-net above described, and a floored weir, of which latter method only a single example has come to our knowledge, a weir having been built expressly for bass in 1880, just below Merrymeeting Bay. Bass were once plenty in the Kennebec, but there was at that time little demand for them. Now they are in demand, but are unfortunately scarce. The catch of 1880 is estimated at 12,760 pounds.

Tomcod.—This fish is little prized in the Kennebec, and is now taken only as an incidental product of the smelt fishery, except those captured with dip-nets and grapples at Augusta in midwinter, which are estimated for the winter of 1879–'80 at 40,000 pounds. The quantity taken in the smelt fishery is estimated at 60,000 pounds. The greater portion of these are fed to animals, but the best of them are selected and sold for human food.

Blueback.—The fishermen of the Kennebec almost without exception distinguish the blueback (*Clupea æstivalis*) from the true alewife (*C. vernalis*). As a rule the former is not cured or marketed in any way, but is sold for bait to passing fishing vessels or thrown into the refuse heap. Occasionally, however, some of them are smoked and sold as alewives. The number taken in the Kennebec in 1880, estimated at 400,000, was much larger than ever known there before.

ANDROSCOGGIN RIVER.—The Androscoggin ranks in size as the third river of Maine, draining 3,600 square miles, of which 2,750 are within the State limits. Its aggregate lake surface is 213 square miles, but very little of this was ever accessible to migratory fishes. Its sources are in the mountainous region of Western Maine and Northern New Hampshire. Its upper waters are more elevated than those of any other river, and its descent to the sea steeper. It abounds in gravelly rapids and so far as accessible afforded in early time excellent breeding ground for salmon. The highest point reached by salmon appears to have been Rumford Falls, a little more than 100 miles from the sea, where a natural fall prevented their further progress. It is matter of direct testimony that a few salmon were taken here about 1815, and of tradition that they were abundant here and in Swift River, a near-by tributary, at an earlier date. Probably, however, the falls at Lewiston was always a serious impediment to salmon, being quite impassable to shad and alewives. Salmon are known to have been caught at Lewiston as late as 1815. They were finally shut out by a dam at Brunswick. Alewives used to breed in Sebattus pond, and shad in the main river below Lewiston. Neither of these species has ascended farther than Brunswick for many years; consequently they are reduced to exceedingly small numbers.

The recent fishery of the river is confined to the tidal portions, within 6 miles of its junction with the Kennebec, in Merrymeeting Bay, where a few shad, alewives, and sturgeon are taken. For convenience these fisheries are regarded as part of those of the Kennebec River, and have therefore been included in the remarks on that river.

CASCO BAY AND TRIBUTARIES.—This district possesses no river fisheries of great value, the aggregate product being estimated at $5,609. The species caught, arranged in order of their pecuniary importance, are as follows: Smelts, shad, eels, salmon, tom-cods, alewives.

The smelts are mainly taken in weirs, of which there are 25; located in New Meadows River, 4; in Harpswell Sound, 2; in Middle Bay, 2; in Maquoit Bay, 3; in Freeport, 1; in Yarmouth, 6; in the Presumpscot River, 2; in Portland Back Cove, 3; and in Portland Harbor, 2. In this district (in New Meadows River and Freeport) there are also four smelt seines in use, the only ones in the State. The smelt fishery of this district is of very recent origin, none of the weirs dating back more than twelve years.

The shad taken here are nearly all sea-shad, and are probably immature fish belonging to the brood of the Kennebec. They are mostly taken in drift-nets, which are plied in New Meadows River, Quohog Bay, Harpswell Sound, Middle Bay, Maquoit Bay, and some other localities. Middle Bay has been the best ground. This fishery has been carried on for nearly thirty years and possibly longer. During the past twenty years it has greatly declined. The product is salted and marketed as mess-shad.

The principal eel fishery of this district is in Quohog Bay, where there was discovered in 1876 a most remarkable eel-bed, the most productive ever known in the State. It extends over about 10 acres, on a muddy bottom, without grass, at a mean depth of 13 feet at low tide. The eels are taken out by spears worked through holes in the ice, which commonly forms here in December. The first and second winter from its discovery this bed yielded 2 tons of eels a day for the first five or six days of fishing. Eels are taken in many other localities around the bay with spears, and in the Presumpscot River and around Portland with pots or baskets.

The salmon taken in Casco Bay are believed to belong to the Kennebec River, with few exceptions.

The only tributaries of Casco Bay large enough to demand notice are Royal's River (Yarmouth) and the Presumpscot. Royal's, though a very small river, was frequented by salmon regularly and in considerable numbers at the beginning of the present century; but they have long been shut out by dams, and the last seen were caught in a weir more than twenty-five years ago.

The Presumpscot drains about 520 square miles of territory, and among its tributaries are lakes with an aggregate area of 90 square miles. Lake Sebago, the second lake in the State in size, lies but 22 miles from the sea, but has an elevation of 247 feet. The Presumpscot is therefore a rapid river. It has remarkably clear water, and abounded naturally in gravelly rapids. It was frequented by salmon, shad, and alewives, but seems to have been best adapted to salmon. All fisheries were practically extinguished early in the present century by a dam at the head of the tide. That dam was afterwards abandoned, and alewives have since found a limited breeding ground, and though unable to ascend the river far, both shad and salmon have occasionally been found in it in recent years. All the dams now on the river, some seven in number, have been recently provided with fishways, through which alewives do, and salmon may, ascend to Lake Sebago.

SACO RIVER.—The Saco drains an area of 1,400 square miles, of which 600 square miles lie in the State of New Hampshire, including the greater part of the White Mountain region. Its sources are therefore more elevated than those of any other Maine river. Probably half of the

entire basin is covered with forest. Its lake surface measures 46.8 square miles. A much larger proportion of its basin is occupied by sandy and gravelly land than any of the larger rivers of the State, a circumstance that doubtless contributes largely to the constancy of its flow. The main river is deep, not a single ford existing within 100 miles of the sea. The tributaries, however, afford many gravelly shallows adapted to the requirements of salmon as spawning ground. Several natural falls of considerable height oppose the ascent of anadromous fishes. The first, at the head of the tide, seems to have prevented the ascent of any but salmon, which were able to surmount all obstacles as far as Hiram, 45 miles from the sea, where they encountered an insurmountable obstacle in Great Falls, about 80 feet in height. Below this point they had access to the Great and Little Ossipee Rivers, tributary to the Saco on the west side, in which they are believed to have found their best breeding ground. Tradition asserts their ancient abundance, but that had passed away more than ninety years ago, and at no time within seventy-five years have they been so abundant that a man could take more than five or six in a day with a dip-net at Saco Falls, the principal fishing place known to Saco tradition. The latest date of the capture at Salmon Falls, 16 miles from the sea, was in 1845, and since 1850 they have been practically extinct, but in recent years occasional specimens are taken with dip-nets in an illegal and surreptitious way at the Saco and Biddeford Falls.

Shad and bass have been taken in the tidal portion of the river in recent times, and both were much fished for in 1860. In 1867 gill-nets were in use for shad and several men found occupation in the fishery, but it has since been abandoned. Several nets are still in existence and occasionally set, but not regularly. Alewives are sometimes dipped, but not regularly, nor in any considerable numbers.

The smelt fishery is the only one regularly followed. The only method employed is that of hook and line, plied under the shelter of a movable house on the ice. The favorite location is about 2 miles below the falls, and the fishing is done mostly by night, the houses being lighted by kerosene lamps and heated by small coal stoves. The largest and best houses use six lines each. Some twenty-five men engage in the business. Their aggregate catch is estimated at 6,250 pounds of smelts in the winter of 1879–'80, and they received better prices than the fishermen of any other locality, owing to the superior size and quality of the smelts.

MOUSAM RIVER.—This small river, about 24 miles long and draining about 120 square miles of territory, runs for nearly its whole length through a sandy country, and its water is very pure. At its head is Mousam Pond, a body of water covering about 3 square miles. The Mousam was anciently frequented by salmon, shad, and alewives, and salmon were at one time very plenty. The salmon were exterminated many years ago, and though a few alewives and shad yearly enter the river, there is no fishery for them nor for any other river fish at present existing.

YORK RIVER.—The extreme length of York River is about 12 miles, and its basin has an area not exceeding 50 square miles. Of its early history no facts have been learned. At present it is the site of a small smelt fishery employing two bag-nets and producing 3,000 pounds of smelts in a year.

PISCATAQUA RIVER.—The drainage basin of the Piscataqua, which forms the boundary between Maine and New Hampshire, has an area of 550 square miles, of which 240 square miles is in the State of Maine. Its lakes, having an area of 16 square miles, are thoroughly utilized as reservoirs for extensive mills at Great Falls and Salmon Falls. At the latter point the main river (here called Salmon Falls River) is hopelessly obstructed against the ascent of anadromous fishes, and the principal tributaries are in nearly the same condition. The main upper waters are believed

to have been inaccessible for nearly two hundred years, so that the very tradition of their presence has become dim. It is, however, beyond question that before the obstruction of the river the principal anadromous fishes, especially salmon, were very plenty. Salmon have continued to show themselves occasionally in the river to within forty years. Shad and alewives held on much better, and considerable numbers of both were taken twenty years ago, but since then have greatly declined, and at the present time the attempt to catch them is almost wholly abandoned. Two or three small weirs yielding a very small number of shad and alewives are still maintained on the New Hampshire side of the river. The fishery on the Main shore in 1880 was reduced to a half dozen smelt weirs, whose united product of smelts, tomcods, bass, eels, and perch was valued at $965.

5. LAWS RELATING TO THE RIVER FISHERIES OF MAINE.

THE COMMON LAW.—The common law, as interpreted and applied by the Maine courts, makes a broad distinction between navigable and unnavigable rivers. In the former category are placed all rivers and parts of rivers in which the tide ebbs and flows; in the latter all in which the tide does not ebb and flow.

In navigable rivers, as thus defined, the riparian proprietors own the soil from high-water to low-water mark, excepting cases in which the distance between the two marks is greater than 100 rods, and in these cases they own to the 100-rod limit and no farther.* This title to the soil carries with it the exclusive right to erect fixtures for fishing or other purposes, or even to make a net fast to the shore or bottom within the 100-rod limit; but does not include any exclusive ownership in the water covering the flats, nor in the fish that may swim in it, nor any exclusive right to use a movable net or other apparatus for catching fish, nor does it include any title whatever beyond the 100-rod limit. The public, on the other hand, have not only a right, on equal terms with the riparian owner, to fish in the deep water and on the flats beyond the 100-rod limit, but also the right to take fish with movable apparatus in the water over the soil of the proprietor even up to high-water mark.†

In unnavigable rivers the title of the riparian owner is held to extend to the land under the water from each shore as far as the middle of the stream, carrying with it the exclusive right to fish by any mode in the water covering this land, the public rights being limited to the privilege of passing with boats and other craft, and to float timber up and down streams of suitable size. In the case of fresh-water lakes and natural ponds of greater area than 10 acres, the law of Maine is founded upon that of Massachusetts,‡ and the exclusive rights of the riparian owner extend only to high-water mark.

Thus we have in fresh-water ponds and lakes a fishery with movable apparatus in the hands of the public, in non-tidal rivers an exclusive fishery with movable apparatus in the hands of the riparian owners, and in tidal waters both the same free fishery with movable apparatus and a fishery with fixed apparatus in the hands of land-holders. The law on these points is sufficiently clear, but custom does not in all points agree with the law. Neither have the riparian owners on the non-tidal rivers enforced their rights against the public, nor the public against the riparian owners on tidal waters. In the former case the public has always enjoyed, and now enjoys, the privilege of free fishing with movable apparatus, which is alone allowed by law in those waters; and in the latter the riparian proprietors have maintained an exclusive fishery with fixed apparatus in the waters in front of their respective estates, not merely on the shores laid bare by

* This modification of the common law springs from Massachusetts colonial ordinances passed in 1641 and 1647.

† According to decision of the courts even the digging of clams on flats which are private property is held to be a public right.

‡ An ordinance of 1641 decreed free fowling and fishing in all such great ponds.

the retreating tide, but beyond low-water mark as far as it is found practicable to extend their structures from the shore, in many cases to the maximum depth of 20 feet at low water.

STATUTE LAWS.—All of these fishing rights are held subject to the regulation of the legislature, which has not been backward in exercising its power. During the sixty years of the separate existence of the State of Maine, the legislature has passed 433 acts relating to fisheries, of which 11 were of a general character, 51 related to the sea-fisheries, 161 to the anadromous fishes, 159 to fresh-water fishes, 7 to shell-fish, 22 to the inspection of fish products, 7 to fish culture, and of 5 the precise bearing was not ascertained. In addition to this mass of legislation, we are able to cite at least 48 acts of the legislature of Massachusetts having special reference to the river fisheries of Maine, besides other acts of a more general character which were also in force in the "district of Maine." Of the 433 acts passed by the Maine legislature, there were 114 passed between 1821 and 1840, inclusive; 74 from 1840 to 1860; 245 from 1861 to 1880. Of the 161 acts relating to the anadromous fishes, 71 were passed in the first period of twenty years, 29 in the second period, and 61 in the third period. Of the acts relating to the inspection of fish products, 14 were passed in the first period, 3 in the second, and 5 in the third.

The aims of legislation on the river fisheries have been: first, the preservation of the supply of fish; second, the harmonizing of conflicting interests; third, the prevention of fraud in the sale of fish products. The first object was attained by provisions compelling the removal or abatement of obstructions, especially by the construction of fishways, and by a great variety of provisions touching the time, mode, and extent of fishing. The second purpose was prominently in view in the framing of many of the special laws instituting town fisheries in which all the citizens should have an interest, and was often influential in provisions that restrict certain methods for the benefit of others. And to the prevention of fraud in sale of products was devoted a long list of enactments relative to the inspection of dried and pickled fish.

In the matter of the construction of fishways it has been the uniform policy of the State to require the owners of dams to construct and maintain them. The courts have rendered repeated decisions affirming the principle that "every owner of a mill or dam built it under the condition that a sufficient passageway be allowed for the fish, and the limitation, being for the public benefit, is not extinguished by any neglect to compel compliance." Provision for the enforcement of this rule of law has constituted a considerable part of the legislation on the fisheries for salmon, shad, and alewives. A heavy penalty has been attached to a breach of the law. At times the dam-owners have been left to devise for themselves such contrivances as they might, and at other times officers have been appointed, and charged with the duty of deciding the plan and location. Sometimes, as in a general act passed in 1741, there was provision for the appointment by a court of justice of committees to inspect dams and decide all questions as to fishways. In 1786 it was left to committees chosen by the towns. Early in the present century the county commissioners were assigned this duty in cases not governed by special acts, of which, however, there were very many, covering the majority of the rivers and giving fishway questions into the hands of the local officers. Since 1868 the State commissioners of fisheries have had jurisdiction in such matters, with power to order fishways built or repairs made at their discretion, in all cases serving formal plans and specifications.

The prominent provisions of legislation relative to time and modes of fishing are: the maintenance of yearly and weekly close-times; the limitation of length of nets and other apparatus; the prohibition of fishing near fishways.

The yearly close-time for salmon, shad, and alewives has generally begun from the first to the last of July (sometimes as early as June 16 for shad) and extended to December. At the

present time the close-time for salmon, shad, and alewives begins July 15 and extends to the first of the next April, rod-fishing being, however, allowed from July 15 to September 15. The weekly close-time that has been generally maintained has been from sunrise on Saturday to sunrise on Monday.

Nets and other apparatus were early limited in length to one-third of the width of the stream or water where used. At present they may not, except in the Penobscot River, occupy more than one-eighth the width of the channel, nor shall fixed apparatus extend more than 100 feet beyond the line where there is a depth of 2 feet at low-water.

Early laws exempted but a very small area, 3 or 4 rods from a fishway, from fishing, but since 1868 the limit has been removed farther and farther until now it is fixed at 500 yards; but there are many exceptions in small rivers.

The foregoing remarks have reference especially to the fisheries for salmon, shad, and alewives. About other anadromous species there has been little legislation. Smelts are protected by a yearly close time, from April 1 to October 1, dip-nets being, however, allowed from April 1.

The earliest provisions relative to the inspection of fish products applicable to Maine appear to be contained in a colonial ordinance of Massachusetts of the year 1652, which, after rehearsing the injurious effects on colonial trade resulting from the fraudulent practices of some dealers, provided for the appointment of "viewers," who should scrutinize fish at the time of their delivery by the seller to the buyer, and decide whether they were merchantable or not. Only dry salted fish appear to have been included. In 1692 a much more comprehensive ordinance was passed, in which provision was made for the size of casks, the appointment of "gaugers and packers" in every town where necessay; the inspection of goods packed to see that they are of good quality; the marking of the cask with the brand of the "gauger and packer"; the infliction of penalties for the infraction of the laws, &c. Similar provisions have remained upon the statute book until the present time. Inspection is compulsory, and penalties attached to its omission, or to the exportation of unpacked fish. If the goods are found by the purchaser or consumer to be otherwise than as represented by the brand, damages can be recovered of the inspector.

PART XIII.

THE SALMON FISHING AND CANNING INTERESTS OF THE PACIFIC COAST.

By DAVID STARR JORDAN and CHARLES H. GILBERT.

1.—THE SALMON FISHERIES OF CALIFORNIA AND OF OREGON SOUTH OF THE COLUMBIA RIVER.

1. The Sacramento River.
2. The Eel and Smith Rivers, California, the Rogue River, Oregon, and the adjoining seaboard counties.

2.—*THE SALMON FISHERIES OF THE LOWER COLUMBIA.*

1. The Salmon; its habits and movements.
2. The fishermen.
3. The canneries and outfit.
4. Process of canning.
5. Labor at the canneries.
6. Profits and losses of the canneries.
7. History of the canning industry.
8. Future of the Salmon Fisheries.
9. Salmon oil.
10. Statistics of Salmon Fisheries of the Columbia.

3.—STATISTICAL RECAPITULATION.

Statistics of Pacific Coast Salmon industry for 1880.

PART XIII.

THE SALMON FISHING AND CANNING INTERESTS OF THE PACIFIC COAST.

By DAVID STARR JORDAN AND CHARLES H. GILBERT.

1.—THE SALMON FISHERIES OF CALIFORNIA AND OF OREGON SOUTH OF THE COLUMBIA RIVER.

1. THE SACRAMENTO RIVER.

FISHING TOWNS.

VALLEJO.—The regular salmon fishermen rarely come down the Sacramento as far as Vallejo, but there are three salmon-traps in the river at this point. There are also one or two fishermen catching sturgeon (*Acipenser transmontanus*) with hook and line.

The traps do not pay at present, the salmon in the river having decreased in number since they were first introduced.

A fisherman at Vallejo, Mr. A. Fürst, claims to have introduced the first trap pound-net in San Francisco Bay in 1861. It was of the same shape as those in use at present, and was, he says, modeled after one formerly used for catching whitefish in Lake Erie.

A long "leader" runs from the shore to the opening in a heart-shaped inclosure, which, in turn, leads into the trap proper. Pound-nets in the Sacramento never paid, even when fishing was at its best. The expense of keeping them up is too great. In the fall, when water is low in the river, the water becomes salt at Vallejo and barnacles entirely cover the meshes of the nets.

Mr. Fürst has been on the Sacramento since 1852, and thinks that salmon are not nearly so abundant in the river as formerly. He thinks that all kinds of fish are becoming scarcer in the neighborhood of San Francisco, and that even out at the Farallones, fishermen have to put out five times as many lines to load a boat as they formerly did. He states that prior to 1866 the fishing in the bay and on the river used to be very good. Men used to go out and make sometimes as high as $100 a night in herring fishing. Since 1866, fishing has fallen off very fast. Pound-nets now cannot catch one-tenth of what they used to do. He is greatly impressed with the destructiveness of seals and sea-lions. They run up the river and take the salmon from the gill-nets, leaving nothing but the heads. He has even seen seals go into a trap and take fish out.

The incoming run of salmon is first met by the fishermen near the mouth of the river. During the last of the season they can be caught as high up the river as nets can be worked.

SAN PABLO.—No fishermen work in the vicinity of San Pablo, but there are six or seven Chinese companies on the bay southwest of San Pablo engaged in the shrimp business, the methods being precisely like those employed by the Chinese colonies about San Francisco.

COLLINSVILLE AND BLACK DIAMOND.—In the year 1880 there were about 225 boats engaged in salmon fishing on the Lower Sacramento, each boat with a crew of two men. Most of the men are Italian, some are from the southern part of Austria, and a few are Greeks. On account of the nature of their work, most of them live on scows, which they tow from one part of the river to another, following the salmon in their migrations. The majority of the fishermen are unmarried. Those who have families generally live on shore; a few, however have large scows of two or more rooms and take their families with them up and down the river. During the season when few salmon are caught and the canneries are not running, many of the fishermen go down the river to Martinez and Benicia, but when the open season comes on, the most of them cluster around Black Diamond and Collinsville, where the canneries are.

OUTFIT.

A good outfit for salmon fishing is worth from $700 to $1,000. It consists of a scow, a sail boat, and a gill-net. These, of course, vary in price, but on an average the scow is worth $250, the boat $250, and the net $300. The men make their own nets. They are single thickness gill-nets, which drift down stream, catching the salmon as they run up. They are from 200 to 300 fathoms long, from 6 to 9 fathoms deep, and with an average mesh of $8\frac{3}{8}$ inches (measured mesh is diagonally across when stretched).

Nearly all the boats are made in San Francisco. They are sharp at bow and stern, sloop-rigged, with a center-board, and probably average from two to three tons.

The scows are variable in shape and appearance. They are flat-bottomed, with vertical parallel sides narrowed and slanting somewhat towards each end. They are boarded over above and are nearly covered by the house, only a narrow margin being left around the sides. The house generally has but one room, with a door at one end and two windows on each side. It is flat-roofed. Probably an average sized scow would be 20 feet long and 12 feet wide, the house about 7 feet high and occupying all of the scow but a strip about 18 inches wide on each side and 2 feet wide at each end. Some of the fishermen, on account of poverty or other reasons, own no scows, but live on shore and fish always in the same locality. Of course these are placed at a disadvantage by not being able to follow the run of salmon.

METHODS OF FISHING.

Fishing is always done on the ebb tide, whether it be day or night. Two men always work together. They go out to their fishing-grounds, which are chosen chiefly by a clear channel, and the net is placed in the water, one man working the boat and the other paying out the net. Everything is governed by laws which the fishermen have made for themselves. Each of the two men has his own part in the work. It is always the same one who rows while the other manages the net. The two then rest in their boat, boat and net floating down together until they have gone far enough, when the net is taken out, and the fish removed. The distance they float of course varies with the grounds and the season.

According to a law among the fishermen, a second net is not to be placed in the water until the first one has floated down a certain distance, and although the fish are all caught running up stream the second, third, and even fourth net frequently catches more than the first. They generally begin fishing at about half ebb tide.

DISPOSITION OF FISH.

The salmon caught are either shipped to the San Francisco markets, sold to the canneries, or salted and smoked.

There are two great "runs" of salmon during the year. The first one begins about the middle of April, the second about the middle of August, and they last about forty days each. The canneries usually begin about the 15th of April and run until the 1st of August, when the "close season" begins. They begin again September 15, when the fishermen are allowed to commence fishing, when they run as long as the supply of fish will warrant, which is generally from three to four weeks. During the canning season each boat is expected to catch from twenty to one hundred fish daily, and sometimes they exceed this. From the end of the canning season the salmon continually grow scarcer through the winter, until, in January and February, the boats scarcely average one fish a day. The salmon average 15 to 20 pounds each.

While the canneries are not running all the salmon caught are shipped to the San Francisco markets. They are shipped exclusively on the river steamers. Each regular shipping place has a small building on the wharf for the reception of the fish. They are each marked with the owner's private mark, usually an eye gouged out, the snout cut off, or a cut of some particular shape on the gill covers. From 1 to 2 cents per salmon is charged for wharfage, and from 5 to 8 cents each for transportation.

During the canning season each boat is allowed to ship only 40 fish a week to the San Francisco markets. This is to prevent the market from being overstocked and is a law the fishermen have imposed on themselves. The remainder of the fish caught are sold, at a price fixed during the season, to the canneries, providing that the canneries and fisherman can agree on a price and that more fish are not caught than the canneries can put up.

When the canneries refuse to accept all the salmon caught, the fishermen preserve the surplus by salting or by salting and smoking. It is also asserted that much fishing is done during the "close season," and the fish cured. This curing is done exclusively by the fishermen themselves.

The fish are salted in metal tanks about 8 feet in diameter and 5 feet deep. One of these will hold about 500 salmon at a time. The process of salting and preparing for shipment takes about two weeks. They are usually packed in half-barrels for shipment, but Mr. William Hosking, of Collinsville, states that he has shipped them in tierces to London, and that after having twice crossed the tropics they arrived at their destination in good order. Salted salmon are extremely variable in price, but probably average 20 cents each.

In smoking salmon the salted fish are carefully washed and scrubbed, then dried for a day and hung up in a smoke-house in which is kept up a slow fire, usually of oak wood. It takes about a week to smoke salmon, and they find a ready sale at 40 cents per head.

SALMON CANNING ON THE LOWER SACRAMENTO IN 1880.

The salmon pack has been heavy on the Sacramento this year. There have been ten canneries at work, four in San Francisco, one at Benicia, three in the vicinity of Collinsville, one at Courtland, and one at Sacramento. Those in San Francisco and the one at Benicia pack other goods as well as fish.

Those packing in San Francisco had their fish shipped down the river by steamer or schooner, and the salmon were often old and unfit for canning before they were delivered. This was particularly true towards the last of the season, when the fish could only be caught well up the river. At this time the salmon brought in to be canned were in such condition that I think they could hardly be wholesome food, and with such an article placed on the market it is no wonder that the Sacramento fish bear an indifferent reputation.

The spring run was fairly good, and was remarkable for its unevenness and the length of time it lasted. The fish seemed to come up in a succession of schools, and while usually the run

becomes so slack in July that the canneries do not run at all, this year some of them ran along until the commencement of the close season. Much dissatisfaction is expressed concerning the time chosen for close season. It is claimed: (1) That it is at the time of the heaviest run, which is almost over by the time the river is again open; (2) that it is not at all observed, because, although the fishermen cannot sell to the canneries, they can and do salt a great quantity.

Usually for the first week or ten days after September 15, the fish run well, and the canneries can readily get all they can put up. At the first of this year's fall season, so many were caught and shipped to San Francisco in one day that the market was completely flooded. Part of them was sold by the steamboat company to pay freight charges, and the remainder, amounting to several thousand fish, was thrown into the bay. The fall run soon becomes light, and all the canneries had stopped work this year by October 15; those on the river stopping about October 1.

There were no difficulties between the fishermen and canners this year. The catch was good and the market more extensive than usual, owing to increased number of canneries at work. During the spring season all the fish caught found a ready sale at 30 cents and 35 cents each. In the fall the price fell to 25 cents. At Collinsville, October 10, most of the boats had stopped work. A boat then averaged about five salmon in one drift (one night), and the fish sold at the wharf for about 45 cents each. The fall salmon average larger than the spring fish, and are lighter in color.

The exact figures for this year's canning cannot be ascertained before the stock is disposed of. As there is a considerable amount yet on the market, it is with reluctance that the firms will give any figures, and it is possible that in some cases the amount canned is over or under estimated.

The Sacramento River salmon average four to each case, being one-fourth smaller than the same species in the Columbia River.

Estimated pack of the Sacramento River canneries during season of 1880.*

[As reported by the canneries to C. H. Gilbert; some of the estimates probably too high.]

	Cases.
Emerson & Corville (San Francisco)	12,500
C. J. King (San Francisco)	7,300
J. Lusk & Co. (San Francisco)	9,950
Cutting Packing Company (San Francisco)	12,500
Sacramento River Packing Company (two canneries)	18,686
Bradford & Co	8,525
Benicia Packing Company	5,612
Taylor & McDowell	1,685
Washington Cannery Company	3,689
Total	80,387

SALMON SALTED ON SACRAMENTO RIVER FOR 1880.

The amount of salmon salted during the fishing season is small. It is only when the run is very heavy and more fish are caught than are needed to supply the market, that the surplus is salted down. Most of the fish salted on the Sacramento River are put up by the fishermen during the close season. They then have their tanks hidden in the tules and put up great quantities.

*The estimate made by the fish commissioners of California is 62,000 cases canned on the Sacramento in 1880. The number of salmon sent fresh to the markets of San Francisco is estimated by the California fish commission as 188,296 or about 2,000,000 pounds. (Rept. Cal. Fish Comm., 1880.)

Of course when the work is done in this secret manner, no very close estimate can be made. The estimate given here is furnished by Mr. Silvestri, who has, to that end, corresponded with the principal salters on the river. The quantity of salmon salted during the fall of 1880 was 33,000 fish, averaging 12 pounds each.

STATISTICS OF SALMON INDUSTRY FOR CONTRA COSTA AND MARIN COUNTIES.

Fishermen:	
American	5
Chinese	25
Italian	345
Greek	25
German	100
Total	500
Number of boats	230
Amount of capital invested in boats	$60,000
Number of pounds of fish taken, including those canned and salted	10,000,000
Value of fish taken	$170,000

STATISTICS OF TOTAL CATCH OF SALMON FROM 1875 TO 1880.

The following figures have been obtained by the State commission of California, as the total number of pounds of salmon taken in the Sacramento River for the six years ending August 1, 1880:

1875 (August 1, 1874, to August 1, 1875)	5,098,781
1876	5,331,423
1877	6,493,563
1878	6,520,768
1879	4,432,250
1880	10,837,400

The increase in the run of 1880 over that of previous years is ascribed by the commissioners to the planting of young salmon in the river.

SALMON FISHING IN THE SACRAMENTO RIVER IN 1872–'73.

The following description of the salmon fisheries of the Sacramento River was prepared by Mr. *Livingstone Stone* in 1872:

"The fishing on the Sacramento is done in three ways: (1) By drift-nets; (2) by fyke-nets; (3) by sweep-seines.

"DRIFT-NET FISHING.—The drift-nets are used exclusively for catching salmon. They have an 8¼-inch mesh, are usually 40 meshes deep, and from 150 to 200 fathoms long. As nearly as I could learn, there were not far from a hundred salmon nets in operation on the Sacramento River in 1872. At the meeting of the salmon fishermen of the Sacramento that year, there were 95 boats represented.

"These nets are worked by simply drifting them with the tide. The salmon, which of course are heading against the tide, are gilled in the meshes. The turn of the tide is the most favorable time for this sort of fishing.

"The nets are frequently drifted a mile before being hauled in. The salmon-fishing is conducted entirely by white men, no Chinamen being allowed to participate in it. There is no law

regulating the matter, but public opinion is so strong in relation to it, and there is such a prejudice against the Chinamen, that any attempt on their part to engage in salmon fishing would meet with a summary and probably fatal retaliation.

"The number of fresh salmon shipped from Rio Vista to San Francisco in the year 1872 is as follows:

January	792
February	1,581
March	1,945
April	3,354
May	4,408
June	1,201
July	1,145
August	1,496
September	2,335
October	583
November	441
December	390
Total	19,671

"On one day in February, when I came down the river, there were put on board the steamer, at Courtland, 7 fresh salmon; at Rio Vista, 32 fresh salmon; at Sherman Island, 32 fresh salmon; at Collinsville, 123 fresh salmon.

"The daily number of fresh fish (salmon and sturgeon) brought down the Sacramento River to San Francisco in 1872 by the steamers of the Central Pacific Railroad Company is as follows:

Date.	Fish.	Date.	Fish.	Date.	Fish.	Date.	Fish.	Date.	Fish.	Date.	Fish.
January 1	87	February 1	326	March 1	247	April 1	243	May 1	1,485	June 1	536
2	97	2	174	2	199	2	57	2	1,758	2	.....
3	105	3	287	3	402	3	198	3	1,342	3	403
4	182	4	157	4	462	4	439	4	560	4	207
5	111	5	324	5	404	5	4,711	5	.....	5	229
6	115	6	250	6	401	6	114	6	909	6	174
7	133	7	337	7	1,030	7	.....	7	1,487	7	157
8	125	8	393	8	344	8	428	8	1,298	8	75
9	113	9	334	9	139	9	372	9	1,361	9	.....
10	109	10	262	10	334	10	416	10	1,046	10	175
11	211	11	415	11	272	11	599	11	482	11	220
12	224	12	296	12	356	12	578	12	.....	12	300
13	243	13	280	13	316	13	310	13	431	13	357
14	112	14	228	14	135	14	.....	14	578	14	348
15	166	15	253	15	447	15	589	15	689	15	210
16	234	16	432	16	283	16	960	16	1,216	16	.....
17	308	17	247	17	419	17	863	17	1,068	17	564
18	214	18	259	18	255	18	879	18	712	18	307
19	172	19	348	19	501	19	643	19	.....	19	306
20	302	20	408	20	425	20	581	20	804	20	158
21	73	21	285	21	452	21	.....	21	929	21	41
22	294	22	389	22	106	23	693	22	899	22	38
23	210	23	249	23	516	23	905	23	859	23	.....
24	221	24	223	24	396	24	827	24	950	24	89
25	210	25	334	25	192	25	1,123	25	697	25	167
26	267	26	276	26	253	26	835	26	.....	26	139
27	113	27	292	27	244	27	435	27	960	27	162
28	46	28	395	28	242	28	.....	28	1,198	28	160
29	76	29	272	29	384	29	1,014	29	1,297	29	199
30	301			30	344	30	990	30	1,242		
31	141			31	378			31	699		
Total	5,514	Total	5,779	Total	11,394	Total	15,613	Total	27,395	Total	5,861

Date.	Fish.	Date.	Fish.	Date.	Fish.	Date.	Fish.	Date.	Fish.	Date.	Fish.
July 1	268	August 1	554	September 1		October 1	189	November 1	40	December 1	
2	43	2	177	2	836	2	253	2	33	2	136
3	134	3	72	3	821	3	462	3		3	68
4	61	4		4	1,209	4	136	4	82	4	246
5	73	5	360	5	1,170	5	67	5	69	5	213
6	38	6	747	6	512	6		6	111	6	128
7		7	632	7	215	7	143	7	122	7	113
8	249	8	558	8		8	160	8	167	8	
9	202	9	573	9	708	9	148	9	45	9	234
10	214	10	159	10	636	10	218	10		10	248
11	260	11		11	412	11	85	11	91	11	234
12	177	12	105	12	512	12	74	12	67	12	283
13	75	13	661	13	331	13		13	123	13	123
14		14	297	14	258	14	95	14	147	14	151
15	103	15	1,014	15		15	81	15	81	15	
16	140	16	708	16	896	16	132	16	96	16	116
17	281	17	186	17	780	17	118	17		17	164
18	276	18		18	1,112	18	22	18	87	18	226
19	181	19	1,041	19	1,042	19	70	19	112	19	204
20	175	20	1,205	20	461	20		20	167	20	74
21		21	1,567	21	261	21	75	21	157	21	64
22	303	22	1,499	22		22	87	22	70	22	
23	330	23	1,061	23	567	23	122	23	50	23	88
24	337	24	165	24	563	24	114	24		24	82
25	323	25		25	395	25	52	25	53	25	93
26	353	26	427	26	303	26	50	26	58	26	127
27	270	27	349	27	225	27		27	118	27	100
28		28	341	28	154	28	62	28	78	28	75
29	520	29	591	29		29	18	29	51	29	
30	228	30	304	30	203	30	2	30	92	30	100
31	345	31	240			31	69			31	70
Total	*5,048*	*Total*	*15,677*	*Total*	*14,706*	*Total*	*3,682*	*Total*	*2,367*	*Total*	*3,716*

"The proportion of sturgeon and salmon in the shipments of the various months is estimated by the San Francisco market-men as follows:

"January, 10 per cent. salmon, 90 per cent. sturgeon. February, 10 per cent. salmon, 90 per cent. sturgeon. March, 50 per cent. salmon, 50 per cent. sturgeon. April, mostly salmon. May, all salmon. June, all salmon. July, all salmon. August, all salmon. September, all salmon. October, 50 per cent. salmon, 50 per cent. sturgeon. November, 50 per cent. salmon, 50 per cent. sturgeon. December, 10 per cent. salmon, 90 per cent. sturgeon.

"Besides the salmon above mentioned, a large number are taken by sailing vessels and by the opposition line of steamers and other conveyances to San Francisco and the larger towns.

"The points from which salmon are shipped on the river steamers are Sacramento City, Courtland, Emmatown, Rio Vista, Collinsville, Antioch, Benicia, Martinez.

"In the spring of 1872 about 25,000 salted salmon came from the Sacramento River to San Francisco, and in the fall of the same year about 9,000. The Rio Vista salmon fishermen recommend the prohibition of fishing from June 1 to October 1, or from June 15 to October 15.

"FYKE-NET FISHING.—The fyke-nets have a mesh of 2½ inches. There were in the winter of 1872–'73 eighty-five fyke-nets on the Sacramento at Rio Vista. They are stationary, of course, and are examined every twenty-four hours. All the kinds of fish that are found in the river are caught in these nets. Mr. John D. Ingersoll, a prominent fyke fisherman of Rio Vista, informed me that the daily catch for twenty nets is now about 75 pounds of fish.

"They include chubs, herring, perch, viviparous perch, sturgeons, hardheads, split-tails, Sacramento pike, suckers, crabs. Of these the perch, pike, and sturgeon are the best food-fishes, though all of the species named are sold in the market.

"There has been a vast decrease in the returns of the fyke-nets during the last twenty years. In 1852 and 1853 they used to catch 700 or 800 pounds a day in one fyke-net. An average of 250 pounds a day for one net at Sacramento City was usually expected in those times. The present catch of 75 pounds a day in twenty nets certainly presents an alarming contrast. The fyke-net fishing is conducted wholly by white men, I believe, the Chinese fishermen being ruled out by force of public sentiment. The fyke-nets are usually visited early in the morning of each day, and the catch is sent down to San Francisco by the noon boat. The fyke-net fishing begins in November and is continued till May. The best fishing is when a rise in the water drives the fish inshore, where the fyke-nets are placed. During the summer months the water is warmer, the fish are poor, and the fishing is discontinued.

"On the 27th of February, 1873, I went the rounds of Mr. Ingersoll's set of fyke-nets with him. We visited twenty nets, but as some of them had not been examined for over twenty-four hours, the yield was supposed to be equivalent to one day's fishing for thirty nets. The nets had four hoops each and 14-foot wings. We took out about 120 pounds of fish in all. Hardheads were the most numerous, and the Sacramento pike next. Mr. Ingersoll said that perch used to rank second in abundance in fyke-net fishing, the average for thirty nets being 200 or 300 pounds a day, but the perch were quite insignificant in numbers on this day. We found in the nets seven small viviparous perch and two small sturgeon. I learned also that mink, beaver, and otters are sometimes caught in the nets. In 1872 Mr. Ingersoll caught 8 minks, 2 beavers, and 1 otter in his fyke-nets.

"SWEEP-SEINE FISHING.—The sweep-seine fishing is given over to the Chinese, who are not allowed by public sentiment to engage in either of the other two kinds of fishing just described, but what they are not permitted to do by the prohibited methods they make ample amends for by their own methods. They are, I should say, the most industrious and persistent fishermen on the river. They fish all the year round. They use fine mesh-nets, with which they sweep every part of the river, especially the partially-stagnant fresh-water lagoons, or sloughs, as they are called in California, where the fish collect in myriads to spawn. With these nets they catch vast quantities of fish of all sizes, and so destructive has their fishing been on the Sacramento, that all the fish of that river except salmon are disappearing with unexampled rapidity.

"It is owing to this kind of fishing that the returns of the fyke-nets have diminished so alarmingly the last few years. The Chinese have been at it for seven or eight years, and if they keep on three or four years more at this rate, the small fish of the Sacramento will be practically exterminated. I had no means of ascertaining with any exactness how many Chinese fishermen there were on the river, but there are a large number, and Mr. Ingersoll said that they were increasing every year. The most of their fresh fish they send to the San Francisco Chinese markets as soon as caught, but they also dry a great quantity of them on bars and floors prepared for the purpose. These are both eaten by themselves and sent packed in barrels to the Chinese quarter in San Francisco. While at Rio Nita in February, 1873, I visited a Chinese fishing-station on the Sacramento River. It was located about 80 rods above the Rio Nita steamboat-landing, and consisted of a nest of Chinese fishing-boats numbering seven small boats and three large ones. There was also on the shore, just across the road, two old tumble-down buildings with drying-bars and floors near by in the open air, where some of the fishermen lived and attended to the drying of the fish. The small boats were small, flat bottomed dories, square at the stern, sharp at the bow, about 15 feet long, and strongly built.

"The large boats were also strongly built, but narrow and pointed at both ends, and constructed in the Chinese fashion. Two of the three large boats had one mast, and the other one

had two masts, considerably raking, with Chinese sails, which were not like anything used in this country for sails. Nearly amidships, but a little nearer one end than the other, was a tent in which the Chinamen lived. There was also considerable space in the hold of this really Chinese junk, which added a good deal to the house-room.

"The whole air and look of these crafts was decidedly foreign, and I might say oriental.

"If I understand their method rightly, the small boats are to visit the sloughs and various fishing points when they go out to draw the seine, and the larger boats are really only movable dwellings and store-houses, where they live and receive the fish that are brought in by the small boats, and which, of course, they move from place to place on the river as the exigencies of the changing fishing seasons may require."*

2. THE SALMON FISHERIES OF THE EEL AND SMITH RIVERS, CALIFORNIA, THE ROGUE RIVER, OREGON, AND THE ADJOINING SEA-BOARD COUNTIES.

In Eel River there is a fall run of salmon only, composed of *O. chouicha*† and *O. kisutch*. The cannery usually runs till the last of November. About 6,000 cases were put up in 1880, 1,400 in 1878, and 8,500 in 1877. About $3,400 worth of salted salmon in half-barrels were shipped to San Francisco in 1878. The salmon are not counted at the canneries, but sold by weight, at $20 per ton. The cannery was built in 1877, and belongs to the Cutting Packing Company in San Francisco.

Mr. V. S. Trent, in a letter to Professor Baird, dated Ferndale, Cal., March 3, 1880, refers to the salmon-canning interests of Eel River in the following language:

"Eel River is about 225 miles north of San Francisco, and is a barred river; steamers make the trip from San Francisco in about twenty-four hours; a round trip in seven or eight days.

"A good harbor inside the bar. The river is about 150 miles long and subject to heavy freshets in fall and winter. There is but one cannery on the river, put up in 1877. In 1878, 1,400 cases were put up against 3,500 in 1877, which, at $6 per case, amounted to $6,600. Other shipments of salmon in half-barrels, amounting in all to $100,000. About one hundred and sixty men are employed. The salmon are taken in seines and fine gill-nets of 7-inch mesh. There are two or three kinds of salmon here; several kinds of trout; sturgeon are plenty; perch and smelts are plenty; quahaug, clams, and crabs are found here, though shell-fish are very scarce. Parties here talk of putting in lobsters and shad from Sacramento River this season. Salmon are not counted here, but are sold by the ton, live weight, at $20 per ton."

At Ellensburg, on Rogue River, Oregon, near its mouth, is a salmon cannery, belonging to Mr. R. D. Hume.

In Del Norte County, California, there is no sea-fishing of any importance. The salmon run in considerable numbers in Smith River in the fall, and at the town of Smith River there is a salmon cannery. Its product for 1880 was 7,000 cases. About 500 barrels have also been salted down. The total annual catch outside of salmon probably does not exceed 3,000 pounds.

Rogue River is fed in spring by melting snows from the mountains, and has consequently both a spring and a fall run of salmon. In spring, when the river is high, the water is fresh for a considerable distance beyond the bar.

The fish do their playing outside, and as soon as they reach the mouth of the river, run straight up. At this season they are therefore caught with gill-nets. In fall the water is salt or brackish

* Report U. S. Fish Commission, III, 1874, pp. 382–5.

† We now (1886) prefer the name *O. tschawytscha*.

for a considerable distance up-stream. The fish then enter the river and run up and down with the tides, usually starting up-stream when the first fall rain comes. During the fall they have to be caught with seines. The spring run this year was good, but the fall run promises to be light. *Nine thousand three hundred cases have been put up during the present year.*

A hatchery is in operation on Rogue River, and it is the intention of Mr. Hume, who controls the river, to use every effort to keep it stocked in case the expected falling off in the product of the Columbia River comes to pass.

Canneries have been in operation at Siuslaw and Umpqua Rivers, in Douglas County, but *both are now closed. More or less of salmon are salted on the Umpqua, Siuslaw, and Yaquina* Rivers.

The total catch of the entire coast, outside of fish taken by the Indians, will not vary far from 1,000,000 pounds.

2.—THE SALMON FISHERIES OF THE LOWER COLUMBIA.

1. THE SALMON.

The fishing interests of the Lower Columbia River are entirely concentrated in the canning of salmon. Their importance far exceeds that of all other fishing interests on the Pacific coast combined.

The species making up almost the entire catch on the Columbia River is the quinnat, or king salmon, *Oncorhynchus chouicha*, the chinnook salmon of the Columbia River canners.

This species usually begins running in the Columbia late in March, the principal run being from May to July. The laws of Oregon and Washington forbid the capture of salmon in March, August, and September, and from 6 p. m. on Saturday to 6 p. m. on Sunday.

As taken at the canneries early in the season, the average weight is 22 pounds, or 16 pounds when "dressed." Larger individuals, weighing as high as 70 pounds, are sometimes taken. The largest one seen by the writers weighed 58 pounds. Later in the season many smaller ones are taken, so that the average weight is then much less.

The following pages give in brief all that is known of the life history of the different species of salmon:

There are five species of salmon (*Oncorhynchus*) in the waters of the North Pacific. All of these are widely distributed and all are now known to occur in the waters of Kamchatka as well as in those of Alaska and Oregon. There is at present no trustworthy evidence of the existence of any other species on either the American or the Asiatic side of the ocean.

These species are (1) *Oncorhynchus chouicha*, the quinnat, chinnook or king salmon; (2) *O. nerka*, the blue-back salmon or redfish; (3) *O. kisutch*, the silver salmon; (4) *O. keta*, the dog salmon; (5) *O. gorbuscha*, the humpback salmon.

The different species, non migratory or imperfectly migratory, properly called trout, are excluded from this discussion.

Of these species, the blue-back predominates in Frazer's River, the silver salmon in Puget Sound, the quinnat in the Columbia and the Sacramento, and the silver salmon in most of the small streams along the coast. All the species have been seen by us in the Columbia and in Frazer's River; all but the blue-back in the Sacramento, and all but the blue-back in waters tributary to Puget Sound. Only the quinnat has been noticed south of San Francisco. The blue-back has not yet been noticed from any stream south of the Columbia.

Of these species, the quinnat and blue-back salmon habitually "run" in the spring, the others in the fall. The usual order of running in the rivers is as follows: *nerka*, *chouicha*, *kisutch*, *gorbuscha*, *keta*.

The economic value of the spring running salmon is far greater than that of the other species, because they can be captured in numbers when at their best, while the others are usually taken only after deterioration.

The habits of the salmon in the ocean are very imperfectly known. Quinnat and silver salmon of every size are taken with the seine at almost any season in Puget Sound. The quinnat takes the hook freely in Monterey Bay, both near the shore and at a distance of 6 or 8 miles out. We have reason to believe that these two species do not necessarily seek great depths, but probably remain not very far from the mouth of the rivers in which they were spawned.

The blue-back and the dog salmon probably seek deeper water, as the former is seldom or never taken with the seine in the ocean, and the latter is known to enter the Straits of Fuca at the spawning season.

The great majority of the quinnat salmon and nearly all the blue-back salmon enter the rivers in the spring. The run of both begins generally the last of March; it lasts, with various modifications and interruptions, until the actual spawning season in November; the time of running and the proportionate amount of each of the subordinate runs, vary with each different river. In general, the runs are slack in the summer and increase with the first high water of autumn. By the last of August only straggling blue-backs can be found in the lower course of any stream, but both in the Columbia and the Sacramento the quinnat runs in considerable numbers till October at least. In the Sacramento the run is greatest in the fall, and more run in the summer than in spring. In the Sacramento and the smaller rivers southward, there is a winter run, beginning in December.

The spring salmon ascend only those rivers which are fed by the melting snows from the mountains, and which have sufficient volume to send their waters well out to sea. Such rivers are the Sacramento, Rogue, Klamath, Columbia, and Frazer's Rivers.

Those salmon which run in the spring are chiefly adults (supposed to be at least three years old). Their milt and spawn are no more developed than at the same time in others of the same species, which will not enter the rivers until fall. It would appear that the contact with cold fresh water, when in the ocean, in some way caused them to turn toward it and to "run," before there is any special influence to that end exerted by the development of the organs of generation.

High water on any of these rivers in the spring is always followed by an increased run of salmon. The canners think, and this is probably true, that salmon which would not have run till later, are brought up by the contact with the cold water. The cause of this effect of cold fresh water is not understood. We may call it an instinct of the salmon, which is another way of expressing our ignorance. In general, it seems to be true that in those rivers, and during those years when the spring run is greatest, the fall run is least to be depended on.

As the season advances, smaller and younger salmon of these two species (quinnat and blue-back) enter the rivers to spawn, and in the fall these young specimens are very numerous. We have thus far failed to notice any gradations in size or appearance of these young fish by which their ages could be ascertained. It is, however, probable that some of both sexes reproduce at the age of one year. In Frazer's River, in the fall, quinnat male grilse of every size, from 8 inches upwards, were running, the milt fully developed, but usually not showing the hooked jaws and dark colors of the older males. Females less than 18 inches in length were rare. All large and small, then in the river, of either sex, had the ovaries or milt well developed.

Little blue-backs of every size down to 6 inches are also found in the Upper Columbia in the fall, with their organs of generation fully developed. Nineteen-twentieths of these young fish are males, and some of them have the hooked jaws and red color of the old males; others do not. Some of them apparently have never been to the sea.

The average weight of the quinnat in the Columbia, in the spring, is 22 pounds; in the Sacramento about 16. Individuals weighing from 40 to 60 pounds are frequently found in both rivers, and some as high as 80 pounds are reported. It is questioned whether these large fishes are: (*a*) Those which, of the same age, have grown more rapidly; (*b*) those which are older, but have, for some reason, failed to spawn; or (*c*) those which have survived one or more spawning seasons. All of these origins may be possible in individual cases; we are, however, of the opinion, that the majority of these large fish are those which have hitherto run in the fall and so may have survived the spawning season previous.

Those fish which enter the rivers in the spring continue their ascent until death or the spawning season overtakes them. Probably none of them ever return to the ocean, and a large proportion fail to spawn. They are known to ascend the Sacramento as far as the base of Mount Shasta, or to its extreme headwaters, about 400 miles. In the Columbia they are known to ascend as far as the Bitter Root Mountains, Spokan Falls, and the Falls of Snake River, and their extreme limit is not known. This is a distance of 600 to 1,000 miles.

At these great distances, when the fish have reached the spawning-grounds, besides the usual changes of the breeding season, their bodies are covered with bruises, on which patches of white fungus develop. The fins become mutilated, their eyes are often injured or destroyed, parasitic worms gather in their gills, they become extremely emaciated, their flesh becomes white from the loss of the oil, and as soon as the spawning act is accomplished, and sometimes before, all of them die. The ascent of the Cascades and the Dalles probably causes the injury or death of a great many salmon.

When the salmon enter the river they refuse bait, and their stomachs are always found empty and contracted. In the rivers they do not feed, and when they reach the spawning-grounds their stomachs, pyloric cœca and all, are said to be no larger than one's finger. They will sometimes take the fly, or a hook baited with salmon roe, in the clear waters of the upper tributaries, but there is no other evidence known to us that they feed when there. Only the quinnat and blueback (then called redfish) have been found in the fall at any great distance from the sea.

The spawning season is probably about the same for all the species. It varies for all in different parts of the same river, and doubtless extends from July to December.

The manner of spawning is probably similar for all the species, but we have no data for any except the quinnat. In this species the fish pair off, the male, with tail and snout, excavates a broad shallow "nest" in the gravelly bed of the stream, in rapid water, at a depth of 1 to 4 feet; the female deposits her eggs in it and after the exclusion of the milt they cover them with stones and gravel. They then float down the stream tail foremost. A great majority of them die. In the headwaters of the large streams unquestionably all die. In the small streams, and near the sea, an unknown percentage probably survive. The young hatch in about sixty days, and most of them return to the ocean during the high water of the spring.

The salmon of all kinds in the spring are silvery, spotted or not according to the species, and with the mouth about equally symmetrical in both sexes.

As the spawning season approaches the female loses her silvery color, becomes more slimy, the scales on the back partly sink into the skin, and the flesh changes from salmon red and becomes variously paler, from the loss of the oil; the degree of paleness varying much with individuals and with inhabitants of different rivers.

In the Lower Sacramento the flesh of the quinnat in either spring or fall is rarely pale. In the Columbia, a few with pale flesh are sometimes taken in spring, and a good many in the fall. In Frazer's River the fall run of the quinnat is nearly worthless for canning purposes, because so many are white meated. In the spring very few are white meated, but the number increases towards fall, when there is every variation, some having red streaks running through them, others being red toward the head and pale toward the tail. The red and pale ones cannot be distinguished externally, and the color is dependent neither on age nor sex. There is said to be no difference in the taste, but there is no market for canned salmon not of the conventional orange color.

As the season advances, the differences between the males and females become more and more marked, and keep pace with the development of the milt, as is shown by dissection.

The males have (*a*) the premaxillaries and the tip of the lower jaw more and more prolonged, both of them becoming finally strongly and often extravagantly hooked, so that either they shut by the side of each other like shears, or else the mouth cannot be closed; (*b*) the front teeth become very long and canine-like, their growth proceeding very rapidly, until they are often half an inch long; (*c*) the teeth on the vomer and tongue often disappear; (*d*) the body grows more compressed and deeper at the shoulders, so that a very distinct hump is formed; this is more developed in *O. gorbuscha*, but is found in all; (*e*) the scales disappear, especially on the back, by the growth of spongy skin; (*f*) the color changes from silvery to various shades of black and red or blotchy, according to the species. The blue-back turns rosy-red, the dog salmon a dull, blotchy red, and the quinnat generally blackish. In the case of the blue-back, the flesh grows pale in direct proportion to the external redness.

These distorted males are commonly considered worthless, rejected by the canners and salmon salters, but preserved by the Indians. These changes are due solely to influences connected with the growth of the testes. They are not in any way due to the action of fresh water. They take place at about the same time in the adult males of all species, whether in the ocean or in the rivers. At the time of the spring runs, all are symmetrical. In the fall all males of whatever species are more or less distorted. Among the dog salmon, which run only in the fall, the males are hook-jawed and red-blotched when they first enter the Straits of Fuca from the outside. The hump-back, taken in salt water about Seattle, shows the same peculiarities. The male is slab-sided, hook-billed, and distorted, and is rejected by the canners. No hook-jawed females of any species have been seen.

It is not positively known that any hook-jawed male survives the reproductive act. If any do, their jaws must resume the normal form.

On first entering a stream the salmon swim about as if playing; they always head towards the current, and this "playing" may be simply due to facing the flood tide. Afterwards they enter the deepest parts of the stream and swim straight up, with few interruptions. Their rate of travel in the Sacramento is estimated by Mr. Stone at about 2 miles per day; in the Columbia at about 3 miles per day.

As already stated, the economic value of any species depends in great part on its being a "spring salmon." It is not generally possible to capture salmon of any species in large numbers until they have entered the rivers, and the spring salmon enter the rivers long before the growth of the organs of reproduction has reduced the richness of the flesh. The fall salmon cannot be taken in quantity until their flesh has deteriorated; hence the "dog salmon" is practically almost worthless, except to the Indians, and the hump-back salmon is little better. The silver salmon, with the same breeding habits as the dog salmon, is more valuable, as it is found in Puget Sound

for a considerable time before the fall rains cause the fall runs, and it may be taken in large numbers with seines before the season for entering the rivers. The quinnat salmon, from its great size and abundance, is more valuable than all other fishes on our Pacific coast together. The blue-back, similar in flesh but much smaller and less abundant, is worth much more than the combined value of the three remaining species.

The fall salmon of all species, but especially the dog salmon, ascend streams but a short distance before spawning. They seem to be in great anxiety to find fresh water, and many of them work their way up little brooks only a few inches deep, where they soon perish miserably, floundering about on the stones. Every stream, of whatever kind, has more or less of these fall salmon.

It is the prevailing impression that the salmon have some special instinct which leads them to return to spawn in the same spawning-grounds where they were originally hatched. We fail to find any evidence of this in the case of the Pacific coast salmon, and we do not believe it to be true. It seems more probable that the young salmon, hatched in any river, mostly remain in the ocean within a radius of 20, 30, or 40 miles of its mouth. These, in their movements about in the ocean, may come into contact with the cold waters of their parent rivers, or perhaps of any other river, at a considerable distance from the shore. In the case of the quinnat and the blue-back, their "instinct" leads them to ascend these fresh waters, and in a majority of cases these waters will be those in which the fishes in question were originally spawned. Later in the season the growth of the reproductive organs leads them to approach the shore, and to search for fresh waters, and still the chances are that they may find the original stream. But undoubtedly many fall salmon ascend, or try to ascend, streams in which no salmon was ever hatched.

It is said of the Russian River, and other California rivers, that their mouths in the time of low water in summer generally become entirely closed by sand bars, and that the salmon, in their eagerness to ascend them, frequently fling themselves entirely out of water on the beach. But this does not prove that the salmon are guided by a marvelous geographical instinct which leads them to their parent river. The waters of these rivers soak through these sand bars, and the salmon "instinct," we think, leads them merely to search for fresh waters.

This matter is much in need of further investigation; at present, however, we find no reason to believe that the salmon enter the Rogue River simply because they were spawned there, or that a salmon hatched in the Clackamas River is any the more likely on that account to return to the Clackamas than to go up the Cowlitz or the Des Chutes.

"At the hatchery on Rogue River the fish are stripped, marked, and set free, and every year since the hatchery has been in operation some of the marked fish have been recaught. The young fry are also marked, but none of them have been recaught."

This year the run of silver salmon in Frazer's River was very light, while on Puget Sound the run was said by the Indians to be greater than ever known before. Both these cases may be due to the same cause, the dry summer, low water, and consequent failure of the salmon to find the rivers. The run in the sound is much more irregular than in the large rivers. One year they will abound in one bay and its tributary stream, and hardly be seen in another, while the next year the condition will be reversed. It is evident that often the salmon are swimming about in search of fresh water, and that they will enter the first river they find.

There has been much discussion pro and con among canners as to whether the hooked-jawed fall fish are really different species from the spring salmon, or whether they are merely different states of the same fish. Both views are in a measure true. Two additional species (*keta*, *kisutch*), not found in the spring, make up a large part of the fall run. On the other hand, the same species that form the spring run are also found in the fall, but so transformed that it is not strange that

they are not at once recognized. The idea that each river on any coast has its own peculiar species of salmon is grossly erroneous. The impression, prevalent for a time, that some twenty different species occurred in the Columbia, each with a peculiar time to run and to spawn, is also incorrect. The ability to tell a trout from a young salmon, or to recognize the same fish through all its protean changes, *has been vouchsafed to few of those who have written on them.* It is fair to say that the account written in 1740 by Steller, the first discoverer of these species, is to this day the most accurate notice of the different species.

The blue-back salmon, as above noticed, runs in the spring with the quinnat. It is a handsomer and more gracefully-formed fish, but much smaller, its average weight being 5 or 6 pounds and rarely exceeding 10. At the canneries four blue-backs are usually counted as one quinnat salmon.

With the salmon, in spring, a large trout is taken (*Salmo gairdneri* Rich), known as the steelhead or steel-head salmon. Its usual weight is about 16 pounds. It has no value to the canner, as its flesh is pale and its bones are not soft when boiled. Most of those seen in spring are spent fish, not yet recuperated from the last spawning season.

2. THE FISHERMEN.

There are about twenty-five hundred men employed in the salmon fishery of the Lower Columbia River, about half of them living in Astoria, the rest in the other canning towns. A discussion of their characteristics and nationality will be found in the chapters on fishermen, in Section IV. Their rate of wages and profits will also be discussed in another section of this report.

3. THE CANNERIES AND THEIR OUTFIT.

The canneries in operation in 1880 are the following:

OREGON.

Astoria.—Astoria Packing Company, Astoria Fishery (A. C. Kinney), John A. Devlin & Co., William Hume, George W. Hume.

Upper Astoria.—Anglo-American Packing Company, Badollet & Co., A. Booth & Co., Fisherman's Packing Company, J. O. Hanthorn & Co., Watson & Bauman, West Coast Packing Company, S. D. Adair & Co., James Williams & Co. (Tanzy Point).

Clifton.—Oregon Packing Company (J. W. & V. Cook).

Quinn's.—James Quinn.

Westport.—John West & Co.

Rainier.—Jackson & Myers.

WASHINGTON.

Unity.—Aberdeen Packing Company.

Knappton.—Joseph Hume.

Pillar Rock.—Pillar Rock Packing Company.

Fisherton.—Columbia Canning Company.

Eagle Cliff.—William Hume, Cutting Packing Company.

Eureka.—Eureka Packing Company.

Hapgood's.—Hapgood & Co.

Brookfield.—J. G. Megler & Co.

Cathlamet.—F. M. Warren.

Bay View.—R. D. Hume.

The average running outfit of each cannery is rather more than $30,000. The total amount of capital invested in the canneries is therefore from $900,000 to $1,000,000.

APPARATUS AND METHODS OF CAPTURE.—Each cannery is provided with some forty to fifty boats, which they rent to the fishermen. Very few fishermen—not fifty in all—have their own boats.

These boats are mostly made in San Francisco, but as they can be made in Astoria somewhat more cheaply than they can be bought in San Francisco, some of the canneries are having them made in their own establishments. They can be built in Astoria for $175, without paint or rigging; painted and rigged they are worth about $225. The boats are sloop-rigged, with flat bottom and center-board, and usually without deck. The chief danger which the Columbia River fishermen run is getting into the rough water on the bar. The breakers then turn the boats end over end and a deck would not prevent it.

The salmon are caught chiefly by means of gill-nets, although seines are used by some fishermen in the latter part of the season, when young fish of from 8 to 10 pounds are in the river. The young salmon count the same as the blue-back at the canneries, *i. e.*, four and a half count as one quinnat.

The gill-nets used are mostly made for the canneries by the fishermen. Some of the canneries employ a few fishermen to work for them during the winter, and repair their old nets and knit new ones. The nets average from 200 to 300 fathoms long and from 40 to 45 feet deep; mesh, 8½ inches. It takes about 170 pounds of twine to make a net, the twine worth about $1.10 per pound. Fishermen are paid 20 cents a fathom for knitting nets. The nets are worth about $300 to $400. There are two men and one net to each boat.

As competition between the canneries becomes more close the nets are being yearly increased in length. Formerly the nets were furnished by the fishermen, but now very rarely. The chief reason for this is that the custom of home canneries of taking fish and asking no questions as to how they were obtained led to the stealing of nets, and no fisherman could afford to run the risk of having his net stolen. When a net is cut loose from the buoys and ropes it cannot be identified.

When a fisherman has his own net he seldom "catches a steamboat in it." Fishermen working cannery nets often have them run into by steamers.

Most of the canneries keep an extra supply of nets constantly on hand, so that in the height of the season no boat need lie idle when a net is lost.

The number of boats on the river has been much increased in the last three years. Some firms thought that by doubling the number of boats the profits would be correspondingly doubled. Other firms had to increase their number similarly, and the result is that the average of fish per boat is greatly decreased. There is hardly room on the river for so many to fish at once. A hundred salmon boats may be counted at almost any time in sight at Astoria. No one cannery can, however, afford to reduce unless all the others should do so. The following record of the catch of Badollet & Co. will show the decrease in the average per boat with the increase of boats:

	1876 (18 boats).	1877 (40 boats).	1878 (45 boats).	1879 (45 boats).
April	1,015	1,830	5,216	9,407
May	19,165	17,825	27,723	31,668
June	30,661	19,474	22,781	25,119
July	33,900	31,081	31,735	31,904
Total	84,741	60,210	87,455	98,098
Average per boat.	4,652	1,505	1,943	2,179

One boat now carries three times as much netting as was formerly carried. The gill-nets, at first 125 fathoms, are now 350 fathoms long, and they are now made 45 feet deep.

The sea-lions and seals destroy immense numbers of salmon in the mouth of the Columbia. They watch the gill-nets, and take the caught salmon by the throat, devouring that choice morsel as it comes through the net, for a salmon is "gilled" just in front of the middle of the body. From a fishery point of view, the seal is an egregious nuisance.

4. PROCESS OF CANNING.

The salmon are brought to the wharf usually in the morning, counted and thrown in a heap. A Chinaman then takes each, cuts off its head, tail, and fins, and removes the viscera, throwing them into a large tub. Some of the cutters become very expert and will clean 1,700 fish per day.

Next the fish are washed and sometimes scraped with a knife, though the scales are not removed. Then they are placed in a trough in which several knives acting like a feed-cutter cut the salmon into sections as long as the height of a can. These sections are set on end and split by a Chinaman into about three pieces, one large enough to fill a can, the others smaller.

These fragments are placed on tables and Chinamen there fit them into the cans. Other Chinamen put on the covers, and still others solder them. In some canneries the soldering is done by machinery. In this case the cans are rolled along by an iron chain belt and the end rolls in the melted solder. Most of the canners think hand-soldering safer, although much more labor is required.

After soldering, the cans are placed in hot water and carefully watched to see if any bubbles rise from them indicating a leak in the can. If perfect the can is placed in an iron tank and boiled in salt water, it being possible to raise salt water to a higher temperature than fresh. After being boiled about one and one-fourth hours the can is taken out and vented, the pressure within driving out all the air through the aperture made. The hole is immediately soldered up, and the cooking completed by again boiling (one and one-half hours) in salt-water kettles. If the process of cooking were completed before the cans were vented, the pressure would be sufficient to burst the cans.

The cans are afterwards tested by being tapped on the head with a large nail. If the can is leaky it gives back a "tinny" sound easily recognized. This is a very important process, as some canneries lose largely by careless testing, the leaky cans afterwards bursting and damaging more or less the entire box. The cans are usually tested three or four times, and by different workmen. A leaky can is simply sent back to be soldered.

The cans are all made on the premises from sheet-tin imported for that purpose. The cost of the tin can is estimated at one-ninth of the cost of the can of salmon.

On an average three salmon fill one case of forty-eight 1-pound cans.

5. LABOR AT THE CANNERIES.

In the canneries a white foreman, book-keepers, and a few subordinate overseers are employed, and sometimes a few white boys or girls. The bulk of the work is done by Chinese.

Some of the Chinese, as the fish-cutter, the Chinese foreman, and other very capable persons, receive $40 to $45 per month. The most of them receive $1 per day of eleven hours and work as wanted, *i. e.*, leaving when told and coming at any hour set, only the time in which they are actually engaged being counted.

It is certain, in brief, that no white laborers could live and work on these terms, and that no cannery could be run in the present state of things with any profit with other than Chinese labor.

The Chinese come in April and go in August, and comparatively few return. Each man is employed directly without the intervention of agents of the Six Companies or any other person.

As a rule, the Chinese work very faithfully. They are never engaged in drunken riots, and their work is very uniform. On the other hand, they are not, as a rule, devoted to their employers. If dissatisfied, "they are the hardest class in the world to manage." They would "use a knife for 2 cents." There are not half a dozen Chinamen that "I would dare let their pay run over a day after due." They are inveterate gamblers, and their wages go from one to another as earned, to pay gaming debts. Some of the canners take pains to continue employment for such Chinese as show themselves tractable, in order to have leaven for next year's lump.

The white fishermen tolerate the Chinamen in the canneries because they know that the canneries must close were it not for them. It is, however, the unwritten law of the Columbia that any Chinaman daring to fish for salmon is to be killed on sight. So they do not fish.

The canneries employ from 100 to 200 Chinamen each. Badollet & Co. paid last year $13,000 to Chinamen. The entire amount paid by all canneries yearly to Chinamen is nearly $300,000.

6. PROFITS AND LOSSES OF THE CANNERIES; RECLAMATIONS.

PROFITS.—The business of canning salmon partakes more of the nature of a speculation than of a legitimate manufacturing business. That it shall not be run at a loss demands, of course, that the profits for the time being shall be very great. The season is only three and one-half months long, and the buildings, machinery, and outfit must lie idle for the rest of the year. The rate of interest is extremely high (12 per cent. or more), and the danger of loss through strikes in the active season is great. Finally, most canners are not strong enough to resist the necessity of forced sales through the action of speculative combinations. These men depress the market when the year's "put-up" is ready for sale. The bankers who furnish the money furnish it for "manufacturing and not for speculating purposes," and the canner is forced to sell for what he can get, unless strong enough to hold over, in which case the profits are reduced by loss of interest, or unless strong enough to ship directly to England.

Outside of losses through strikes and speculative combinations are several minor leaks, which may destroy all the profits.

RECLAMATIONS.—All cases exported are guaranteed, and security is given for the return of the money paid for all cases proving faulty. Whenever, through any means, a can is not perfectly sealed the salmon in it decays, pushing up the top. The can is then called a "swell-head." Sometimes such a can bursts and often the whole case is ruined by it. Great losses are thus often sustained, especially by those new in the business, from want of foremen and others fully competent to supervise the business. Two large canneries (at least) have been driven into bankruptcy through the great number of "swell-heads." One firm lost 35 per cent. of its shipment to Liverpool. The average reclamation amounts to 2 to 3 per cent. With some of the best established firms it is less than 1 per cent.

OTHER LOSSES.—Besides faulty canning one source of swell-heads is this: Some salmon are often left over from one day to the next and in the morning more are brought in. If these are piled on the first, the latter are left still another day, during which time they spoil, and if canned are still rotten salmon. If not canned they are a dead loss. Much money has been lost from not attending to the salmon in the order in which they are received.

Others lose through packing cans in green boxes, through economy. In the ship's hold the boxes sweat, the labels come off, and the saleableness of the salmon is depreciated if not the fish itself.

Some lose from leaving the canneries untenanted for the idle season, leaving boats to shrink, boards to be stolen, and things generally to go to ruin.

Some lose through not having a stock of nets, &c., sufficient to make up losses without delay.

There are also numerous minor leaks, which are known only to those thoroughly conversant with the business.

7. HISTORY OF THE CANNING INDUSTRY.

The Humes first began canning salmon on the Columbia, in a small way, about 1870, at Eagle Cliff. At first the salmon were obtained at about 10 cents each and sold at $8 per case. The first years were very profitable, except 1873, when loss was occasioned through the failure of numerous banks.

Since then improved methods have come in. Competition and strikes have raised the price of fish, and from 1876 to 1880 the river has become a perfect web of nets. In 1876, the river was first fished "for all that it was worth." The canneries on the lower river or "bay" are gradually "cutting out" those above, and to get fish enough now a fisherman must operate very near the mouth of the river. Some of the canneries 20 miles up the river now send their boats to Astoria and take up the fish on steam-tugs. The canneries above Astoria must, therefore, in the nature of things, be forced to suspend in time unless a change takes place.

It became evident three or four years ago to the canners that the supply of salmon would not last forever, and a contribution was first made to form a joint-stock company for the purpose of building a hatchery which should keep up the supply.

A fishery law was passed in Washington and in Oregon, to take effect in each district, if ratified by the other, substantially as follows:

(1) Fishing was prohibited in March, August, and September.

(2) Fishing was prohibited from 6 p. m. Saturday to 6 p. m. Sunday.

(3) Gill-net mesh should not be less than 4½ inches square, seines not less than 3, and traps should not have their slats less than 2½ inches apart.

(4) Licenses were charged as follows:

Each boat	$10 00
Each man with gill-net	5 00
Each dip-net	2 00
Each trap	50 00
Each seine	10 00

(5) The proceeds of these licenses should be applied to the propagation of salmon under the direction of a "fish commissioner of the Columbia."

A point on a tributary of the Columbia River was selected as being the most available for the purpose, and a hatchery was built. The support of the State and Territory has now been withdrawn, as the law under which it was given has been for some reason declared unconstitutional. Its future depends on the re-enactment of some similar law, as the hatchery cannot be kept up by voluntary contributions.

8. FUTURE OF THE SALMON FISHERIES.

As to the question of the diminution of salmon in the Columbia River the evidence appears somewhat conflicting; the catch during the present year (1880) has been considerably greater than ever before (nearly 540,000 cases), although the fishing since 1876 has been very extensive. On

the other hand, the high water of the present spring has undoubtedly caused many fish to become spring salmon which would otherwise have run in the fall. Moreover, it is urged that a few years ago, when the number caught was about half as great as now, the amount of netting used was perhaps one-eighth as much. With a comparatively small outfit the canners caught half the fish; now, with nets much larger and more numerous, they catch them all, scarcely any escaping during the fishing season (April 1 to August 1). Whether an actual reduction in the number of fish running can be proven or not, there can be no question that the present rate of destruction of the salmon will deplete the river before many years. A considerable number of quinnat salmon run in August and September, and some stragglers even later; these now are all which keep up the supply of fish in the river. The non-molestation of this fall run, therefore, does something to atone for the almost total destruction of the spring run.

This, however, is insufficient. A well-ordered salmon hatchery is the only means by which the destruction of the salmon in the river can be prevented. This hatchery should be under the control of Oregon and Washington, and should be supported by a tax levied on the canned fish. It should be placed on a stream where the quinnat salmon actually come to spawn.

It has been questioned whether the present hatchery on the Clackamas River actually receives the quinnat salmon in any numbers. It is asserted, in fact, that the eggs of the silver salmon and dog salmon, with scattering quinnat, are hatched there. We have no exact information as to the truth of these reports, but the matter should be taken into serious consideration.

9. SALMON OIL.

A factory for making oil from salmon-heads is in operation at Astoria, Mr. T. C. George being the proprietor. It was established last year, when 18,000 gallons were made, and sold at about 24 cents. The salmon-heads are bought from the canneries at the rate of 1,000 heads for $1. On an average, a thousand heads make 30 to 35 gallons of oil. The factory is only run during the canning season. The heads are cooked by steam, and the oil is run off from the top. The process is here rather crude, the factory not having yet ventured on improved machinery. After the salmon season this year Mr. George proposes to make oil from seals and bears. Many of the fishermen propose to use their gill-nets for catching seals and sea-lions after the salmon run. An oil factory in Upper Astoria has been leased by Mr. George, but is not now running. Another belongs to Watson, but is (probably) now silent. There is scarcely any oil in the viscera of *Oncorhynchus chouicha*. Salmon oil is usually mixed with other and dearer oils, and not thrown separately on the market.

The following is the record of a salmon oil factory at Astoria:

Capital invested		$2,000
Men employed	number	6
One boiler, one engine	horse-power	35
Average wages per day of ten hours		$2
Total paid in wages		$1,000
Length of season	months	3
Value of material		$3,500
Value of product		$7,000

10. STATISTICS OF SALMON-FISHERIES OF THE COLUMBIA.

Estimates of amount of salmon canned on the Columbia, 1860 to 1880.

[Mostly from printed circulars of salmon dealers.]

Year.	Number of cases of 48 pounds each.	Year.	Number of cases of 48 pounds each.
1869	26,729	1875	244,203
1870	93,730	1876	428,730
1871	84,805	1877	468,804
1872	43,606	1878	417,637
1873	102,722	1879	448,000
1874	291,021	1880	539,587

Estimates for whole river in 1880.

Total capital invested in canneries	*$1,100,100*
Total number of hands employed	4,000
Total paid in wages	$600,000
Total wages paid to Chinese	$500,000
Value of material consumed	$1,200,000
Value of product	$2,697,930

Pack of salmon on the Columbia River, 1875 to 1880.

[Tabulated by canneries.]

	1875.*	1876.*	1877.*	1880.†
	Cases.	*Cases.*	*Cases.*	*Cases.*
S. D. Adair & Co				11,000
Aberdeen Packing Company				12,500
Anglo-American Packing Company			13,247	16,000
Astoria fishery				29,700
Astoria Packing Company				35,000
A. Booth & Co	34,000	37,000	23,160	28,000
Badollet & Co		25,682	20,690	29,000
Bradley, Davis & Co			9,056	
Columbia Canning Company				12,996
Cutting Packing Company	20,000	24,681	16,866	16,500
Clackamas Packing Company			858	
J. W. & V. Cook				23,000
Dodge, Sweeny & Co	12,500	10,000	10,240	
Eureka Packing Company				18,487
Fisherman's Packing Company			14,955	28,000
Fitzpatrick, Davis & Co		20,375	10,540	
George W. Hume			11,277	25,500
Joseph Hume	25,000	21,800	22,056	19,000
William Hume	16,000	17,500	8,861	22,000
Do				9,500
R. D. Hume	20,000	48,000		19,000
Hanthorn & Co			14,092	28,000
Hepburn & Co			3,320	
Leveridge & Prindle			10,015	
J. G. Megler & Co	16,000	28,000	19,240	17,775
Oregon Packing Company	22,000	36,986	24,553	
Pillar Rock Company			6,645	16,000
James Quinn			2,977	5,400
Sternbergor & Co			84,029	
John West	15,000	13,870	7,595	15,932
F. M. Warren	10,000	28,500	16,968	15,000
West Coast Packing Company				14,306
Watson & Bannon	*13,000*	*17,500*	*6,858*	14,029
Watson Bros			8,144	
Hapgood & Co	18,000	21,425	11,718	16,335
Jas. Williams				16,638
John A. Devlin		21,500	19,056	17,000
Jackson & Myers		12,000	8,311	6,000
Kinney Bros		38,500	51,291	
	221,500	428,730	468,804	539,587

*Oregon Immigration Company. †From statements made to the Census Office by the different canners.

STATISTICS OF CAPITAL, ETC.

We have full statistics of the capital, number of men employed, wages paid, &c., of all but two of the canneries located in Oregon. The two not included are the canneries at Ranier and Quinn's.

The averages of these are given in the table below. Most of the remaining canneries are smaller than these here enumerated.

The total capital of the sixteen canneries in Clatsop County, above referred to, is $733,500, or, on an average, $45,844 each. An approximate estimate of the amount of capital invested in the remaining thirteen canneries, or those of Washington Territory and of Columbia County, Oregon, may be made by comparing their pack of salmon with that of the sixteen canneries in Clatsop County.

The average number of cases packed by the sixteen canneries is 22,256 each; by the thirteen, 14,115 each. Assuming that the pack of salmon is in proportion to the capital invested, which is generally true, we have $29,096 for each of the thirteen canneries, or $349,248 for the total. The total amount of capital invested in the canneries on the Columbia may therefore be set down as not far from $1,081,748, or say $1,100,000.

Other statistics for the sixteen Clatsop canneries are the following, to which an addition of about one-half more to each total will give an approximate total for the whole river.

Statistics for canneries in Clatsop County, Oregon.

	Average for each cannery.	Total for 16 canneries.
Capital invested (real and personal)	$45,844	$733,500
Greatest number of hands employed (at any one time)	179	2,862
Men (above 16 years)	89	1,426
Women (above 15 years)	11	174
Children		9
Number of hours per day	10 to 11	
Wages of skilled laborers	$2 55	
Wages of ordinary laborers (Chinese)	$1 26½	
Total paid in wages	$25,871 50	$413,304
Value of material consumed	$54,625 00	$874,000
Value of product	$68,295 00	$1,092,400

PRICES OF SALMON.

The business of canning salmon was first begun in 1863, on the Sacramento River, by William Hume, G. W. Hume, and A. S. Hapgood as Hapgood, Hume & Co.

The general price, wholesale, has usually ranged from $1.50 to $2; the lowest price before 1878 having been $1.25.

In 1878 the stock on hand was very large, and weak holders began to cut prices in order to realize. The price finally fell to $1 per dozen. Nearly all the salmon in the market was bought up by speculators, and the price rose to $1.40. The prices since have ranged generally from $1.10 to $1.20

Most of the salmon canned on the Columbia is shipped directly to England. The number of cases packed in 1880 (539,587) represents on an average three salmon to the case or 1,618,761 salmon. Each salmon when fresh weighs about 22 pounds, a total of 35,612,742 pounds. Adding an estimate for the salmon salted or consumed fresh, and we have a total of 38,500,000 pounds as an estimate of the total product of the Lower Columbia for the year 1880. Not half a million pounds of this is made of species other than the quinnat salmon (*Oncorhynchus chouicha*).

The total sum paid by the canners to fishermen in 1880 for salmon is about $809,380, or 50 cents each.

The total value of the pack, estimated at $5 per case, would be $2,697,930.

3.—STATISTICAL RECAPITULATION.

STATISTICS OF PACIFIC SALMON FISHERY AND CANNING INDUSTRY FOR 1880.

Number of persons employed	8,310
Capital invested	$1,381,900
Value of product	3,399,574

The total catch was 2,887,900 salmon, weighing 53,844,000 pounds. Of this amount 1,585,500 pounds were salted, 200,000 pounds smoked, 2,000,000 pounds sold fresh at San Francisco, 43,379,542 pounds canned, and the rest consumed locally or unaccounted for.

The extent of the canning industry was as follows:

	Canneries.		Number of factory hands.	Sold to the canneries.		Product of the canneries.		
	Number.	Capital.		Pounds of fresh salmon.	Value.	Cases.	Pounds in 1-pound cans.	Value.
Sacramento River	10	$100,000	800	5,305,000	$79,600	80,387	3,858,576	$400,935
Smith and Eel Rivers, California, Rogue River, Oregon, and vicinity	3	25,000	95	1,591,800	15,918	22,300	1,070,400	111,590
Columbia River	29	1,100,000	4,000	35,612,742	809,380	539,587	25,900,176	2,697,930
Puget Sound	1	4,000	15	198,000	1,560	3,000	144,000	15,000
Alaska	2	10,000	30	672,000	3,360	10,000	480,000	30,000
	45	1,239,000	4,940	43,379,542	909,818	655,274	31,453,152	3,255,365

SALMON CANNING AT PORT BLAKELY.

The salmon cannery of Jackson & Myers, formerly at Muchilteo, has now been removed to Port Blakely, on the west side of Admiralty Inlet opposite Seattle. Here salmon are abundant in summer and fall in the salt water and are taken with seines. During the past year (1880) the run has been very good, and 3,000 cases have been packed. The species chiefly taken is the silver salmon or "coho" (*O. kisutch*), with an occasional quinnat salmon. On alternate years (1877, 1879) there is a considerable run of the humpback salmon or "haddo" (*O. gorbuscha*), the female of which species is canned, the male thrown away or given to the Indians to be salted. These small salmon usually sell at the canneries at 3 to 5 cents each, twelve to fifteen of them filling a case.

The details of the Alaska salmon fishery, are fully discussed by Dr. Bean in another section of this report in connection with the fishing-grounds and fishery resources of Alaska. (See Section II, FISHING GROUNDS, pp. 81–115.)

Blank page retained for pagination

PART XIV.

THE FISHERIES OF THE GREAT LAKES.

BY LUDWIG KUMLIEN.

1.—THE POUND-NET FISHERY.

1. Fishing-grounds.
2. Fishermen.
3. Apparatus and methods of the fishery.

2.—THE GILL-NET FISHERY.

1. Fishing-grounds.
2. Fishermen.
3. Apparatus and methods of the fishery.
4. Preparation of the fish.
5. Financial arrangements.

3.—THE SEINE FISHERY; MINOR FISHERIES.

1. The methods and extent of the seine fishery.
2. Spearing and hook-and-line fishing.
3. Fishing with grapplings, fyke-nets, and dip-nets.

4.—STATISTICS OF THE FISHERIES.

Statistics of the fisheries of the Great Lakes in 1880.

Blank page retained for pagination

PART XIV.

THE FISHERIES OF THE GREAT LAKES.

By Ludwig Kumlien.

I.—THE POUND-NET FISHERY.

1. FISHING-GROUNDS.

The pound-net fishery is the most important carried on in the Great Lakes. It absorbs a greater amount of capital, employs more men, and yields larger returns than any other fishery, and its importance is annually increasing.

The position of the pounds is constantly being changed, some grounds which a few years ago were very productive being now almost abandoned, and others just coming into prominence, so that we can hardly do more than to point out the location of the more important grounds as they existed in 1879.

The most important stations in Lake Superior are located among the Apostle Islands. The majority of the nets are set from the shores of the islands nearest land. To the westward the stations occupied in 1879 were at the entrance to Superior City, Wis., at Bark Bay, and Siscowet Bay; eastward, in Chaquamegon and Bete Grise Bays, at Portage Entry, in Keweenaw, Huron, and Marquette Bays, the channel between Grand Island and the mainland, at Whitefish Point, and in Whitefish Bay.

In Lake Michigan, the most productive grounds are about the Beaver Islands and on the north shore east of Scott Point, on the west shore of Green Bay, and among the islands at its entrance. On the west shore of the lake there are numerous stations, the most important being near Jacksonport; at Whitefish Bay, between Two Creeks and Manitowoc; at Amsterdam, Port Washington, and Waukegan. At the head of the lake the principal stations are located between Michigan City, Ind., and New Buffalo. On the east shore pound-net fishing is not prosecuted to any considerable extent except in Little and Grand Traverse Bays. The only stations southward are at Good Harbor Bay, Big Point Sable, and near Ludington. The principal fisheries in Grand Traverse Bay are near Hog Island and in Northport Bay. There are others also on the north shore of Little Traverse Bay and near its entrance. Several nets are usually set at Point Waugoschance.

The Lake Huron pound fisheries are comparatively not of great moment. The principal grounds are located on the north and south shores of Thunder Bay and at the head of Saginaw Bay.

Among the most remarkable grounds in the lakes are those situated at the west end of Lake Erie. The whole shore from the mouth of the Detroit River to Lorain, several miles east of Vermillion, is occupied at short intervals by pounds. Kelley's Island and the Bass Islands are also favorite localities. There are other important stations at Dover Bay and between Willoughby and Painesville.

The pound-net fisheries of Lake Ontario are of minor importance. The few stations occupied are situated at the east end of the lake, near Sackett's Harbor and Cape Vincent.

The nets, with few exceptions, are set comparatively near shore. When a very large number are set in a line, however, as is the practice at the west end of Lake Erie and some other localities, the outer net, of course, is situated in quite deep water. The station for single nets most distant from land is probably that situated at the north end of Green Bay, midway between Point Peninsula and Summer Island. The nets set here are about 7½ miles from the nearest shore.

The kind of bottom most sought for is fairly hard clay covered with sand. If the bottom is too hard the great labor involved in driving stakes becomes a serious obstacle, while if too soft the stakes will not bear the weight of the net without becoming loose and unstable.

Pounds are seldom set in more than 75 feet of water, the average depth being about 35 feet. The deepest net in the lakes is situated off the north shore of Saint Martin's Island, at the entrance of Green Bay. The bowl stands in 97 feet of water. The stakes, which are three times spliced, are 125 feet in length.

2. FISHERMEN.

There is nothing peculiar characterizing the pound-net fishermen not shared by others. The owners are generally men having considerable capital and possessed of the ability to carry on a large business.

3. APPARATUS AND METHODS OF THE FISHERY.

NETS.—The pound-nets of the Great Lakes are of simple construction. Each consists of a leader, a heart-shaped pound, and a square bowl or pot. The length of the leader varies according to the situation of the net, from 30 to 85 rods, or from 500 to 1,400 feet, the average being about 50 rods. The size of the mesh is usually 6 inches, but in some localities is reduced to 4½ inches, and in others increased to 8 inches. At the east end of Lake Ontario, the size of mesh in leader, heart, and bowl is uniformly only 2 inches. The mesh of the heart is usually 5 inches, but varies from 3 to 7 inches in a few instances. The bowl or pot is generally about 30 feet square. In the largest nets, however, it is occasionally 40 feet square, while in the smaller ones 28 feet is a very common size. In Lake Ontario the pounds are smaller and the bowl is only 20 feet square. The mesh varies in size from 2 to 4 inches, the average being about 3 inches. In depth the nets vary very greatly, making it difficult to form an average. The widest differences are found among the nets in Green Bay. Some are set in a single fathom of water, while others are from 40 to 65 feet deep. The great Saint Martin's Island pound, already noted, which is 97 feet deep, may also be mentioned in this connection. The average value of the nets is about $350.

Besides the ordinary pound-nets there are others, known as "baby" pounds, employed in some localities.

BOATS.—Many different shapes and sizes of boats, from small skiffs to steam-tugs, are employed in the pound fishery. There is one, however, universally known as the "pound-net" boat, which is in use in greater numbers than any other. Those employed on the west shore of Green Bay may be regarded as typical, and we will therefore describe one of them.

The Green Bay "pound-net" boats are large, flat-bottomed, and broad of beam. Their average length is about 28 feet, their breadth of beam 9 feet, and their depth about 42 inches. They will carry from 60 to 80 half-barrels of fish, a safe load being 70 half-barrels, or about 10,500 pounds. They are usually sloop-rigged and carry long, heavy masts. They are constructed of rough boards, and commonly built by the fishermen. On each side of the center-board there is usually a covered bin.

These boats are moderately fast sailers, are very safe, and can run in 6 inches of water. When the nets are to be lifted they are taken into the bowl.

Various modifications are made in the shape and rigging of the pound-net boats in other localities. On the east shore of Green Bay they have no masts, being propelled entirely by oars. On the west shore of Lake Michigan, in the vicinity of Two Rivers, some have but one mast and a gaff-sail, while others have two masts. They are also somewhat better built than those in use in Green Bay, and are employed only in lifting the nets or when driving the stakes. Between Two Rivers and Port Washington again the boats are without masts. In the vicinity of Grand and Little Traverse Bays, on the east shore of Lake Michigan, some have masts and are rigged like Mackinaw boats, while others, particularly in Grand Traverse Bay, are without masts. The same obtains in the Straits of Mackinaw. In Lake Huron most of the boats are schooner rigged. At the west end of Lake Erie they are commonly used in transporting the fish. At Port Clinton, Sandusky, and Huron the boats are of fine model and large, and generally carry two masts. Many of them are 30 feet long and have a breadth of 10 feet, and will carry from 7 to 10 tons. The masts are from 35 to 40 feet high. At Bronhelm Bay the boats have two masts and are furnished with a gaff-topsail, but in the same sheet as the main sails. No jibs are employed. The Painesville and Willoughby boats are among the best on the lakes. They vary in length from 28 to 34 feet, and are 4 feet deep. They carry two masts.

The average value of the "pound-net" boats, at least those having masts and sails, is about $200.

Many Mackinaw boats are also employed in the pound-net fishery, particularly at Marquette, Lake Superior, and at Two Rivers, on the west shore of Lake Michigan. They are better adapted for cruising than the "pound-net" boats. Regarding the model and peculiarities of this boat, Milner says:* "The famous 'Mackinaw' of the lakes has bow and stern sharp, a great deal of sheer, the greatest beam forward of amidships, and tapers with little curve to the stern. She is either schooner rig, or with a lug-sail forward, is fairly fast, the greatest surf-boat known, and with an experienced boatman will ride out any storm, or, if necessary, beach with greater safety than any other boat. She is comparatively dry, and her sharp stern prevents the shipment of water aft when running with the sea. They have been longer and more extensively used on the upper lakes than any other boats, and with less loss of life or accident. The objection to the more general use of the Mackinaw is that her narrowness aft affords too little room for storage."

At Waukegan scows about 22 feet in length and 8 feet in breadth are employed. They carry 6 tons and are worth only about $60. A small boat, known as the "anchor" boat, is also used here in drawing the stakes and removing the fish.

Steam tugs are employed in the vicinity of the Straits of Mackinaw, at Escanaba, Green Bay, and in several fisheries on the west shore of Lake Michigan and the Beaver Islands, in connection with the off-shore nets.

* MILNER: The Fisheries of the Great Lakes. Report U. S. Commissioner Fish and Fisheries, Part II, 1874; Appendix A, pp. 13–14.

The firm of Grosse Brothers, of Little Suamico, Green Bay, employ two steam yachts late in the season in connection with their off-shore fisheries.

In the Lake Erie fisheries row-boats are employed in calm weather in place of the larger "pound-net" boats.

"Hayward" and "Huron" boats are also used in the pound-net fishery in some localities.

PILE-DRIVERS AND STAKE-LIFTERS.—In setting the pound-net stakes, pile-drivers, worked by steam or by hand, are employed in all the larger fisheries. The driver commonly used consists of a strongly-built raft carrying two uprights, from 10 to 25 feet in height, at one end, between which a block of wood, faced with iron and weighing about 150 pounds, works upward and downward. This weight or hammer is attached to a rope and suspended by means of a patent double block. When in operation the pile-driver is anchored at the four corners.

Driving stakes is considered the hardest work connected with the pound fishery. Under the most favorable circumstances, the weather being calm and the bottom clayey, four men can drive about twenty stakes in a single day. The stakes are driven into the bottom from 3 to 10 feet, according to their length and the character of the bottom.

On the west shore of Lake Michigan, in the vicinity of Two Rivers, the pile-drivers are built more substantially than in some other localities. On account of the frequent storms and heavy seas, they are not mounted on rafts, but on two pound-boats lashed together.

In removing the nets a sort of scow, about 30 feet long and 12 feet wide, is sometimes employed. It has a slit, about 2 feet wide and from 4 to 6 feet long, cut in the bow. When in operation the scow is run on to the stake, the latter passing to the end of the slit, where, by means of a low, stationary windlass, it is easily removed. Such scows are owned only by the wealthier firms, and are borrowed or hired by their neighbors.

METHOD OF FISHING.—The length of the fishing season varies largely in different parts of the lakes. In the upper lakes the season opens about the middle of May or the first of June, and closes ordinarily about the middle of September. At the west end of Lake Superior, however, some nets are removed in August, from the more exposed points, while at the Magdalen Islands they are allowed to remain until ice forms. In Green Bay some nets are removed in July and reset in October.

In Saginaw Bay, Lake Huron, and also to a greater extent in the river, pounds are allowed to freeze into the ice in fall, and are not removed until it breaks up in spring. A channel 2 feet wide is cut over the sides of the bowl, and the large cake of ice loosened is moved to one side when the fish are to be removed.

The season in Lake Erie opens about the middle of March or the first of April and closes in June. The nets are reset in fall for about two or three weeks during the latter part of September and the first of October, or until the weather becomes too stormy for fishing. In Lake Ontario the ordinary season is from June to October.

At the Green Bay fisheries, and indeed in nearly all localities, the nets are visited daily during the height of the season, if the weather permits. During summer, however, the fish are removed only once in three days. The fishermen go out early in the morning as soon as it is light. In the vicinity of Bronhelm Bay, Lake Erie, the nets are usually visited in the afternoon.

Three men are generally employed to work the nets, except in very heavy weather or when fish become unusually abundant, when the number is increased to four or five or even to seven.

In transporting the catch to market from the more remote fisheries, schooners are commonly employed. The boats of the dealers at Green Bay City and other towns on the bay cruise along the north shore and among the islands, and collect whatever supplies of fish the pound fishermen

may have for sale, and in return furnish them with the supplies of which they stand in need. Near the larger towns, both in Green Bay and elsewhere, the fish are brought in directly from the pounds in the pound-boats, and are generally shipped inland or to other distributing points by rail. At one fishery at Lake Erie, however, a steam tug is employed to tow the pound boats to and from the nets; this, however, is unusual.

FINANCIAL ARRANGEMENTS.—The nature of the apparatus used in pound-fishing and the outlay which it involves make it impossible for men of limited means to engage in it. The industry is therefore largely carried on by men who possess considerable capital and capacity for prosecuting a business of some magnitude. Fishermen are ordinarily hired, and the owners, especially of the larger fisheries, such as those on Lake Erie, although they may have a complete knowledge of the methods employed, rarely engage personally in fishing.

2.—THE GILL-NET FISHERY.

1. FISHING-GROUNDS.

The gill-net fishery is second only to the pound fishery in importance. It is carried on extensively, moreover, in some localities where pound-fishing is impossible on account of the nature of the coast, and during the winter season, when the pounds are not in operation, and becomes, therefore, in these places and at this time, of paramount concern.

The gill net grounds have already been described at length in the chapter devoted to fishing-grounds in general, and only their location will be given here.

The principal gill-net grounds of Lake Superior extend from the national boundary on the northwest shore to Grand Island, Michigan, on the south shore. East of Grand Island the only important grounds are located at Whitefish Point, and these are but a few miles in extent.

In the vicinity of the Straits of Mackinaw we find many grounds of greater or less extent and productiveness. The most easterly extends 16 or 17 miles southeast of Strong Island to Spectacle Reef. Stations of minor importance are located between Mackinac and Round Islands, west of Round Island, and north of Point Saint Ignace. Extensive grounds occupy the shore west of the Straits as far as Seul Choix Point.

Gull Island is surrounded by gill-net grounds, but it is owned by private parties and the fisheries are prosecuted only by them.

The only additional fishery on the north shore of Lake Michigan is at Point aux Basques.

The entire entrance of Green Bay, north of Washington Island, is occupied by gill net grounds. There are four principal ones, known as the "Sag Bay," "Saint Martin's Island," "Summer Island," and "Washington Island" grounds. The two former extend into Lake Michigan, the last two westward into Green Bay. The "Washington Island" ground far exceeds the others in size, but all are important and productive.

On the west shore of Green Bay we find but two localities where summer gill-netting is carried on. These are beyond the pound stations opposite Indian Village and Bark River. In winter, however, fishing is prosecuted all along the shore, but not extensively north of Menominee.

Limited grounds are situated in the vicinity of Green Bay City.

On the east shore of the bay a small amount of fishing is done in the vicinity of Chambers Island and at Sturgeon Bay.

On the west shore of Lake Michigan there are numerous grounds of varying importance. The most northerly is at the Cana Islands, a little to the north of Jacksonport. The next lies off Clay Banks, and a small one 4 miles farther south. None of these grounds are of great extent. Southward, however, stretching from Two Creeks to Manitowoc, is a large and much-frequented ground, *and one of the most important on the west side of the lake. Other grounds occur farther south,* beginning at Sheboygan and extending with occasional interruptions to within a few miles of the boundary line between Wisconsin and Illinois. The principal fishing is in the vicinity of Sheboygan, Milwaukee, Racine, and Kenosha.

Gill-nets are employed along almost the entire eastern shore of Lake Michigan, north of Michigan City, as far as Manistee, in Grand Traverse Bay, and from its entrance northward to the Straits of Mackinaw.

In Lake Huron the most noteworthy grounds extend northward from the entrance of Thunder Bay, and southward from the entrance of Saginaw Bay.

At the west end of Lake Erie there are two grounds of considerable importance, one opposite the village of Toussaint, and the other around Gull Island Shoal, east of the Bass Islands.

Eastward we find grounds of very great size, extending several miles in either direction from Erie, and far out into the lake. Others of nearly as great proportions lie off Ashtabula and Conneaut.

The gill-net fishery in Lake Ontario is of less importance than that carried on in the other lakes. Grounds of limited extent exist in the vicinity of Poultneyville, Fair Haven, Oak Orchard, Wilson, Braddock's Bay, Charlotte, and Colise Landing, at the east end of the lake.

2. FISHERMEN.

On account of the number of steam-tugs employed in the gill-net fishery, many men, such as engineers, pilots, and firemen, who are not strictly fishermen, are connected with it. Furthermore, participation in the gill-net fishery does not imply the possession of any considerable amount of capital, as in the pound fishery, and hence we find all classes of fishermen employed. Some own hundreds of nets and employ steam-tugs and other large craft; others possess only a small boat or two, and fish with scarcely more than a score of nets. As a class, the gill-net fishermen are, perhaps, the most venturesome men, and at the same time the most skillful seamen, of the lakes. In certain regions they set their nets near the shore, but in other localities they invariably fish at a distance of 20 or 30 miles from land, and frequently encounter storms, which, were it not for their skill in managing their boats, would inevitably overwhelm them. As we have already stated, however, disasters are comparatively rare.

3. APPARATUS AND METHODS OF THE FISHERY.

BOATS.—A great variety of boats are employed by gill-net fishermen, most important among which are the steam-tugs, and the boats known as the Mackinaw, the Huron or "square stern," the Hayward, the Carver, the Wheeler, and one called the Clinker, the name being descriptive of the manner in which it is built. Norwegian sloops are also used in some localities.

The Mackinaw boat has already been described in the chapter on the pound-net fishery.

The steam-tugs used in the fisheries are from 5 to 30 tons burden, modeled after the ordinary towing tug. They cost from $2,000 to $10,000 each. In the forward hold bins for storing fish and ice-boxes are built. The after third of the boat is housed over and used as a place of storage for the net-boxes. Rollers are arranged at the bow, over which the nets are hauled in. Tugs are used only with "heavy rigs," that is, with a large number of nets, and principally in off-shore fisheries.

The Huron or "square-stern" boat is employed principally in Lake Michigan. A few are also to be found at the east end of Lake Ontario. "It is the ordinary model of a schooner-rigged sail-boat, with less sheer than the Mackinaw, but with plenty of room for net, fish, or half-barrels. The better models are faster than than the Mackinaws. They are generally from 30 to 40 feet in length. In most of the regions where they are employed the fishing is done much farther from shore than in the 'light-rig' localities. An inquiry into the history of the loss of life and accidents among the fishermen of Lake Michigan indicates that these boats had suffered the most, partly, no doubt, because of their longer runs out from shore."*

The Huron is used in preference to the Mackinaw when it is desirable to carry a heavy load, the sharp stern of the latter not affording sufficient space for storage.

The Hayward boat, named after the maker, is a schooner-rigged craft, usually capable of carrying a five-ton load. Its average length is 32 feet, and its breadth of beam 8 or 9 feet. They are used principally on the east shore of Lake Michigan. A number were formerly owned at Thunder Bay, Lake Huron, but they have been superseded, with one exception, by Mackinaw boats.

The Carver boat, used exclusively at the east end of Lake Erie, is similar to the last described in shape and rig. They are from 24 to 30 feet in length, with from 6 to 9 feet breadth of beam. They carry two masts, and are schooner-rigged, generally with gaff top-sail, and some with jibs. The latter, however, are going out of use. The boats are worth from $200 to $225.

The Wheeler boat, used only in the vicinity of the head of Lake Huron, does not differ materially from the last two, except that it is clinker-built. It is usually larger and more valuable than the Carver, being generally 32 feet in length and costing $375.

"The Norwegian is a huge unwieldy thing, with flaring bows, great sheer, high sides, and is sloop-rigged. She is absolutely dry in all weathers, and though perfectly safe, and with ample room, is only used by the Scandinavian fishermen, most other fishermen objecting to her slowness and the great labor of rowing in time of a calm. These boats are in use in but very few localities. They are from 35 to 40 feet in length."* They carry about 200 yards of canvas. Some owners, perhaps rather rashly, claim that they are the fastest as well as the dryest boats. They assert that they can easily pass the lake schooners. They are worth about $300. Grand Haven is the principal place where they are employed. One was used at Racine, Lake Michigan, in 1878, but none in 1879.

NETS.—The gill-net of the lakes is usually about 40 to 45 fathoms in length, and from 13 to 18 meshes deep, the size of the mesh being from 4¼ to 5½ inches, stretch measurement. The average length is exceeded in some localities, however, being 65 fathoms at Bayfield, Lake Superior; about 75 fathoms in certain stations at the east end of Lake Erie; 90 fathoms at Two Rivers, Lake Michigan, and 100 fathoms in the Beaver Island region. At Saint Joseph and South Haven, the length is usually but 30 fathoms. Nets carried by the tugs are generally longer than those set from boats.

At many of the Lake Superior fisheries the nets are counted by the "box," each box containing from 450 to 500 yards in one piece. At certain fishing stations on Lake Michigan also the box is taken as the *unit of measure, but the number of nets in a box* varies somewhat with the locality.

The size of the mesh does not vary very much in the upper lakes, where the catch consists almost entirely of whitefish and trout, and the extremes of size employed there are about 3¼ and 6 inches. In most localities different sizes are employed at different seasons—the smaller in the spring and summer, the larger in fall. In Lake Erie the mesh of the whitefish nets varies from

* MILNER: Report U. S. Commissioner of Fish and Fisheries, Pt. II, 1874; Appendix A, p. 14.

4¼ to 4¾ inches, while in the pike-nets it is smaller, varying from ⅞ to 3¾. At Sackett's Harbor, Lake Ontario, the size of mesh employed for different species is as follows: For ciscoes, 2 inches; pike and bass, 3 to 4 inches; whitefish, 4½ to 5 inches; trout, 6 inches; sturgeon, 8 to 10 inches.

Some nets employed in Green Bay are only 4½ feet deep, and some in Thunder Bay, Lake Huron, 5 feet.

In certain localities the nets are buoyed by wooden floats and weighted with stones, while in other cork floats and lead weights are used.

Many nets were formerly knit by the fishermen's wives and daughters, but now they are usually made by machinery and purchased from dealers in the larger cities. At Two Rivers, Wis., however, a majority of the women and children spend most of the winter in making nets for local supply and for shipment to other fishing towns on Lake Michigan. Nets made of cotton twine are worth about $5.50, but linen nets are valued at $2 more apiece. Cotton nets are generally employed.

METHODS OF THE FISHERY.—There is no season of the year in which gill-nets are not in use in some part of the lakes. Summer is the least profitable season, and in some localities fishing is suspended altogether during the warmest weather, which occurs usually in July. With this exception the regular season lasts during "open-water" time, that is, while there is no ice in the lakes. Of course, the length of this season varies very considerably in different years and in different parts of the lakes in the same year. In the upper lakes it opens usually in April and closes in November, while in the lower lakes fishing begins in March and ends in December. Winter fishing lasts while the ice is firm.

"Open-water" fishing is prosecuted on all the grounds mentioned in the early part of this chapter, while winter fishing is confined principally to Lake Michigan, and is usually carried on at the outer limit of the warm-weather grounds, or even farther from shore.

Gill-net fishing with steam-tugs is essentially different from boat fishing. The tugs, like the large sail-boats, carry "heavy rigs" or many nets in contradistinction to the "light rigs" or smaller number of nets carried by small boats. Tugs usually carry from two hundred and fifty to four hundred nets, disposed in gangs of about forty nets each. They are set from the stern of the boat while it steams slowly along, and are taken in over the bows, where rollers are arranged to lessen the hardship. Nets are invariably anchored, but are frequently moved about considerably by the currents.

Some of the larger boats, as already stated, carry "heavy rigs," or from seventy-five to one hundred and eighty nets, but some of the smaller ones use but a score or two. The latter carry two or three men. The Lake Erie tugs carry about one hundred and twenty-five nets and keep three gangs of twenty-five nets each in the water at one time. The fishermen of Grand Haven always own four gangs of nets. When they go out to remove the fish, they carry a dry gang with them, which they set in place of the one "lifted;" another is left to dry in the fish-house, and the fourth does service when it is impossible to dry that recently "lifted."

The methods of the winter fishery are quite different. In Green Bay each fisherman owns from twenty-five to one hundred nets, which are set in gangs usually across the bay, and in deep water, 60 fathoms being a favorite depth. The men have little shanties with about 7 by 12 feet floor-space and 6 feet high, built light and covered with canvas and mounted on iron-shod runers.

In working the nets holes are cut in the ice at intervals of 100 feet. A pole, with a line attached and long enough to reach from one aperture to the next, is thrust under the ice. A net is fastened to the line and the latter is then hauled in at the second hole until all the net has passed under water at the first hole. This maneuvre is repeated until all the nets are set. In "lifting" the

nets the shanty is drawn over a hole and the fish removed from the nets on either side. Two men can manage about thirty nets. Similar methods are employed at the Saginaw Bay fisheries in Lake Huron, which are, perhaps, the most extensive winter gill-net fisheries on the lakes.

While the water is cold fish are removed from the nets about once in three days, but in warmer weather, when there is danger of their spoiling, they are removed every other day, or even daily. Fish caught in gill-nets do not ordinarily bring as high a price as those which are taken in pounds, for the reason that the former, if allowed to remain in the gill-nets for any considerable length of time, die, and are liable to decay, while the latter are sure to reach market in better condition.

4. PREPARATION OF THE FISH.

There are no peculiarities in the methods of preparing gill-net fish for market. A large proportion, however, are sold fresh, because in the more important gill-net fisheries, especially those carried on in the vicinity of, or in close communication with, the markets, only large fish are taken, which are too valuable to salt. Schooners are employed to a considerable extent by dealers to cruise among the Beaver Islands and along isolated portions of the shore to collect the products of the fisheries.

5. FINANCIAL ARRANGEMENTS.

In Section IV, devoted to fishermen, we have already alluded to the arrangements which hitherto existed extensively everywhere on the lakes, but which brought disaster to so many fishermen. It was usual for dealers to advance full outfits, including provisions, to the fishermen, and to look for pay in the fish which were to be caught. Although this system proved fairly successful in years of abundance of fish, it proved utterly ruinous to both fishermen and outfitters in years of scarcity. It found its most complete development in Green Bay, where the financial condition became at length critical. In 1876 one dealer alone at Green Bay supplied the fishermen, many of whom came from a long distance, with provisions to the amount of $25,000, the greater part of which amount remains still unpaid. At present, however, only a few reliable and well-known men are allowed credit, and others are obliged to pay at once for the nets and other necessaries which they receive.

In the large fisheries, in which steam-tugs are employed, the capitalists keep the apparatus under their own control and hire a sufficient number of fishermen to carry on the industry.

3.—THE SEINE FISHERY; MINOR FISHERIES.

1. THE METHODS AND EXTENT OF THE SEINE FISHERY.

The seine fishery of the Great Lakes has probably altered more in its general character than any other branch prosecuted. In the early days, when the fisheries were carried on in this region to but a limited extent, seine fishing was of the highest importance, but with the introduction of gill-nets and pounds, which enabled the fishermen to take much larger quantities of fish than it was possible to do by means of seines, the latter gradually disappeared; in fact, in a number of localities the seines were cut to pieces and used in the manufacture of pound-nets. At the present time the principal seine fishery of the lakes is that carried on in the Detroit River. This is very

extensive and important. The seines used here are large and are hauled ashore by means of horse-power, so that a large amount of capital is necessary to carry on the fishery. Seining, however, is also prosecuted to a greater or less extent at Marquette, Mich.; Whitefish Point, Lake Superior; Escanaba and Oconto, Green Bay; Milwaukee, Racine, and at several points at the east end of Lake Ontario.

As has been intimated, the seines used in the Detroit River are large, averaging not less than 60 fathoms in length and 30 feet in depth, with a mesh varying from 1¾ to 2 inches. In most of the other localities mentioned the seines are small affairs, worth usually not more than $20, and but few fish are taken in them. The ones in use at Escanaba, however, are about 70 rods in length, and are valued at $200 each. At Racine the seines are 100 fathoms long, the mesh being about 3 inches. About Port Ontario, at the east end of Lake Ontario, there are several seines in use, which are 200 rods long, and from 5 to 7 feet deep, the mesh varying from 3 to 3½ inches in different parts of the same net. All the seines are set from land, and, so far as could be ascertained, except at Detroit River, are drawn in by hand. The larger ones which are managed in this manner require at least eight men.

The principal season in which seine-fishing is carried on is the early summer, usually from June to the middle of July. In some localities, however, the seines are used both at this time and also in the fall.

As might be expected, a great variety of fish is taken in these seines, different fish being more or less abundant in different localities. The principal marketable species which are taken at Escanaba are pike, sturgeon, herring, and bass. In the Detroit River the catch consists mainly of whitefish and pike, known in this locality as "yellow pickerel." Large runs of herring appear frequently in the spring before the arrival of the whitefish, and some of the managers use seines with small meshes for taking quantities of this fish. At Port Ontario the catch is almost entirely of whitefish; a few sturgeon, suckers, and mullet, together with other varieties of minor value, are also taken.

There are no peculiarities in the manner of working the seines which it is necessary to mention, except, perhaps, some which obtain in the Detroit River. The seine-fishery is by far the most important branch prosecuted in the river, and the seines, with the exception of a few fykes and "baby-pounds," are the only form of apparatus employed. At each of the fishing stations is established a building for the accommodation of the men engaged in fishing and also for the storage of the fish, and near-by is a pen in which the fish may be kept until such time as they may be sent to market. These pens are constructed of planks and vary in size from a few feet to several acres. The boats employed in connection with this fishery are simple row-boats, 25 or 30 feet long, carrying eight men. In hauling in the seine two windlasses, moved by horses, are employed, to each of which is attached one end of the leading-line of the seine. The net and the windlass are so disposed that when the former is hauled in it reaches a spot near the opening of the pen, and the fish are very-easily transferred from it to the pound in which they are to be kept. Usually about sixteen hauls are made in each twenty-four hours, two gangs of men being employed.

No peculiarities exist in the method of preparing seine-fish for market, except, perhaps, that a large proportion of them are sold fresh. They do not, as a rule, bring a higher price than fish taken by other means.

2. SPEARING AND HOOK-AND-LINE FISHING.

Besides the three principal modes of fishing—pound-netting, gill-netting, and seining—which have been treated of somewhat at length in the previous parts of this chapter, there are several other methods, which, although not of great importance, are prosecuted to a considerable extent in certain localities. Among them we may mention spearing, hook-and-line fishing, grappling, fyke-net fishing, and dip-net or "scap"-net fishing.

SPEARING.—The principal locality at which spear-fishing is carried on is Saginaw Bay, where it is prosecuted by the ordinary fishermen.

In Saginaw Bay spearing is carried on only in winter. The grounds vary in proportion with the advance of the season and the thickness of the ice. Usually, however, few fishermen fish outside an imaginary line drawn from Shebewaing, on the east shore of the bay, to Point Aux Gres, on the west shore.

During a favorable winter a village of considerable size springs up on the ice, and all manner of supplies are brought out to the fishermen by the traders from the neighboring shore. So many fishermen congregate in the course of the season that it has been found profitable to carry out billiard tables for their amusement during the long winter evenings.

A writer in the Provincetown Advocate of February 28, 1877, gives the following account of the appearance of this singular village at that date:

"The fishermen on Saginaw Bay, Lake Huron, have erected a good sized town of shanties far out on the ice. The dwellings are of thin wood, lined with thick building paper, and are placed on runners so as to be moved from place to place. The slab city also boasts a hotel. The shanties dot the surface of the bay in all directions. The number is now over 300 and about 30 are being put up daily. The average number of occupants in each shanty is three men or boys, making not less than 1,000 persons already living on the ice. There probably will be twice that number during February, and they can remain there in safety until the middle of March."

The number of men engaged during the season of 1879 was about 400, a much smaller number than formerly.

The apparatus employed, in addition to the shanties already described, which stand in the same relation to the fisheries as the boats used in summer, consists of spears and lure-fishes. The spears are of the ordinary pattern, size, and weight. The lure-fishes are small blocks of wood, shaped like a fish, weighted on the under side by a small piece of metal, and furnished with metal fins and eyes. A cord is fastened to them and they are let down into the water, but not to a great depth, so that they may be watched readily by the fisherman. The fish mistake the decoy for their natural prey and attempt to seize it, bringing themselves within range of the fatal spear of the fisherman. The value of all the apparatus employed in 1879, including shanties, spears, lure-fishes, &c., was estimated at $4,500.

The daily catch of each fisherman is not less than 25 pounds. This amount, however, is small, compared with the yield of other years. Instances were given by the fishermen of the capture of from 400 to 600 pounds of fish by one man in a day. The fishery has declined very much within the last half-decade.

HAND-LINE AND TRAWL FISHING.—Angling for pleasure is carried on to a large extent with hand-lines in all the lakes during summer, but as the supply of fish obtained in this way varies extremely in amount and rarely enters into commerce, no account of it can be taken in the statistical tables. The trawl, however, is employed in many localities as a means of capture, for purely commercial ends. It is so employed to a greater or less extent at Racine, Chicago, Michigan City, Saugatuck, Toledo, Port Clinton, Toussaint, Sandusky, Vermillion, and a few smaller places.

The trawl, ordinarily called a "trot-line," "ground-line," "long-line," or "hook-rig," is very similar to the trawl-line used on the Atlantic coast. The form employed at Vermillion consists of a ninety-thread line, about 3 miles long, to which hooks attached to gangings 2 feet long are fastened at intervals of 16 or 18 feet. About 20 pounds of line are required for each mile. The line is anchored to the bottom, and has its position marked by a buoy at each end. Each trot-line is worth from $20 to $35.

At Sandusky and Vermillion the product of the trawl-fishery consists of catfish exclusively, but at most of the other places mentioned a variety of kinds are taken, among which trout and sturgeon are the most important. For the capture of catfish a variety of baits are used. At Sandusky all kinds of offal are employed, but at Vermillion herring is the principal bait, although large quantities of grasshoppers are used in summer, and oftentimes blackbirds. At Racine and at Chicago, however, where several species of fish are taken, minnows and "shiners" furnish the principal bait.

The depth at which the fishery is carried on varies very considerably. The cat-fishermen usually fish in shallow water from 35 to 50 feet deep, although in many cases at a considerable distance from shore. At Chicago, where a number of species are taken, the boats "run out 15 or 20 miles and sometimes farther. Setting their lines, which contain from five hundred to a thousand hooks each, baited with minnows before leaving shore, they continue on and run into Michigan City, and remain overnight. Starting early the next morning they take up their lines and arrive in Chicago during the day."*

The season for trawl-fishing usually lasts from March to October, but at Racine and one or two other localities fishing is prosecuted during the winter. The cat-fishermen expect to take about $3 worth of that fish in a day. The season of 1879 was an unusually profitable one for them in many localities, and the business is rapidly increasing in importance.

At Toledo, and probably at some other points, when quantities of catfish are taken too great to be disposed of profitably at once, they are kept in live-boxes until the demand increases. Of late years the fishermen have salted a large part of their catch and have disposed of it in the city to wholesale dealers and grocers, or have shipped them to various neighboring inland towns. This custom prevails also in other localities. The majority of the fish taken at Saugatuck by hook-fishermen are consumed in the immediate vicinity.

Ordinary hooks and lines are used at Buffalo in winter for the capture of pike and sturgeon. The fishermen are mainly sailors. In some winters as many as three hundred and fifty people are engaged in this fishery, but no ice formed in 1879, and consequently it proved a failure.

3. FISHING WITH GRAPPLINGS, FYKE-NETS, AND DIP-NETS.

GRAPPLING.—At Buffalo and in one or two other localities considerable quantities of sturgeon are taken by means of a three-pronged grappling-hook. The hook is dragged over the bottom by fishermen in boats, and the fish are impaled on its sharp prongs. All nets are prohibited at Buffalo, and consequently a large proportion of the sturgeon captured here are taken with these hooks.

FYKE-NET FISHING.—Fykes are used in many localities. Many of them are of small size and are not worth more than from $1.50 to $5.

At Green Bay City more fykes are used than elsewhere on Lake Michigan, at least one hundred and fifty of them being employed. At Huron the fykes in use are about 4 feet in diameter, with wings 6 rods in length. The catch here consists of bull-heads, perch, grass-pike, and black bass.

* MILNER: Rept. U. S. Fish Commission, Pt. 2, pp. 785, 786.

The most valuable fykes, however, are those used in Saginaw Bay. About one hundred are employed here, worth $10 each.

A considerable number of these nets are employed at the east end of Lake Ontario, but no particulars regarding them were obtained.

DIP-NET FISHING.—Besides the dip-nets used in taking fish out of pounds and for other similar purposes, there are some which are used as means of capture. At De Pere, near Green Bay City, about one hundred large dip-nets, from 5 to 7 feet square, and having a mesh of 3 inches, are employed. They are used by the farmers and others who live along the river for catching suckers, moon-eyes, and other non-commercial species, which they use as manure and as bait for catfish.

At Sault de Ste. Marie dip-nets are employed by the Indians in catching fish in the rapids. One Indian sits at the stern of the canoe to steer while another stands on the alert at the bow, dip-net in hand, and scoops in any fish which may be seen in the vicinity of the boat. Frequently several hundred pounds are taken in this way by one canoe in a day.

4. STATISTICS OF FISHERIES OF GREAT LAKES.

The fisheries of the Great Lakes in 1880 employed 5,050 fishermen and an invested capital amounting to $1,345,975. Included in the apparatus were 1,500 pound-nets, 44,544 gill-nets, 148 seines, and 1,656 vessels and boats. The fishery product was valued at $1,784,050, and aggregated 68,742,000 pounds of whitefish, trout, herring, sturgeon, and other species.

The full details of the extent of these fisheries in the several lakes will be found in another section of this report, and also in the Census volume on the Fisheries of the United States.

INDEX.

Page.

Abagadassett Point, Maine 719, 720
Aberdeen Packing Company 745
Acetic acid for preserving bait 350
Acipenser oxyrhyncus 622
sturio 678, 697
Acushnet River, fisheries of 668
Ahmodoc, name for cod 202
Aillik, Labrador 134, 135
Akutan Pass, Alaska, cod bank at 213
Alabama, mullet fishery of 577
Alaska, abundance of cod at 207
cod fishery of 121, 198, 209
fishing-grounds of 212
memorial concerning 211
native fishermen of 220
salmon industry, statistics of 753
Albemarle Sound, fisheries of 632
mullet in 560
Aleutian Islands, cod at 212
Alewife, blueback 688
dip-nets 671, 688, 702
drift-nets 688
fecundity of 686
gill-nets 642
fishery in Connecticut River 663
Kennebec River 720
Maine .. 687-690, 701, 702, 703, 704, 705, 708, 712, 714, 715, 720, 724
Mattapoisett River 668
Penobscot River 708
Taunton River 667
Wareham 669
York River 642
laws relating to 669, 670, 671, 689, 727
of Cape Cod 670
regulations of 713
menhaden called 329
natural history of 687
season in Maine 688
seines 688
set-nets 688
weirs 708
Alewives called blackbacks 669
catch of 700, 708, 712, 713, 715, 720, 722
in Chowan River 633-635
Delaware River 654
Massachusetts 667
Merrimac River 673
Neuse River 631
Potomac River 605

Page.

Alewives, catch of, in Rappahannock River 644
close-time for 727
dried 720
dry-salted 709
for cod bait 193, 436
manure 720
former abundance of 699
habits of 669
in Buzzard's Bay 602
Cape Fear River 626
Maine 678
Merrimac River 673
Monomoy weirs 602
Pamlico Sound 632
pound-nets 609
Santee River 624
methods of capturing 672, 688
curing 689
packing 637
pickling 689, 690
smoking 689
pickled 434
price of 670, 672, 702, 710
season for, in Ogeechee River 618
smoked .. 474, 481, 672, 689, 702, 704, 708, 713, 715
taken in mackerel nets 296
weirs 660
utilization of 689
varieties of, in Maine 688
Aliaska, young cod at 208
Allright Island, Magdalens 460
Altamaha River, shad fishery of 617
sturgeon fishery of 618, 622
Amchitka, Alaska, cod bank at 214
American Sardine Company 491, 495, 496, 520
American sardines, menhaden 330
Amherst Island, Magdalens 460
Ammodytes personatus 205, 220
Amsterdam, Lake Michigan 757
Anchors for cod dory 151
cod gill-nets 228, 229, 230
cod trawls 176
haddock trawls 236
halibut trawl 10, 11
on halibut vessels 6
Anchovies, herring as 519
imports of 522
statistics of 521
Androscoggin River, fisheries of 717, 723
headwaters of 674

Page.

Anglo-American Packing Company 745
Anguilla rostrata 678, 695
Anticosti, halibut fishery at 4, 17, 46, 47, 60
herring grounds at 461
" statistics of 439
trade with 459, 460
Apalachicola, mullet fishermen of 561
fishery of 576
Apostle Islands, Lake Superior 757
Apparatus of alewife fishery 689
bass fishery 694
cod fishery 126, 151, 175, 191, 220, 227
eel fishery 696
Great Lakes fisheries 758, 762, 767
halibut fishery 9, 110
herring fishery 428, 459, 475, 499
mackerel fishery 250, 278, 294
menhaden fishery 335
red-snapper fishery 587
salmon fishery 680, 732, 745
shad fishery 685
smelt fishery 690
sturgeon fishery 698
swordfish fishery 318
Applies, J., menhaden factory of 374–409
Appomattox River 638
Arctic Current at Labrador 136
Arctic Ocean, polar cod in 201
Ashby, Capt. Benjamin, on swordfish 317, 324
Aspee Bay, mackerel in 276
Assizes Harbor, herring fishery at 142
Astoria Packing Company 745
Astoria, Oreg., salmon canneries at 735
Atheresthes stomias 216
Atka, Aleutian Islands, cod at 201
Atkins, C. G 598, 611, 673
Atwater, Prof. W. O., on guano 363
Atwood, Capt. N. E 140, 158, 282, 290, 297, 299
Atwood, Samuel, trawls used by, in 1849 39
Augusta, Me 718
Auk, paroquet, at Alaska 215
Babson, Capt. F. J 281, 347
Babson, D. C. & H 471, 472
Badollet & Co 745
Bag-nets, construction of 691
mullet 569
smelt 691, 703, 709, 716
Baird, Prof. S. F ... 199, 227, 350, 369, 507, 551, 555, 605, 645
Bait, alewives for cod 193, 436
birds for cod 127, 152
bluefish for grouper 593
boxes in mackerel fishery 278
capelin for cod 127, 139, 146, 151, 183, 436, 437
catfish, moon-eyes for 769
clams for cod 141, 203
mackerel 281, 293, 346
cod and halibut for 112
for halibut 79
comparison of salted and iced 350
cutters for 282
cuttlefish for cod 216
delays in securing 193
difficulties of keeping 152
obtaining 152, 186

Page.

Bait, fish-eggs for herring 507
sardine 507
fishery for 431
menhaden 347
for cod-fishing 127
grouper 993
halibut, method of preparing 12
smelt 715
Saint Pierre fisheries 450
swordfish 323
fresh squid for cod 127
versus salt 168
from British provinces 127, 152
frozen 351
herring for 440, 455
cod 151, 184, 193
halibut 65
lady-fish for 588
furnished by fitters 132
giant squid for cod 185
groupers for 593
haddock for halibut 18, 35
hagdon for cod 131
halibut for cod 216
menhaden for 349
herring and lant for cod 139
for 426, 435
catfish 768
cod 160, 168
haddock 237
hake 242
halibut 18, 34, 432
statistics of 438
iced 351
herring for cod 183
in fresh-halibut fishery 12
haddock fishery 236
trawl-line cod fishery 151
jackfish for grouper 593
lady-fish for 587, 588, 593
leather-jackets for 587
mackerel 254, 293
for 280, 306
cod 131, 142, 151, 160, 193
hake 242
ground 287
preparation of 279
menhaden, consumption of 348
for 282, 330, 342, 345, 347, 349, 353, 362, 376
cod 193, 345, 436
haddock 236
hake 242
mackerel 255, 280, 281
in Grand Bank fleet 348
slivers for cod 133
method of catching 193
icing 152, 183, 193, 349, 350, 439
mill 160, 255, 282, 283, 346
mullet for grouper 593
on Pacific cod fleet 220
pens on cod schooner 150
pickled menhaden for halibut 112
porgies for halibut 42
porgy slivers for haddock 237

Page.

Bait, preservation of 185, 186
by chemicals 350
cold air 351
with acetic acid 350
quantity of herring used for 432
menhaden used for 282
used 151
red-snapper 587, 590, 593
refrigerators for 186
room on haddock vessel 235
salmon for cod 216
salt beef for grouper 593
salted clams for cod 127, 133, 151, 168, 220, 436
for red-snapper 587
herring for cod 220
squid for cod 127
salt fish for 593
in cod fishery 167
pork for grouper 593
sculpins for cod 216
seines for capture of 146
sharks for 587, 593
shrimp for Spanish mackerel 545
spurling for 499
squid for cod 151, 184, 199, 436, 437
red-snapper 588
supply on the Banks 440
toll, method of using 284
used on Grand Bank 152
Western Bank 152
yellow-fish for cod 208
Baiting cod hand-lines 127
hooks 193
trawls 154, 185
haddock trawls 237
halibut trawls 12, 112
station in Maine 423
stations 437
at Newfoundland 162, 454
Baker, Marcus 205
Balistes capriscus 586
Ballast in George's Bank schooner 191
Baltimore, fish shipped to 609
Spanish mackerel at 551
Bank Bradley, cod fishery on 142
mackerel on 276
method of fishing on 138
trawling on 160
Bank cod fishery with hand-lines 123, 125
Bank Orphan, mackerel on 276
Bank trawl-line cod fishery 148
Banquereau, abundance of halibut on 59
cod fishery on 124, 148
gear for fishing on 127
halibut fishery on 4, 55, 64
Baranoff Island, Alaska 212
Bark Bay, pound-net fishery at 757
Barnegat Inlet, pound-nets in 607
Barnstable district, pound-nets in 604
Barnstable, Mass., mackerel fleet of 307
Barometer, aneroid 171
variation of, at Greenland 96
Barrels, fish, size and quality of 434
for packing mullet 573

Page.

Barrels for packing shad 687
Barren Island Menhaden Works 383
Bar weir 500
Bass, black 768
catch of, in Neuse River 631
fishery of Great Lakes 766
Maine 716, 723, 725
laws regulating 665
former abundance of 695
in Connecticut River 662
Oswego 650
sea 590, 604
striped, catch of 700
in Maine 693–695
modes of capture of 694
mode of curing 695
taken in weirs 600
size of, in Maine 694
Susquehanna 650
yellow 650
Bass Islands 758
Bass River 671
Bath, Me., smoked herring at 488
smelt shipped from 693
Bathymaster signatus 214, 216
Bay, in herring smoke-house 476
Bay of Bulls, Newfoundland 163
Bay of Chaleur, mackerel in 276
Bay of Fundy, baiting at 183
hake in 241
mackerel in 276
menhaden in 329
Bay of Islands, Newfoundland 145, 461
cod fishery at 141
herring, value of 472
Bay of Saint Lawrence, halibut fishery in 4
Bay of Saint George, mackerel in 276
Bay the North, Newfoundland 442
Bay View, Wash 745
Bean, Tarleton H., ... 753
on Alaska cod fishery 121, 198
Bear Island, Maine 438
Beaufort, N. C., fishermen of 561
fishing-camp at 563
mullet at 578
Beaver Harbor, herring at 443
Beaver Islands, Lake Michigan 757
Becket-lines on halibut trawls 11
Belfast, Me., herring fleet of 438
mackerel fleet of 306
smoked herring at 488
Belkofsky, Alaska, cod at 212
native fishermen of 220
Bellesimore Bank, Labrador 147
Bering Sea, cod in 201, 214
salmon in 215
Bertram, J. G., on herring fishermen 427
Scotch herring cure 433
Bertram's "Harvest of the Sea," quoted 420
Bete Grise Bay 757
Beverly, Mass., cod fishery of 149, 150
Beverly vessels at Cape North 138
Biddeford, Me., herring fleet of 438
Big Point Sable, Lake Michigan 757

Page.

Bilbon, Spain, fish exports to 130, 146
Bird Rocks, halibut fishery at 4, 43
Birds at Shumagin Islands 215
eaten by cod fishermen 132
for cod bait 127, 152
Black Diamond, Cal., salmon fishery at 732
Blackford, E. G., on swordfish 317, 325
Black River, fisheries of 624
Bloater herring 473, 486
methods of curing 487
Block Island, mackerel drailing at 298
off 247
menhaden at 331
swordfish at 317
Blount's Creek, mullet in 560
Blueback alewife 688
salmon 740, 744, 745
Bluefish bait, menhaden for 347
catch of, in pound-nets 550
Rhode Island 606
destructive to nets 375
fishery 600
for grouper bait 593
red-snapper bait 587
gill-nets 530
in Buzzard's Bay 603
Chesapeake Bay 638
Maine 695
Massachusetts 667
pound-nets 608
Rhode Island pound-nets 604
mummichogs 555
taken with menhaden 375
Blue Hill Bay, herring fishery in 423
Blue Hill, Me 306, 438, 705
Boardman, S. L., on menhaden 355
Boats, Albemarle Sound 637
carver 763
Chinese 738
Connecticut River 666
gill-net, of Great Lakes 762
Great Lakes, number of 769
Hayward 760, 763
Huron 760, 763
in halibut fishery 10
Hudson River fisheries 659
mullet fishery 577
Neuse River fisheries 631
Pamunky River 643
rock and perch fishery 539
salmon fishery 732, 746
spot fishery 535
squeteague fishery 529
Mackinaw 759
menhaden, statistics of 361
Norwegian 763
on cod vessels 126, 137
Potomac River 645
Saint John's River 615
Susquehanna River 653
pound-net, of Great Lakes 758
salmon 746
seine, mackerel 250
menhaden 336

Page.

Boats, seine, mullet 566
shad 636
stake-net 659
steam, in Great Lakes fisheries 762
used in Labrador fishery 138
Wheeler 763
yawl 10
Bob-line for mackerel 300
Bogue Sound, mullet fishery in 575
in 556, 560
Boisbubert Island, herring spawning at 422
Boneless cod 225
in Alaska 229
hake 243
sardines 516
Bonito 602, 608
Bonne Bay, halibut fishery near 4
herring fishery at 461
Newfoundland 145
Bony-fish, menhaden called 329
Boone Island, mackerel off 247
Booth, A., & Co 745, 751
Booth Bay Harbor, halibut fishery from 39
Booth Bay, Me., cod fishery from 123
herring fleet of 425, 438
smoking at 474
Labrador fishery from 146
mackerel catch of 310, 311
fishery from 297
fleet of 306
trawling from 160
Boreogadus saida in Arctic Ocean 201
Pacific 200
Boston as a herring market 435
haddock fishery from 234, 235
herring fishery at 425
fleet of 438
mackerel catch of 309, 310, 311
fleet of 307
market fleet 3
pound-nets at 604
smoked-herring trade of 484
Boston Fish Bureau, reports of 268, 309, 310, 311
Bounty in Scotch herring fishery 427
to cod fishermen 144
vessels 130, 131
Bowen, Capt. D. C., on Pacific cod 203
Bowers Beach, Delaware 528
Bowers, W. W., on Pacific cod 200
Bow-nets, shad 629
Boxes for smoked herring 480
Braddock's Bay, gill-net fishery at 762
Bradley Bank, cod fishery on 137
Bradore, Labrador, herring at 142
Brail-net 570
Bremen, Me., herring fleet of 438
mackerel fishery at 297
fleet of 306
Brevoortia tyrannus 329, 490
Brier Island, halibut fishery near 4
Brightman, B. F., on menhaden oil 366
Bristol Bay, Alaska, cod at 201, 212
Bristol, Me., herring fleet of 425, 438
mackerel fleet of 306

Page.

Brit, herring called 420, 421
British Columbia, cod fleet of 200
herring statistics for 439
British fishermen in American waters 355
British provinces, bait from 127, 152
British provincials in fresh halibut fishery 6
George's Bank fishery 189
on mackerel fleet 248
Broadkiln Creek, Delaware 528
Brookfield, Wash 745
Brooklin, Me., herring fleet of 438
mackerel fleet of 306
Brook trout 521
canned 515
Brosmius, none in Pacific 200
Brown, Alexander 639
Brown, John 687, 694, 695, 716
Brown's Bank, abundance of halibut on 58
cod fishery on 124, 149, 187, 189
haddock on 234
halibut fishery on 4, 32, 42, 44
herring on 431
Brush weirs, advantages of 506
construction of *500*
for herring 429, 499
in Albemarle Sound 609
Maine 593
introduction of 475
Bryon Island, Magdalens 460
Buck, J. F. 426
Bucksport, Me 306, 432, 707, 709, 711
Buffalo Island, James River 642
Buffalo, sturgeon grappling at 768
Bugfish, menhaden called 329
Bughead, menhaden called 329
Bull-heads, fyke-net fishery for 768
Bunker, menhaden called 329, 340
Bunt of purse-seine 253
Buoy-line on halibut trawl 10, 11, 111
Buoys for cod gill-nets 228, 229, 230
halibut trawl 10
herring nets 430
used on cod trawls 176
Burnham, D. A., schooner, loss of 58
Burnham, George, on sardine industry 489
Burnham & Morrill 489, 495
Bush-net, Indian 646
Butterfish caught in weirs 342
in pound-nets 608
Buzzard's Bay, fisheries of 668
pound-net fisheries in 597, 603
Byron Island, halibut fishery at 43
Cabell, Col. William 642
Cabell, Dr. William, diary of 639
Cables on cod schooners 150
George's schooners 190
halibut vessels 6
hand-line cod vessels 125
Cadiz salt for mackerel curing 288
California, mullet fishery of 560, 576
salmon industry of 731–740
Camden, Me 706
herring cannery at 498
fleet of 436

Page.

Camden, Me., mackerel canning at 496
catch of 310, 311
fleet of 306
sardine packers at 520
Cameron, Daniel 159, 188
Campobello Island 500
herring at 422, 443
Camp of mullet fishermen 564
Canada benefited by American fisheries 291
menhaden bait exports to 353
statistics of herring fishery of 438, 439
mackerel catch in 308, 313
Canadian fishery on Banquereau 148
officers on menhaden bait 345
Cana Islands, gill-net fishery at 762
Canned brook trout 515
eels 496
fish, oil used on 515
halibut 42
herring 432, 438, 489
mackerel 306, 308, 309, 496
menhaden 330, 490
salmon industry 729–753
method of preparing 733, 747
statistics of 755
testing of 748
salt mackerel 496
sea trout 515
smoked herring 483
Spanish mackerel 550
Canneries, salmon 733
labor at 747
sardine 497, 508
number of 520
Canners, sardine, number of 520
wages of 523
Canning menhaden, method of 490
Cans, sardine, size of 515
Cape Amalia, Greenland 95
Cape Ann fishermen in Florida 615
pound-net fisheries of 597, 599
Cape Bauld, Newfoundland 135
Cape Bonavista, Newfoundland 135
Cape Breton, cod-fishing grounds at 137
halibut fishery at 4, 5
herring spawning at 420
mackerel off 276
Cape Cod, alewife fishery of 670
halibut fishery off 5
pound-net fisheries of 597, 599, 601
trap-fishing at 597, 599, 601
Cape Elizabeth, mackerel off 247
Cape Farewell, Greenland 95
Cape Fear River, fisheries of 625
Cape Flattery, cod at 200
Cape Harrison, Labrador 134
Capehart's fishing-shore 636
Cape Henlopen, squeteague fishery at 527
Capelin as cod food 208
for cod bait 127, 139, 141, 146, 151, 183, 436, 437
in Bering Sea 201
pursued by halibut 44
school of cod 205
seines for capture of 139

Page.

Cape Mugford, Labrador 134
Cape North, cod fishery at 138, 149
halibut fishery at 4, 5, 46
Cape Race, Newfoundland 135
Cape Ray, Newfoundland 135
Cape Saint John, Newfoundland 135
Carbonear, Newfoundland 162
Cardenas, mullet exported to 580
Carp in James River in 1769 639
Carritunk Falls, Maine 717
Carver boat 763
Casco Bay, fisheries of 724
herring fishery at 425
Cashe's Ledge, halibut on 37
Castine, Me 488, 707
herring fishery at 423
Cast-nets, mullet 559, 561, 563, 577
shad 620, 621
Catfish abundant in Cape Fear River 626
bait, herring for 768
catch of, in Delaware River 654
Susquehanna River 653
Ogeechee River 619
trawl fishing for 768
Cathance River 701
Cathlamet, Wash 745
Caton, Capt. J. C., on Pacific cod 203, 210
Caviar, sturgeon 698
Caviare, sturgeon, method of preparing 625
Cedar Keys, Fla 545
fishermen of 561
mullet fishermen of 561
fishery of 569, 576
Chalker, R. B 547, 664
Chalker, S. A 666
Chandler's River, fisheries of 702
Chaquamegon Bay 757
Charleston, S. C., fishermen of 561
menhaden factory at 332
mullet fishery at 561, 576
Charlotte, Lake Ontario 762
Chatham, Mass., mackeral fleet of 307, 310, 311
pound-nets at 602
Chatham Strait, cod in 201
Chebacco boats, fishing vessels called 29
Chebacco River, Massachusetts 667
Cheboy, menhaden called 329
Chenango River 645
Chernofisky Bay, Alaska, cod at 202, 205
Chesapeake Bay, description of 637
fisheries of 637
fishermen of 638
mackerel off 274
menhaden in 329, 331, 369
minor tributaries of 654
pound-nets in 548
Spanish mackerel in 545
statistics of fisheries of 638
Chester River 654
Cheticamp, mackerel at 276
Chicago, catfish fishery at 768
trawling at 767
Chickahominy River 638
Chicopee River 663

Page

Chinese in salmon canneries 747
on the Sacramento River 735
prohibited to fish 748
sweep-seine fishing by 738
Choptank River 654
Choctawhatchtee Bay 559
Chowan River, North Carolina 632
Chubs in California 737
Chugach Gulf, Alaska, cod at 212
Church, James, menhaden steamer first used by 368
Church, Joseph, & Co 343
Clackamas River, salmon hatchery on 750
in 744
Clams for cod bait 141, 203
mackerel bait 281, 293, 346
salted, for cod bait 127, 133, 151, 168, 220, 436
Clark, A. Howard 243, 260, 312, 470, 472, 497, 551, 559, 590, 667
on mackerel fishery 275
menhaden fishery 327
Clark's Bank, on George's 189
Clark & Somes, halibut fleet of 25
Cleghorn's theory of herring movements 419
Clifton, Oreg 745
Climate of Greenland 95
Maine 673
Clothing of cod fisherman 131
Clupea æstivalis 296, 619, 631, 688
harengus 420
mediocris 618
mirabilis 208, 220
sapidissima 578, 683
vernalis 631, 678, 687
Cobbosseecontee River 717, 721
Cobscook Bay 701
herring in 421
Cobscook River, fisheries of 701
Cod, abundance of, at Alaska 206
Alaska, value of 216
average size of 166
bait 182
alewives for 193, 436
capelin and squid for 151
for 146, 183, 436, 437
clams for 141
cuttlefish for 216
frozen herring for 151, 193
giant squid for 185
halibut for 216
herring for 183, 432, 435
mackerel for 142, 151, 193
menhaden for 193, 345, 436
slivers for 133
salmon for 216
salted clams for 133, 151, 220, 436
herring for 220
sculpins for 216
squid for 184, 436, 437
yellow-fish for 208
bellies, smoked 225
boneless 222
called ahmodoe 202
badatl 202
kelpbangers 202
sacht 202

Page.

Cod, called treska by Russians 202
capelin bait for 139
capelin school of 199, 203, 205
care of, in the vessel 129, 131
catch of, at Shumagin Islands 216
in Pacific 210
on George's Bank 188
caught on hake trawls 243
cost of producing cured 226
cruise, calendar of 164
cured, price of 226
day and night fishing for 153, 154
diseases of, at Alaska 208
dried 144, 220, 225
enemies of, at Alaska 208
fishermen, profits of 224
fishery, apparatus for 151
at Greenland 93
Iceland 94
Labrador 121, 134, 139, 142, 143, 145, 459
Magdalen Islands 460
Newfoundland 145
baiting stations for 454
bank hand-line 121, 123
trawl-line 121, 148
bounty in 144
by French at Newfoundland 135
care of the catch 129, 156, 179, 195, 221
condition of, in 1731 125
fishermen in 149
from Marblehead 125
gill-net 121
in Gulf of Saint Lawrence 121, 133, 149, 459
Pacific Ocean 210
menhaden bait in 348
methods of 151
fitting for 130
method of settling trip 157
of Alaska 121, 198, 209
Cape North 149
Marblehead 130
on Banquereau 148
Brown's Bank 124, 149, 189
George's Bank 121, 123, 124, 187
Grand Bank 123, 124, 148, 459
Green Bank 149
La Have Bank 149, 189
La Have Ridges 149
Roseway Bank 149
Sable Island Bank 124
Saint Peter's Bank 148
Seal Island Ground 124, 189
Virgin Rocks 148
Western Bank 124, 148
outfit for vessel in 132, 169
Pacific, capital in 223
methods of 220
products of 225
routine of 162
season at Alaska 205, 206
for 130, 187
on Grand Bank 148, 152, 166
Western Bank 152
vessels in 124, 149

Page.

Cod fishery with hand-lines 148
fishing, gear for, at Shumagin Islands 220
grounds 134, 148
in the Pacific 212
on George's 189
for halibut bait 12, 79, 112
fleet of San Francisco 217, 218
the Pacific 217
food of, at Alaska 206
capelin for 208
crabs for 207
hake for 208
halibut for 208
holothurians for 207
lant for 208
marine worms for 207
on Grand Bank 168
sculpins for 207
shrimp for 208
squid for 208
whiting for 207
yellow-fish for 208
gill-net fishery 231
at Newfoundland 230
gill-nets, American 229
at Newfoundland 229
for red-snappers 589
Norwegian 227
golden, in Alaska 199
handling of, on Pacific cod vessels 219
hand-lining for, methods of 128
herring and lant, bait for 139
school of 199, 203, 205
history of trawling for 158
in Bering Sea 214
brackish water at Alaska 202
Cape Cod weirs 600
school of menhaden 391
Okhotsk Sea 203
kench-cured 225
kenching of 221
lant-school of 199, 203, 205
large size in Gulf of Saint Lawrence 138, 159
liver oil of 157
livers, care of 181
for food 216
methods of catching 194
curing 132, 137, 140, 154, 156, 181
dressing 131, 154, 156, 178, 180, 195
pickling 222
salting 221
migrations of 166
natural history of 166
oil of 131, 225
Pacific, distribution of 200
food of 207
migrations of 204
natural history of 198
reproduction of 208
shape and color of 204
size of 202
parasites of, at Alaska 208
pickle-cured 225
polar, in Arctic Ocean 201

	Page.
Cod, polar, in Pacific Ocean	200
preparation of	222
process of splitting	180
red, in Alaska	199
roe of	157
school and gurry fish	167
schooling of, affected by sharks	206
at Alaska	205
schools of large-sized	139
schooner, deck plan of	150
interior plan of	150
seines	144
in Labrador fishery	142
small, for exportation	145
sounds	157
care of	182
spawning habits of	167
season of	124, 199, 208
splitter	180
splitting of	156
squid-school of	199, 203, 205
throater	180
tom, in Pacific	200
tongues and sounds of	225, 435
trawling trip for, report on	161
vessels at Shumagin Islands	217
construction of	129
washing of	129, 222
winter school of	199
young, movements of	206
Coffin's Island, Magdalens	460
Cohambee River, sturgeon fishery of	622
Cohasset, Mass., mackerel catch of	309, 310, 311
fleet of	307
Colding, on ocean currents	134
Coles River, fisheries of	677
Colise Landing, Lake Ontario	762
Collins, Capt. D. E	153, 154, 156, 437, 452, 454
Collins, Capt. J. W	57, 423, 424, 507, 525
journal of halibut trips by	65
on cod-fishery	121, 123, 148, 187
haddock fishery	234
hake fishery	241
halibut fishery	3, 43
mackerel fishery	247
Collinsville, Cal., salmon fishery at	732
Columbia Packing Company	745
Columbia River salmon, fishery for	740
statistics of	751, 753
Compass for dory	151
Concepcion Bay, baiting at	454
Conklin, B. F., on menhaden fishery	370
Connecticut, catch of mackerel in	306, 308
Spanish mackerel in	552
swordfish in	395
fishermen in Florida	592, 614, 615
Pennsylvania	646
on Savannah River	621
halibut vessels of	3, 4, 5, 9
history of menhaden industry in	368
mackerel fleet of	247, 307
menhaden fishermen of	332
statistics of	361
method of icing bait	350
Connecticut, mullet in	555
pound-net fisheries of	597, 606
smacks, bait used on	349
vessels in Florida	592
Maine	719
Connecticut River, early history of	660
fisheries of	659, 664, 666
pound-nets in	606
Cook, duties of	174, 293
on cod vessel	132
mackerel vessel	258
Cook's Inlet, Alaska, cod at	201, 212
Core Sound, mullet in	556, 560, 575
pound-nets in	570
Corks on purse-seine	336
Cottus polyacanthocephalus	208, 214, 216
Crabs as food for cod	207
cushion	535
horseshoe, in Cape Cod weirs	600
injurious to nets	535
in pound-nets	607
Sacramento River	737
Cranberry Islands, Maine, herring fishery at	423
fleet of	438
mackerel fleet of	306
Cran of herring, size of	427
Creole fishermen	562
Crews in trawl-line cod fishery	140
Crisfield, Md	547
Croatan Sound, fisheries in	632
Cuba, fish exports to	592
market for salted mullet	580
mullet roes exported to	575
Cuban mullet fishermen	562
Cultivator Shoal, George's Bank	37
Curing cod on shipboard	132, 137, 140, 154, 156, 181
Current, Arctic, at Labrador	136
Currents and tides at Greenland	104
Currituck Sound, mullet in	560
Cushing, Hon. Caleb, on trawling	159
Cushing, Me	297, 306, 438, 713
Cusk at Shumagin Islands	216
caught on hake trawls	243
none in the Pacific	200
Cutting Packing Company	745
Cuttlefish as cod parasites	209
for cod bait	216
of the Pacific	199
Cuttyhunk swordfish fleet	318
Cynoscion maculatum	527, 567
regale	527
species of	638
Dall, W. H., cited	215
on cod banks of Alaska	213
Damariscotta, ice fishing for smelts at	693
Damariscotta River, fisheries of	714
Dams, effect of, in the Susquehanna	650
Danes in Pacific cod fleet	218, 219
Dangers of cod fishery	155
George's cod fishery	188
haddock fishery	238
halibut fishery	20, 53, 56, 71
red-snapper fishery	589
Dartmouth, Mass., swordfish fleet of	318

Page.

Davidson, quoted 214
Davis Strait fishery, vessels in 110
fishing-grounds in 95
halibut fishery 90
methods of fishery in 93
route to 108
Day, Sir Francis, on codfish 199
Dead River, Maine 717
Deane, Samuel, on mackerel fishery 299
Deane's History of Scituate, quoted 301
Dearborn, H. A. S 37
Deblois, Capt. E. T., on purse-seining 269
Deck plan of cod schooner 150, 171, 190
haddock vessel 235
mackerel schooner 248
Deer Island, New Brunswick, herring at 422, 443, 505, 654
Deer Isle, Me., herring fleet of 438, 459
smoking at 474
mackerel fishery of 306, 310, 311
Delaware Bay 654
boats in 520
fishing-grounds in 527
menhaden in 331
pound-nets in 607
squeteague fishery in 537
sturgeon fishery in 543
Delaware, fishermen of 528
on Savannah River 621
menhaden statistics of 361
perch fishery of Southern 538
rock fishery of Southern 538
shore fisheries of Southern 527–541
spot fishery of 533
Delaware River, fisheries of 654
Dennis, Mass., mackerel catch of 310, 311
fleet of 307
Dennisport, Mass., fish-packing at 602
Deney's River, fisheries of 701
De Pere, dip-net fishing at 769
Destitution among Newfoundland fishermen 445
Detroit River, fisheries of 766
seine fishery of 765
seines used in 766
Digby chickens (herring) 474
Dip-net fishery on Great Lakes 747, 769
Dip-nets 619
alewife 671, 688, 689, 700, 702
salmon 682, 679
shad 686
smelt 692, 702, 709
striped bass 694
tom-cod 702
Disaster to vessels at Magdalen Islands 468
Diseases of cod at Alaska 208
Disco Bay, Greenland 95
Dismal Swamp Canal 637
Dodd, Capt. A. W 36
Dog-bodies, fishing vessels called 20
Dogfish, cod eaten by 209
destruction to nets 265, 295
in Cape Cod weirs 600
Pacific 206
Dories, equipment of cod 151
in Alaska cod fishery 220

Page.

Dories in haddock fishery 236
halibut fishery 10
method of fishing from 128
on hand-line cod vessels 126
Pacific cod vessels 218
Dory, description of 173
equipment for cod hand-lining 126
halibut, outfit of 10
in gill-net cod fishery 232
method of unloading 178
Douglass, Dr. William, on George's fishery in 1747 187
mackerel fishery 289
Dover Bay, pound-net fishery of 758
Dover, Del 538
Drag net mackerel fishery 295
mullet fishery 567
shad fishery, methods of 628
Drag-nets for shad 628
on Neuse River 631
Drag-seines in mackerel fishery 298, 299
Drailing for mackerel 298, 299
Dresden, Me 697
Dress of cod fisherman 131
Dried alewives 720
cod 225
method of packing 144
mullet 560, 572
roes 575
Drift-net mackerel fishery 296
shad fishery 626
Drift-nets, alewife 688
salmon 679, 700, 707, 718, 735
shad 625, 657, 685
sturgeon 622, 697
Drumfish taken in menhaden seine 373
in Chesapeake Bay 638
Dry fish prepared by Chinese 738
Drying sardine-herrings 511
Dry-salted alewives 709
mullet 579
Dutch nets in Albemarle Sound 630
Neuse River 628
Duxbury, Mass., mackerel fleet of 307
Dyer's River, Maine 716
Eagle Cliff, Wash 745
Eagle Preserved Fish Company 491, 493, 520
Earll, R. E 38, 123, 188, 332, 543, 553, 508, 509, 608, 614
on herring fishery 417
Labrador fishery 146
mackerel fleet 247
menhaden fishery 331, 332, 333, 337, 366
purse-seine 271
swordfish 317, 324, 326
East Lamoine, Me 498, 520
East Machias River, alewife fishery of 702
Eastport, Me., herring market at 435
fleet of 438, 459
smoking at 474
spawning at 421
torching at 420
mackerel fleet of 306
sardine canneries at 497
packers at 520
small herring at 490

Page.

Eastport, Me., smoked-herring statistics of 488
Eastern River, Maine 708, 719
Ebencook Harbor, herring fishery at 424
Edenton, N. C., fish shipped from 637
Edgartown district, pound-nets in 604
Edisto River, fisheries of 623
Eel fishery, methods of 696
of Maine 695–697, 704, 712, 716, 722, 724
season for 696
pots and baskets 696
spears 696, 703
traps, construction of 696
weirs, construction of 696
Eel River salmon fishery 739
Eels, canned 496
catch of 704, 716
destructive to shad 652
sturgeon roe 625
food of 696
in Buzzard's Bay 603
Connecticut River 662
Maine 678
Southern Delaware 539
marketing of 696
methods of capturing 696
spawning habits of 696
taken in weirs 600
trap for 668
Eggs, fish for bait 507
Electric lights in herring fishery 508
Elizabeth Islands, pound-net fisheries of 597, 602
Elops saurus 587, 588, 593
Ellsworth, Me 481
Ellwife, menhaden called 329
Enemies of cod at Alaska 208
England hake at Alaska 206
English mackerel fishery 296, 298
Englishmen in Pacific cod fleet 218, 219
mackerel fleet 248
Entry Island, Magdalena 460
Escanaba, seine fishery at 766
Escumenac Point, cod fishery off 142
Esquimaux Bay, Labrador 143
Essex, Mass., mackerel fleet of 307
Essex River, Massachusetts 667
Eureka, Wash 745
Evarts, Secretary William M 448, 449
Exeter River, New Hampshire 673
Exportation of cod 145
Exports of cod to Bilboa, Spain 130, 144
West Indies 144
herring from Newfoundland 470
menhaden for bait 353
mullet roes to West Indies 575
to West Indies 560, 580
pickled herring 471, 472
salmon 752
Export trade in grenpers 594
mullet 580
pickled herring 470
smoked herring 482
sturgeon 698
Fair, Capt. R 466
Fair Haven, Conn., gill-net fishery at 762

Page.

Fairhaven, Mass 307, 311, 603, 668
Fall River district, pound-nets in 604
Fall River, Mass., swordfish fleet of 318
Fall-traps, shad 620, 623, 638
Farmington River 659
Farallones, cod at 200
Fatback, menhaden called 329
Fayetteville, N. C., fisheries at 625
Fellows, W. W 675
Fertilizer, herring for 432, 438
menhaden as 335
Financial arrangements in halibut fishery 106
of fishermen 533
pound-net fisheries 605, 761
weir fishery 603
profits of cod fishery 157
halibut fishery 23
mackerel seining 208
shad fishermen 616
Finger-stalls 587
Finland, herring-smoking in 485
Finnan haddies 473
Fins, halibut 36
Fish-curing in Alaska 221
Fishermen, bait conflicts between 352
cod 137, 144, 149, 189, 217, 219
profits of 129, 219, 224
Connecticut River 666
Creole 562
Cuban 562
dress of 131
duties of 108
food of 132, 174
fresh halibut 5
gill-net of Great Lakes 762
Great Lakes 758
haddock 235
herring 427, 462, 475
lay of 506
number of 438
profits of 464
Hudson River 659
huts and camps of 564
in Pacific cod fishery 217, 219
salt-halibut fishery 106
mackerel 247, 277, 289, 306, 307
menhaden 332, 333, 334, 345
mullet 561
lay of 570
native, in Alaska 220
New Brunswick 460
number of, on Chesapeake Bay 638
cod vessel 132
of Albemarle Sound 637
Newfoundland 445, 454
Potomac River 645
Saint John's River 615
Susquehanna River 653
on swordfish vessels 318
profits of 130, 216, 533, 537, 562, 616, 622
red-snapper 590
wages of 589
relations of, to fishery 333
rock and perch 539

Page.

Fishermen, salmon, of Columbia River 745
shad, profits of 616
Spanish 562
sports of 163
spot 534
squeteague 528
sturgeon, profits of 622
superstitions of 107, 109
training-school for 149
Fisherton, Wash 745
Fisher, William J., on cod schooling 205
Fish-glue 363
Fishing-gear, cod, at Shumagin Islands 220
for dory hand-lining 127
of George's-men 191
Fishing-grounds at Newfoundland 135
for cod 121, 124, 134, 137, 148
frozen-herring trade 442
groupers 592
haddock 121, 234
hake 121, 241, 242
halibut 4, 37, 44
herring 419, 421–426, 461
mackerel 273, 276
menhaden 331
mullet 560
Pacific cod 212
porch 539
red-snapper 585, 588
rockfish 539
seining mackerel 247
Spanish mackerel 545
spot 534
squeteague 527
swordfish 317
in Croatan Sound 632
Davis Strait 95
nature of 168
on George's Bank 189
Fishing-lines of kelp and bark 220
Fishway at Lawrence, Mass 673
Flaking herring-sardines 511
Flatfish in Cape Cod weirs 600
weirs 342
Flemish Cap, fishery on 93
halibut fishery on 5
Flint Island, halibut fishery at 4
Flitched halibut 109
Flitching halibut, method of 114
Floating factories, menhaden 345, 378–409
Float-nets 643
Floats for cod gill-nets 228, 229, 230
herring nets 430
Florida, catch of mackerel in 552
grouper fishery of 592
mullet cast-nets in 569
fishery of 576, 577
red-snapper fishery of 585–592
river fisheries of 613
Flounder, arrow-toothed 216
fishery 349
Flounders, catch of, in Rhode Island 606
in Massachusetts 667
Rhode Island pound-nets 604

Page.

Flounders, menhaden, bait for 349
taken in weirs 600
Floyd, David G 369
Fly-hook, mackerel 279
Fog, dangers from 155
on Grand Bank 165
signals used in 171
Folk-lore regarding fish season 605
Food of cod on Grand Bank 168
fishermen 75, 109, 132, 174, 563
halibut 36, 118
mullet fishermen 563
Pacific cod 207
supplied by fishermen 132
Foreign fishermen 562
trade in pickled herring 471
Forest and Stream, quoted 321, 591
Fort Pond Bay, menhaden fishing in 375–409
Fortune Bay, bailing at 183
halibut fishing in 5, 44
herring fishery in 445, 461
value of 472
international difficulty at 146, 186
methods of fishing at 450
natural dangers at 444
Newfoundland 442
France, fish-oil manufacture in 368
sardine industry in 489, 513
Franklinville, N. Y., menhaden at 373
Frazer's River, salmon in 740, 744
Frederica, Del 528
Fredericksburg, Va., shad-fishing at 644
Freeman's History of Cape Cod, quoted 301
Freezing herring, methods of 452
French cod fishery, bait for 450
on Saint Peter's Bank 148
fishery limited by convention of 1818 148
Frenchman's Bay hake fishery 242
Frenchmen in fresh-halibut fishery 6
George's fishery 189
on mackerel fleet 248
French method of trawling 158, 160
Friend, Capt. Israel 37
Friendship, Me 295, 306, 425, 438
Frozen bait 588
herring fishery at New Brunswick 452
methods of 450
fishing-grounds for 442
for bait, first use of 440
cod bait 183
food 456
industry 439–458
markets for 455
method of packing 455
methods of preparing 453
price of 456
statistics of 456, 457
trade, crews in 443
origin of 456
statistics of 457
used for smoking 485
vessels 443
meats 351
smelts 693

Page.

Frying sardines 514
Fyke-net fishery of Great Lakes 767
fishing for salmon 737
on Great Lakes 768
Fyke-nets 623, 668
in Detroit River 766
Pamunky River 643
Susquehanna River 653
Fykes, smelt 693, 703, 722
Gadus auratus, in Pacific 198
macrocephalus, in Pacific 198
morrhua, in Pacific 198, 200
Gaff, mackerel 279
Gale, definition of 67
Galeorhinus galeus 206
Gardiner's Bay, menhaden fishery in 371–409
George's Bank, abundance of halibut on 36
cod fishery on ... 121, 123, 124, 187, 191, 196
bait in 436
care of the catch 195
history of 30, 187, 197
menhaden bait in 348
methods of 191
profits of 196
season for 189
dangers of fishing on 38
deep-water halibut grounds on ... 60
first halibut trips to 30
fishing fleet on 188
grounds on 189
fleet, fitting out of 196
haddock on 234
halibut fishery 3, 4, 5, 26, 27, 29, 34, 37, 40, 44
methods of 18, 19
flitches from 91
herring on 421, 431
mackerel on 247, 274, 276
strong tides on 194
schooner, outfit of 190
Georgetown, Me 39, 272
Georgia, mullet fishery of 576, 577
river fisheries of 613
Germans, consumption of herring by 435
on Pacific cod fleet 218, 219
Germany, herring imports from 493
sardine industry in 489
Gib-keelers, mackerel 267
Gigging, mackerel 302
Gilbert, Charles H., on salmon fishery 729, 731
Gilling-seines, shad 657
Gill-net cod fishery 121, 231
fishermen of Lake Ontario 762
fishery for mackerel 294
methods of 764
of Great Lakes 761
Lake Erie 762
Lake Huron 762
Lake Michigan 762
Lake Superior 761
shad statistics of 666
steam-tugs in 762, 764
fishing for bait 431
menhaden 341

Page.

Gill-net fishing grounds on Great Lakes 761
Gill-nets, alewife 642
cod, American 229
at Newfoundland 229
Norwegian 227
construction of Great Lakes 763
for capture of bait 193
rock and perch 540
spot 535
herring ... 427, 429, 430, 450, 451, 462, 464, 476, 642
in Susquehanna River 651
menhaden, construction of 341
methods of setting 547
mullet 568, 575–577
number of, on Great Lakes 769
salmon 707, 732, 739, 746
shad 615, 618, 619, 621, 623, 630, 645, 665
smelt 692
Spanish mackerel 546
squeteague 530
striped bass 694
sturgeon 619, 622
tried in red-snapper fishery 589
Gladding, Edward, & Co 606
Gloucester, Mass., as herring market 435
cod-trawlers 150
exports of herring from 472
foreign trade in herring 471
frozen herring at 440, 456
George's cod fishery 188, 197
haddock fishery 234, 235
halibut fishery 3
herring fishery 425
fleet 425, 438
Labrador fishery company at .. 138
mackerel cannery at 497
catch of 309, 310, 311
fleet of 307
net fishery 295
menhaden bait at 347
baiting fleet of 335
method of icing bait at 350
mullet fishery 559
pound-nets at 604
swordfish fleet 318
trawl-line cod fishery 149
Glue from fish 363
Gob-stick on cod-fishing vessels 127
Goodale's extract of menhaden 330
Goode, G. Brown ... 472, 490, 545, 555, 570, 577, 606, 607, 614
on cod fisheries 121, 123, 148, 187
haddock fishery 234
hake fishery 241
halibut fishery 3
mackerel fishery 247
menhaden fishery 327
swordfish fishery 315
Good Harbor Bay, Lake Michigan 757
Gordy, J. P 255, 267
Gottenborg, herring exported to 471
Gouldsborough, Me., herring fleet of 438
Gouldsborough, West, Me., fisheries at 704
Grand Bank, cod bait on 151
fishery 123, 148, 152, 459

	Page.
Grand Bank cod fishery, bait in	436
fishing-grounds on	124
natural history of	166
season for	152
fishing-grounds on	162, 163
flitched halibut from	91
French method of trawling on	160
halibut fishery on	4, 5, 27, 28, 29, 45, 47, 51
from	64
on eastern slope of	61
fleet, menhaden bait on	348
night fishing on	153
weather on	162, 164, 165
Grand Manan, frozen herring from	441
herring fishery at	505
fishing-grounds at	442
spawning at	421
mackerel off	276
weirs at	500
Grand Traverse Bay, gill-net fishery in	762
pound-nets in	757
Grappling for fish on Great Lakes	768
hook of Great Lakes	768
Grass-pike, fishery for	769
Great Britain, fishery difficulties with	448
herring at	419
Great Lakes, dip-net fishery on	767, 769
fisheries of	755–769
fyke-net fishing on	768
gill-net fishermen of	762
fishery on	761
grappling for fish on	767
hand-line fishing on	767
hook-and-line fishing on	767
pound-net fishery, methods of	760
scap-net fishery on	767
seine fishery of	765
spearing fish on	767
statistics of fisheries of	769
trawl fishing on	767
Green Bank	54
cod fishery on	149
halibut fishery on	4, 54, 65
on	63, 64, 89
Green, Benjamin	504
Green Bay City, fyke-net fishery at	768
Green Bay, gill-net fishery at	761
Lake Michigan	757
pound-net boats	759
fishery	760
seine fishery at	766
Greenfish at Alaska	216
Greenland, abundance of halibut at	91
climate of	96–105
cod at	93
halibut fishery	90, 91, 110
harbors at	105
route to	108
salmon fishery at	93
Greenport, N. Y., halibut fleet of	9
menhaden works at	373–409
swordfish fleet of	318
Green, R. C	458
Greentail, menhaden called	329
Griffin Brothers	492
Grilse salmon	741
Grindstone Island, Magdalens	460
Grosse Island, Magdalens	460
Grosswater Bay, Labrador	140
Ground-line of halibut trawl	10, 11
Grouper	591
abundance of	595
bait, bluefish for	593
jackfish for	593
lady-fish for	593
mullet for	593
fishery	592
apparatus of	593
care of catch	593
methods of	592
Groupers, export trade in	594
fishing-grounds for	592
for bait	593
method of pricking	587, 593
value of	589, 592
Guano, French manufacture of	368
from skate	600
menhaden	342, 638
statistics of	330, 360, 361
Peruvian	362
porgy	600
Gulf of Maine, mackerel in	247, 276, 305
menhaden in	331
Gulf of Mexico, catch of Spanish mackerel in	552
menhaden in	329
mullet fishery in	568
in	558, 561
red-snapper grounds in	585
Spanish mackerel in	545
Gulf of Saint Lawrence cod fishery	121, 133, 139, 145, 148, 149, 459
cod grounds in	137
halibut movements to	63
itinerary of trip to	292
mackerel fishery in	34, 141, 275, 276, 284, 291, 309, 310, 311
mackerel fleet	310, 311
grounds in	276
purse-seines in	247
Gull Island, gill-net fishery at	761
Gully, halibut fishery at the	4, 29, 46
Gurry, throwing overboard the	168
Gymnacanthus galeatus	214
Hack-trap	620, 623
Haddam, Conn	662
Haddock bait, herring for	237, 435
menhaden for	230
caught on hake trawls	243
fishermen	235
fishery	158
Captain Atwood on	159
care of the catch	239
dangers of	238
fifty years ago	241
methods of	236, 237
of New England	121, 234
outfit for	240
productiveness of	239

	Page.
Haddock fishery, profits of	240
season for	188
fishing-grounds for	234
for halibut bait	12, 18, 35, 193
great abundance of	159
icing of	239
large fares of	240
method of dressing	239
none in the Pacific	200
on Grand Bank	178
roe of	239
smoked	473
trawls	236
vessels	235
Hadley, Mass., shad fishery at	660
Hagdons for cod bait	127, 131
Hags eaten by cod-fishermen	132
Hake as cod food	208
at *Shumagin Islands*	216
bait, herring and mackerel for	242
menhaden for	242
boneless	243
England, at Alaska	206
fishery for	121, 241
apparatus of	242
methods of	242
products of	242
vessels in	242
fishing-grounds	241, 242
for *halibut bait*	12
method of splitting	242
none in the Pacific	200
oil of	242
size of	242
sounds, isinglass from	242
method of drying	243
saved by halibut fishermen	24
total catch of	243
trawls	242
Halibut, abundance of, on Brown's Bank	58
George's	35
Grand Bank	58
Green Bank	63
La Have Ridges	58
Western Bank	59
activity of	18
as cod food	208
at San Francisco	42
Shumagin Islands	216
bait, cod and halibut for	112
haddock for	18
herring for	18, 34, 432, 435
menhaden for	112, 349
porgies for	42
bleeding of	19
breeding-ground of	60
called little bulls	58
canned	42
care of, on vessels	20, 35, 41
live	33
causes of decrease of	44, 118
chicken	178
culling	23
decrease of	43
deep-water fishery for	5
grounds for	60
difficulties of catching	17
fins of	132
pickled	30, 106, 114, 435
fishery, apparatus of	10
at Cape Amalia	95
Greenland	90
Iceland	94
baits used in	12
dangers of	20, 53, 56, 71
disposition of catch	21
effects of gurry on	117
financial arrangements in	24, 106
fresh, review of	3
from Maine ports	38
history of	29, 34
in Davis Strait	90
deep water	49, 51
introduction of trawls in	39
journal of voyages in	65
large fares in	25, 38
men in	5, 6, 106
methods of	10
off Canadian shore	91
on George's Bank	3, 26, 34
profits of	23
routine of	65–89
run for the market	20
salt	32, 36, 90
methods of	110, 115
season for	34, 36, 37, 115
unloading the dories	17
vessels in	6, 110
fishing-grounds for	4, 37, 44
in *Davis Strait*	95
flitched	36, 91, 109
food of	36, 37, 118
for cod bait	216
former abundance of	35, 37
on George's	30
found in small areas	59
fresh, quantity landed at Gloucester	24
statistics of catch	3
from Grand Bank	64
Green Bank	64
geographical distribution of	90
Gloucester method of icing	19
grades of	22
gray	22
hand-lining for	19
iced	8, 19, 22, 34, 41, 42
in the Pacific	200
well-smacks	20
killer	113
live	33, 34
method of catching	18
cleaning	19
clubbing	17
flitching	114
handling	18
icing	8, 22, 41
marking	18
salting	114

Page.

Halibut, method of unloading fare of 21
migrations of 62, 63
movements of 62
napes pickled 435
new fishing-ground for 61
New London method of icing 19
on spawning-ground 59
price of 28
in California 42
receipts at Gloucester 29
salted 36, 37, 131
scarcity of 34, 90
smoked 90, 131, 475
taken by George's men 193
trade in 36
trawls 10, 62, 159
methods of hauling 16
setting 13, 81
using 112, 113
unheading 22
unusual season for 61
vessel, deck plan of 9
large fares of 28
method of unloading 21
profits of 24
well-smacks 34, 36
white 22
Halifax commission 346, 350, 448
bait question at 354
Halifax River, mullet in 561
Hallock, Charles, on Labrador fishery 139
Hall, W. D., patent for oil-making 343, 369
Hall & Pearsall 574, 579
Hamilton Inlet, Labrador 135
Hampton boat in Labrador fishery 138
Hancock, Me., mackerel fleet of 306
Hand-line cod fishery 123, 148
fishery of Great Lakes 767
George's cod 191
Hand-lines at Shumagin Islands 216
Hand-lining from dories 127
Hansen & Dieckmann 493, 520
Hapgood's, Wash 745
Hardheads in Sacramento River 737
Harper's Magazine, quotation from 140, 338
Harpoon, swordfish 318
Harpswell, Me., Labrador fishery of 146
Harpswell Sound, Maine 724
Harrington River 704
Harwich, Mass 672
mackerel fleet of 307, 310, 311
Hatteras Inlet, North Carolina 632
Haul-seine fishing in the Susquehanna 651
for squeteague 529
Haul-seines at Newfoundland 450
herring 462
in Neuse River 628, 631
shad 621, 623, 625, 633, 636, 645, 665
method of laying out 636
Havana market fishery of Key West 592–594
for groupers at 593
mullet exported to 580
Havre de Grace, Md 651
Hawkins Brothers' menhaden works 382

Page.

Hawsers, to prevent chafing of 125
Hayward boat 763
Heart-pounds in Maine 598
Heart-seine 601
Hedging, fish, construction of 643
Hemilepidotus Jordani 208, 214, 216
trachurus 216
Herreshoff, John, menhaden works of 366
Herring, abundance of, at Alaska 220
Newfoundland 451
as anchovies 519
food for cod 298
at Alaska 206
bait, fish-eggs for 507
bloater 473, 485
brush weirs 428, 429
canned 489, 493
in oil 491
statistics of 432, 438
captured by torches 499
care of, on the vessels 432
catch of, in Albemarle Sound 637
Hudson River 650
James River 639
Massachusetts 667
Neuse River 631
Pamunky River 643
Potomac River 645
Rappahannock River 644
Susquehanna River 653
cran of 427
cure, laws regulating 434
curing, American method 433
on shore 433
Scotch method 433
decrease of 505, 633
dip-nets for capturing 499
draining, methods of 478
English 619
exports from Newfoundland 470
fires for smoking 479
fishermen 127, 138, 462, 475
of New Brunswick 450
Newfoundland 445
fishery 419–524
apparatus of 427
at Labrador 142
Magdalen Islands 460
Norway 473
economy of 428
affected by moon 503
tides 503
hindered by ice 469
in Cape Fear River 626
Great Lakes 766
international difficulties 446
laws regulating 441
methods at Magdalens 463
New Brunswick 451
of Albemarle Sound 632–637
Pamlico Sound 632
Potomac River 644
York River 642
profits of 464

Page.

Herring fishery, Scotch, economy of 427
statistics of 437, 631
fishing-grounds for 419, 421–426, 460
fleet at Magdalen Islands 469
New Brunswick 444
of New England 438
for bait 423, 426, 431, 432, 435, 438, 499
catfish bait 768
cod bait 139, 160, 168, 183
fertilizer 432, 438
food, statistics of 438
haddock bait 237
hake bait 242
halibut bait 12, 18, 34, 35
frozen 439–458
cured by smoking 485
fishing-grounds for 442
for bait 151, 455
cod bait 193
food 456
halibut bait 65
market for 435, 455
statistics of 457
gibbed 433
gill-net fishery 430
gill-nets 427, 429, 430, 450, 451, 462, 464, 476, 485, 637, 642
hard (smoked) 473, 485
haul-seines 462
at Newfoundland 446
iced, for bait 183
industry, smoked 473–488
in Bering Sea 201
Gulf of Alaska 206
Ogeechee River 618
pound-nets 609
Prince Frederick Sound 206
Rhode Island pound-nets 604
Sacramento River 737
Susquehanna River 651
weirs 602
Magdalen 482
methods of capturing 428, 499
cleaning 433
curing 432
for smoking 465
freezing 452
hanging 478
packing 434
preparing 508
salting 465
smoking 479
migrations of 419
movements of 419, 632
net boats 451
nets at Newfoundland 446
of the Pacific 199
on the New England coast 421
packed as sardines 489
in spices 489, 519
pickled 434, 456
statistics of 432, 438, 439
trade in 459
pound-nets for 429

Page.

Herring, price of, for bait 436
purse-seines 463, 464
quantity taken in weirs 504
red or hard 473
roe of 637
round 433, 465
salted 432, 435, 465
for cod bait 220
salting, methods of 477
sardines, cutting and dressing 510
drying process 511
flaking 511
frying 514
salting 511
scaled 482
sea-packed 433
seines 432, 507
at Newfoundland 450
seining-weirs 503
smoked 456, 466, 492, 506, 609
boneless 484
canned in oil 483
curers of 475
grades of 480
laws relating to 480
markets for 482
packing of 480
price of 482
statistics of 432, 438, 439
smoke-houses 476
smoking, American methods 483
European methods 483
methods of 477, 487
spawning grounds of 425, 426
habits of 420, 426
season of 420
species of 420
Southern methods of packing 637
split 433, 637
statistics of catch of 432, 438
stringing, methods of 478
sweeping 432
taken in purse-seines 432
weirs 600
torching 428, 503, 475
Indian method of 429
trade, men in 248
with Newfoundland 464
traps 429
tucktail 482
vessels and outfit 426
at New Brunswick 451
method of fitting 428
weirs 429, 475, 503
in Maine 598
New Brunswick 485
Hexagrammus 200, 216
Hickory shad 618
Higgins & Gifford, seine-boats built by 250
Hind, H. Y., on herring fishery 467
Labrador fishery 142
mackerel bait 346
quoted 134
Hingham, Mass., cod fishery of 149

Page.

Hingham, Mass., mackerel fleet of ... 307
Hippoglossoides classodon ... 214
Hippoglossus vulgaris ... 200, 208, 216
Holder, C. F., on swordfishing ... 321
Holmes, Thomas L ... 458
Holothurians as food for cod ... 207
Holsteinborg, Greenland ... 93
halibut near ... 95
Hoochenoo Bank, Alaska ... 201, 206, 207, 212
Hook fishery for mackerel ... 275
Hooks and lines in cod fishery ... 139
on haddock trawls ... 236
used in cod-trawling ... 175
George's fishery ... 192, 193
Horseshoe-crabs in Cape Cod weirs ... 600
Housatonic River, fisheries of ... 666
Houses of mullet fishermen ... 563, 564
Howell, Dr. Samuel, on Delaware fisheries ... 654
Hudson Bay Company ... 134, 137
Hudson River, fisheries of ... 658
Hull, Mass., early mackerel fishery at ... 298, 299
herring fleet of ... 458
Hume, George W ... 745
Hume, R. D ... 745
Huntington Bay, New York ... 380
Hurdy-gurdy used in hauling trawls ... 10, 16
Huron Bay ... 757
Huron boat ... 763
Hyannis, Mass., mackerel catch of ... 310, 311
Icebergs, dangers from ... 62
on halibut grounds ... 96
Ice carried on George's cod vessel ... 195
cost of ... 616
drifting, halibut vessels driven by ... 5
drift, on the Banks ... 48
fishing through, at Saginaw Bay ... 767
for smelt ... 691, 692
on Great Lakes ... 764
for fish-preserving ... 221
packing fish ... 636
preserving bait ... 351
haddock ... 239
mackerel ... 249
halibut fishery hindered by ... 50
house on fishing vessels ... 41
halibut vessels ... 7
mackerel schooner ... 249
red-snapper vessels ... 587
on halibut grounds ... 106
red-snapper vessels ... 589
pens on haddock vessels ... 236
halibut vessels ... 8, 9
quantity carried by halibut vessels ... 8
rigging frozen with ... 66
supply for fishing vessels ... 423
used on haddock vessels ... 239
in red-snapper fishery ... 588
on cod schooner ... 173
water for preserving mackerel ... 267
fish ... 588
smelts ... 693
Iced bait in George's fishery ... 193
eels ... 697
fish ... 601, 609

Page.

Iced bait in boxes ... 637
halibut, price of ... 34
mackerel ... 267
red-snapper ... 586
salmon ... 683
shad ... 614, 631, 666
squeteague ... 532
sturgeon ... 622, 626
Icing bait, method of ... 12, 349, 350, 437
haddock ... 239
halibut, method of ... 9, 19, 22
of bait on cod vessels ... 152
Iceland, halibut fishery at ... 94
herring at ... 419
Iliuliuk, Alaska, cod at ... 205, 214
Imports of herring from Newfoundland ... 470
sardines and anchovies ... 522
Indian bush-net ... 646
dip-net fishery ... 769
fishing-place ... 661
Indian Harbor, Labrador ... 141
Indian River, Delaware ... 534, 538, 539
Indian River, Florida ... 561
Indian salmon fisheries on the Kennebec ... 717
Ingersoll, Ernest, on menhaden fishing ... 338
Inspection laws, fish ... 727, 728
of fish in Maine ... 686
mackerel, statistics of ... 312
pickled fish ... 434
Insurance, mutual, on vessels ... 188, 189
International difficulties about bait ... 187
at Fortune Bay ... 446
Ipswich Bay, gill-net cod fishery in ... 231
hake in ... 241
herring in ... 498
torching in ... 429
Ireland, exports of herring to ... 471, 472
Irish boats at Boston ... 158
Irishmen in fresh-halibut fishery ... 6
on mackerel fleet ... 248
Pacific cod fleet ... 218
Iseborough salmon fishery ... 706
Isinglass from hake sounds ... 242, 243
Isle au Haut, Me., herring fishery at ... 423
fleet of ... 438
mackerel fleet of ... 306
Isle of Sable, cod fishery at ... 187
Isle of Wight Bay, Delaware ... 534, 539
Italy, sardine industry in ... 489
Jackfish for gronper bait ... 593
Jacksonport, Lake Michigan ... 757
Jacksonville, Fla., mullet fishermen at ... 561
shad fishery at ... 614
Jacobs, Capt. Solomon ... 447
Jamesport, N. Y., menhaden at ... 371–409
James River, early history of ... 639
fisheries of ... 638
fishery statistics of ... 639
former abundance of shad in ... 638
Jeffries Ledge, haddock on ... 234
Jewett, B. F., on George's fishery ... 188
Jew-fish on red-snapper grounds ... 586
Jig-fishing for mackerel ... 287
Jigger used for capture of cod ... 142, 143, 147

Page.

Jigger, hook and line called 139
Jiggers, fishing vessels called 29
Jigging mackerel, method of 284
Jigs, mackerel 278, 293, 300
Johnston, Professor 352
Johnston & Veasey 223
Jones Creek, Delaware 528
Jones, J. Matthew, on mackerel fishery 297
Jonesport, Me., herring cannery at 498
fishery at 422, 438
sardine packers at 520
Jordan, Prof. D. S 203, 223, 561, 576, 729, 731
Journal of menhaden fishery 371–416
Juniata River 645, 650

Kadatl, name for cod 202
Kegs for packing fish 492
Kellogg & Ives 492
Kelpbangers, name for cod 202
Kelly's Island pound-net fishery 758
Kemps, Mead & Smith 615
Kemp, Stephen 697
Kench-cured mullet 572
Kennebec River, abundance of bass in 695
alewife fishery of 720
bag-nets in 691
fisheries of 716
headwaters of 674
natural features of 716
salmon fishery of 717
shad fishery of 719
season in 684
weirs in 684
smelt fishery of 722
Kennebunkport, Me., herring fleet of 438
mackerel fleet of 306
Kennedy, William 717
Kenosha, gill-net fishery at 762
Kenworthy, Dr. J., on red-snapper fishery 590, 592
Ketch, fishing vessel called 124
Keweenaw Bay 757
Key West, fishermen of 561
Havana market fishery of 592–594
Kiblings for bait 160
King-crabs in pound-nets 607
Kinston, N. C., fisheries at 627
Kittery, Me., herring fleet of 438
Kitt's Hammock, Delaware 528
Klamath River, spring salmon in 741
Knappton, Wash 745
Knives for mackerel dressing 290
used in dressing cod 180
Knowles, Capt. C. G. F 346
Kock, Dr. Charles 614
Kodiak, Alaska, cod at 201, 207, 212
cod banks near 213
native fishermen of 220
Kumlien, Ludwig 605, 606, 755, 757
Kypokok Bay, Labrador 135

Labrador, climate of 136
cod fishery of 121, 133, 459
from Newburyport 144
origin of 143, 147
vessels in 138
fishing-grounds at 134
fish-curing at 146
fishery, causes of decline of 145
from Maine 146
Northern New York 145
Hallock on 139
rights at 459
halibut fishery at 46, 47
herring fishery at 142, 420, 459, 464
gill-nets at 464
grounds at 462
trade with 459
mackerel off 276
movements of halibut toward 63
Northern 134
physical outline of coasts of 135
season for fishing at 136
Southern, halibut fishery at 4, 15, 17
Lady-fish for grouper bait 593
red-snapper bait 587
Laflin, James 223
La Have Bank, cod fishery on 149, 189
haddock on 234
halibut fishery at 4, 42, 43, 44
swordfish on 317, 323
La Have Ridges, abundance of halibut on 58
cod fishery on 149
halibut fishery on 4
Lake Erie, gill-net fishery of 762
gill-nets 763
pound-net fishery of 758
season on 760
Lake Huron, gill-net fishery of 762
ice fishing on 767
pound-net fisheries of 757
Lake Michigan, gill-net fishery of 761, 762
pound-net fishery on 757
Lake Monroe, mullet in 561
shad spawning in 614
Lake Ontario, gill-net fishery of 762
pound-net fishery of 758
seine fishery of 766
Lake Superior, gill-net fishery of 761, 763
pound-nets in 757
Lamoine, Me., herring fleet of 468
smoking at 474
Labrador fishery from 147
Lamprey eels 662, 678
Lance, swordfish 319
Lant as cod food 208
food for halibut 37
for cod bait 220
Lantern used in night seining 262
Lavoie, N., report on cruise 469
Laws, fishery, of Maine 726–728
fish inspection 727
for packing smoked herring 480
protection of menhaden 353
menhaden fishery 370, 379
Newfoundland fishery 448
of fishermen regarding salmon nets 732
relating to alewife fishery 669, 670, 671, 689, 727
bass fishery 695
close-time 605
fisheries 657

Page.

Laws relating to fish-weirs 661
herring cure 434, 481
fishery 441
mackerel fishery 301, 302
pound-nets 609
river dams 620
fishery 712
fisheries of Maine 726
salmon fishery 727, 749
shad fishery 623, 727
smoking of herring 481
Lay of halibut fishermen 23
herring fishermen 427, 464, 506
mackerel fishermen 289
mullet fishermen 570
spot fishermen 537
Leather-jackets 586
for bait 587
Leather turtle at Cape Cod 600
Lebanon, Del 528
Lee-bowing mackerel vessels 287
Legislation for menhaden fishery 353, 370
protection of mackerel 361
Leighton, Capt. Andrew 440
Lepidopsetta bilineata 214
Lewes, Del 531, 533
Lincolnville, Me 306, 706
Liostomus xanthurus 533
Liparis sp. from cod's stomach 208
Liscomb Harbor, Nova Scotia 4
Little Compton, R. I., pound-nets at 605
Little River, N. C 560, 633
Lituya Bay, Alaska, cod at 212
Live cars for groupers 593
sturgeon 698
pens for sturgeon 625
Liver butts on cod schooner 150
Liverpool salt for mackerel curing 288
mullet curing 573
Livers, cod, care of 181
of cod, as food 216
Lobster fishery at Magdalen Islands 460
Lobsters in Cape Cod weirs 600
Loggerhead turtle in weirs 600
Lombard's Cove, Massachusetts 602
Long Island, mackerel off 247
menhaden at 331
fishery at 370, 371–416
pound-net fishery 606
Long Island Sound, menhaden in 380–409
Long Island Tickle, Labrador 143
Lordfish 199
Louisiana, mullet fishery of 577
Low, Col. D. W., on bait mills 283
mackerel fishery 311
voyage 292
Lubec, Me., herring at 422
cannery at 498
fishery at 505
fleet of 438, 459
smoking at 474
sardine packers at 520
weirs at 500
Luce Brothers' menhaden factory 374

Page.

Lyman, Col. Theodore, on menhaden 54
Lyme, Conn., shad fishery at 664
Lynde & Hough 223
MacDonald, Sir John 354
Machias, Me., smoked herring, statistics of 488
Machiasport, herring fleet of 438
Machias River, fisheries of 702
Mackerel, aboriginal name of 298
apparatus of capture of 305
as a fertilizer 304, 306
bait 254, 279
clams for 281, 293, 346
ground 287
menhaden for 255, 280, 281, 345, 346
pogies for 293, 355
preparation of 278, 282
bob 279
bob-line 300
canned 306, 308, 309, 496, 521
care of, on seiners 266
cart-wheeling of 255
catch in 1880 ..... 306, 308
of, in Canada 309
Gulf of Saint Lawrence 309, 310, 311
seine 258
cleaning and salting 287
curing, kinds of salt used 288
demand for 582
draggers 294
drag-seines 299
drailing 299
drift-net fishery 296
early catches of 273
fishermen 247, 293
activity of 286
enterprise of 262, 263
expert 286
lay of 289
nationality of 247
number of 305, 308
fishery 247–313
at Magdalen Islands 460
Nova Scotia 297
care of the catch 265, 287
early methods of 298
English methods of 296, 298
history of 298, 304
in British provinces 299
fall of 1881 263
Gulf of Saint Lawrence 34, 141, 275, 276, 291, 311
Norway 272
landing the cargoes 268
large fares in 292
running for the market 268
schools supported by 298
season for 276
seining at night 259
spring southern 273
statistics of 304, 306, 307, 308
vessels in 248
with drag-seines 298
purse-seines 247–275

Page.

Mackerel-fishing by moonlight 298
grounds for 276, 277
fleet, capture of swordfish by 325
distribution of 307
of New England 247
size of 275, 305, 306
value of 305, 306
fly-hook 279
for bait 306, 308
cod bait 131, 142, 151, 160, 193
hake bait 242
halibut bait 12
mackerel bait 280, 293
swordfish bait 323
gaffs 279, 300
gigging, protests against 302
gill-net fishery 294
gill-nets, construction of 296
gill-netting, history of 296
grades of 290
grounds in Gulf of Saint Lawrence 276
habits of 271
at night 260
handling of cargo of 268
hookers, success of 286
hook fishermen 277
fishery 275
methods of 277, 286, 293
profits of 291, 292
vessels in 277
hooking, method of 283, 285
iced 267
in Gulf of Maine 247, 276
Massachusetts Bay 247
pound-nets 305, 667
weirs 600, 602
injured by plowing 290
inspection, statistics of 312
jigging for 284, 287, 299
jigs 275, 278, 280, 293, 300
knives for rimming 290
large catches of 292
late catches of 295
laws in Massachusetts 302
legislation for protection of 301
lines, vessels using 308
method of canning 496
culling 294
cutting 290
icing 249
salting 267, 288, 293
migrations of 274
movements of 247
at Norway 272
mutilation of 290
nets, vessels using 308
off Block Island 247
Boone Island 247
Cape Elizabeth 247
Chesapeake Bay 247, 274
Delaware Bay 247
Long Island 247
Matinicus Rock 247
Middle States 277

Page.

Mackerel off Monhegan Island 247
Mount Desert Rock 247
New Jersey coast 247
Sandy Hook 274
on George's Bank 247, 274, 276
packing 293, 294
pickled 308, 309, 312
plowing 266, 288
plows 289
pocket or spiller 249, 265
preserved in ice-water 267
price of 274
purse-seine, vessels using 308
quantity of, salted 308, 309
rimming 290
rubbing 290
rusty 289
salted in butts 289
salting 288, 293
schools, movements of 255
schooner, deck plan of 248
outfit of 249, 250
speed of 268
three-masted 272
seine fishery, apparatus of 250
methods of 250
fishing-grounds 247
history of 269
method of using 256
seining by night 259
in deep water 270
methods of 255
profits of 268
prohibited 301
season for 247
seines, protests against 303
set around a vessel 264
Spanish 545
spiller or pocket 266
statistics of Canada 308, 309
New England 308, 309, 310
Newfoundland 309
toll bait 280, 282, 283
trailing 300
used fresh for food 308
versus menhaden fishery 303
vessel, evolutions of 258
vessels and outfit 273
number of 306
voyage, itinerary of 292
Mackinaw boats 759
Maddocks, W. L., on herring 424
Magdalen herring, method of smoking 479, 482
smoked 475
Magdalen Islands 141
cod fishery at 459
grounds at 137
fishery rights at 459
halibut fishery at 4, 43, 46
herring at 468
fishery at 440, 466, 467
fleet 469
grounds at 460
spawning at 420

Page.

Magdalen Islands, herring statistics for 439
trade with 459
value of 472
hurricane at 468
mackerel off 276
trawling at 160
Magnolia, Del 528
Maine, alewife fishery of 687, 701, 702, 703, 704, 705, 708, 712, 714, 715, 720, 724
artificial conditions of rivers in 677
bass fishery of 716, 723, 725
catch of mackerel in 306, 308
swordfish in 325
declivity of rivers of 674
description of rivers of 673
early history of 677
eel fishery of 695–697, 704, 712, 716, 722, 724
fish-inspection laws in 434, 686
halibut fishery from 38
vessels of 3
herring catch of 432, 438
fleet of 438
inspection laws in 481
spawning at 421
history of trawling in 159
Labrador fishery from 146
lakes in 675
mackerel catch of 310, 311
fleet of 247, 306, 307
menhaden industry in 329, 361, 365, 369, 370
pound-net fisheries of 597, 598
purity of river water in 675
quantity of herring smoked in 485, 488
river beds of 675
fisheries of 673
fishery laws of 726
species of fish 678
salmon fishery of 679, 700, 701, 703, 704, 706, 710, 716, 717, 719, 724
shad fishery of 683–687, 701, 702, 703, 704, 708, 710, 716, 724, 725
smelt fishery of 690–693, 702, 703, 704, 708, 712, 714, 715, 716, 722, 724, 725
smoked-herring industry in 473–488
statistics of mackerel inspection in 312
striped-bass fishery of 693
sturgeon fishery of 697–699, 723
temperature of rivers of 676
tides in rivers of 676
tomcod fishery of 703, 704, 723, 724
volume of rivers of 675
Maine Oil and Guano Association 281
Mallotus villosus 205, 208, 236
Mammoth, frozen 351
Manure, fish used for 644
Maquoite Bay, Maine 724
Marblehead, Mass., cod fishery from 125, 130, 132
George's fishery from, in 1747 187
mackerel fishery of 303, 307
menhaden bait at 347
salt halibut at 91
vessels at Cape North 138
Margaree Island, mackerel at 276
Markuson, Capt. Knud 42, 272

Page.

Marquette Bay 757
Marquette, Mich., seine fishery at 766
Marr, Capt. Chester 34, 37, 91, 197, 289
Marsh River, Maine 708
Martha's Vineyard, menhaden at 347
pound-net fisheries of 597, 601
Martin, Capt. George H 231, 317, 322
Martin, Capt. S. J 234, 239, 262, 263, 265
Martin & Balkam 495
Maryland, catch of Spanish mackerel in 552
menhaden, statistics of 361
Massachusetts Bay, halibut fishery in 533
mackerel in 247
pound-net fisheries in 598
Massachusetts, catch of mackerel in 306, 308
swordfish in 325
cod fishery 125
Connecticut River in 659, 660
fishery laws of 301
herring catch of 432, 438
fleet of 438
inspection laws in 435
mackerel catch of 309, 310, 311
fleet of 247, 307
menhaden laws in 370
river fisheries of 667
smoked-herring in 482
Spanish mackerel in 552
statistics of mackerel inspection in 312
menhaden industry in 361
Matanzas, mullet exported to 580
Matanzas River, mullet in 561
Mather, Fred 552, 606, 607
Matinicus Island 498
herring fishery at 423, 424
fleet of 438
mackerel fleet of 306
Matinicus Rock, mackerel off 247, 276
Mattapoisett River 668
Mattapony River 642
Mattawamskeag River 705
Maxwell's chart of Labrador 134
Mayport, Fla 561, 614
McCollam, Thomas W., & Co 212, 216, 223
McDonald, J. L., on Pacific cod 200, 210, 211
McDonald, Col. Marshall 551, 609, 611, 613, 625, 637, 658, 659
McGregor, Jacob 474, 499
Meals of fishermen on shipboard 107
Medomak River, fisheries of 713
Meeker, S. T., on herring 424
Meherrin River 633
Megler, J. G., & Co 745
Melanogrammus æglefinus 234
none in Pacific 200
Melton & Co 615, 616
Menemsha Bight, Massachusetts 602
Menhaden, absence of, off Maine coast 331
as a fertilizer 335, 371
sardines 330
Association 333
bait, consumption of 347, 348
exports of 353
fishery 347

Page.

Menhaden bait, method of icing 349
on Grand Bank fleet 348
value of 347
baiting fleet 335
canned 330
in oil 490
carry-away boat 374
catch of 409–416
in Massachusetts 667
near Connecticut River 668
caught in weirs 342
codfish in school of 391
commercial importance of 329
dip-nets 340, 374
disappearance of, in Maine 423
early uses of 371
emptying seine of 339
factories 331, 365, 367, 373
capacity of 335
cost of 365
in Maine 331
on Chesapeake Bay 638
statistics of 361
first used for mackerel bait 346
fishermen 332, 333, 345, 361
fishery 327–416
apparatus of 335
at Long Island from 1793 to 1880 370
economy of 333, 334
methods of ..335, 338, 366, 367, 371–409
organization of 345
season for 409–416
settlement with crew 333, 334
statistics of 360, 361, 362
fishing at night 259
grounds for 331
on a Long Island steamer 338
fleet, value of 334
floating factories 345
for bait 342, 345, 376
capture of 341
lack of 435
price of 282
quantity used 282, 362
bluefish bait 347
cod bait 193, 345, 436
food 330, 342
hake bait 242
halibut bait 12, 42, 112, 349
mackerel bait 255, 280, 281, 330, 345
manufacturing purposes 356
manure 607
former abundance of 335, 376, 377, 380
geographical distribution of 329
gill-net fishing for 341
gill-nets 341, 530
great haul of 335
grounds, area of 331
guano 638
ammonia in 362
patent for making 369
statistics of 330, 361
habits of 341
in Buzzard's Bay 603

Page.

Menhaden in Chesapeake Bay 638
Gulf of Mexico 329, 588
Long Island Sound 389–409
mackerel fishery 353
Rhode Island pound-nets 604
weirs 600, 602
industry in Chesapeake Bay 360
statistics of 354, 361
large hauls of 372, 378–409
laws for protection of 353, 379
legislation for protection of 370
methods of canning 490
seining 337
movements of 329, 331, 377
names of 329
natural history of 329
number taken 330
Oil and Guano Association 362
oil of, adulteration of 363
early manufacture of ..364, 365, 366, 368, 369
exports of 363
factory, capacity of 344
cost of 344
for tanning 355
grades of 344, 363
industry, history of 364
manufacture of 343
markets 364
patent for steaming 369
prices of 363, 364
refining of 343
statistics of 330, 361
uses of 362
yield of 357, 358, 359, 638
packed as sardines 490
pot works 373
pound-nets 341
press, first use of 366
price of 332, 333, 347, 374–409
protective legislation for 370
purse-boat 374
purse-seine 269, 335
salted for food 347
scrap 363
seasons for 329
seine-boat 250, 251, 336
seines, size of 347
seining, best time for 341
methods of 337, 338
size of 329, 356
slivering 346
slivered 348, 353
slivers for cod bait 133
haddock bait 236
value of 347
statistics of catch of 330, 354, 362
steamers, crew of 332
description of 334
first used 368
in mackerel fishery 304
unloading cargo of 337
used by farmers 330, 371–409
value of 356, 357
vessels, description of 334

Page.

Menhaden vessels, statistics of....360, 361
weirs....341
Merchant, Capt. Epes W....37, 197, 288, 324
Merchant, Capt. George....36, 250, 253, 259, 266, 271
Merrimac River....347, 370, 667, 672
Merritt, H. M....606
Merrymeeting Bay....719
Miamogue, menhaden fishing at....371–409
Michigan City, trawl fishing at....767
Microgadus proximus in Pacific....200
tom-cod....678
Middle Bank, halibut fishery on....33
Middle Bay, Maine....724
Middlesex, Conn., shad at....669
Middletown, Conn....660
Migrations of cod....166, 167
Miles, George W....344
Milford, Del....533
Millbridge, Me....474, 520
Milner, Professor....633, 651, 759, 768
Milk Island, floating traps at....599
Milton, Del....528, 533
Milwaukee, gill-net fishery at....762
seine fishery at....766
Miquelon Beach, halibut fishery at....4, 44
Miquelon, halibut fishery at....17
Miramichi, cod fishery at....137
Miscou Flat, cod fishery on....137
large cod on....139
Mispillion Creek, Delaware....528
Mississippi, mullet fishery of....577
Mitchell, J. M., on herring....420
Mobile Bar, red-snapper fishery at....585
Mobile, red-snapper fishery from....585, 587
Mohawk River....658
Molloy, John....223
Monhegan Fall Ground....234
Monhegan Island, herring fleet of....438
mackerel off....247, 276
fishery at....647
Monomoy Point, pound-nets at....602
Moon-eyes, dip-net fishery for....769
Moon, herring fishery affected by....503
Moosehead Lake, Maine....716
Morey, George, on herring....424
Mossbankers, canned....490
menhaden called....329
Mount Desert Island....705
Mount Desert, Me., herring fishery of....423, 438, 459
Labrador fishery from....147
Mount Desert Rock, mackerel off....247, 276
Mousam River, Maine....725
Mugil albula....555
braziliensis....555
mexicana....560
Mullet, abundance of....556, 580
bag-net....569
bull....555, 560
camp....563
catch of, in seines....567
cast-net fishery....569
cast-nets, statistics of....577
development of fishery for....580
distribution of....555

Page.

Mullet, drag-nets....567
dressing of....572
dried....560
dry-salted....572, 579
ease with which secured....581
exports of....580
feeding-grounds of....556, 560
fishermen....561, 570
fishery....553
apparatus of....562
care of catch....572
methods of....562
of Great Lakes....766
origin of....559
profits of....582
statistics of....575
fishing-grounds for....560
food qualities of....577, 581
for grouper bait....593
fresh....572, 575–577
gill-nets....568, 575–577
habits of....555
hook-and-line fishery for....570
in Florida....614
markets for....577
market value of....578
merits of fresh....581
methods of packing....573
preserving....572
movements of....556
names for....555
pound-nets....570
roes....573
dried....575
fresh....574
method of curing....573
salted....575
statistics of....576–577
salted....560, 572, 575, 576, 577, 578, 582
seine fishery....565
seines....563, 576, 577
size of....557
spawning grounds of....560
habits of....556
stake-nets....568
stop-fishing....569
sweep-nets....568
trade in fresh....578
Murderkill Creek, Delaware....528
Murres at Shumagin Islands....215
Mutual Fishing Insurance Company....189
Mya arenaria....127
Mystic, Conn., flounder fishing from....349
Mystic River, Massachusetts....667
Nantes, France, sardine canneries at....490
Nanticoke shad fishery....647
Nantucket, pound-net fisheries of....597, 602
pound-nets at....604
Nantucket Shoals, halibut fishery on....4
on....34, 37
Napeague, N. Y., menhaden at....374–409
pound-nets at....607
Narragansett Bay, herring in....426
pound-net fisheries of....597, 604

Page.

Narragansett Bay, Spanish mackerel at 545
Naraguagus River, herring weir in 422
fisheries of 704
Nationality of halibut fishermen 6
mackerelmen 248
menhaden fishermen 333
Nautical instruments on halibut vessels 9
Nautilus, schooner, early trip to George's 30, 34
Navigation of schooner 172
Negroes, consumption of herring by 435
Nets, capelin 139
cast 559, 561, 569, 577, 620, 621
drag, mackerel 295
mullet 567
shad 628
gill, for capelin 139
rock and perch 539
squeteague 529
Nense River, description of 626
fisheries of 626
fishing-beaches on 629
mullet in 560
pound-nets in 570, 609
statistics of fisheries of 631
New Bedford, Mass 660
pound-nets in 654
swordfish fleet of 317
New Berlin, Fla 561
shad fishery at 614
New Berne, fisheries at 627
New Brunswick, bait from 436
brush weirs in 500
catch of mackerel in 309
frozen-herring fishery at 444, 451
statistics of 458
trade 441, 457
herring fishermen 450
fishing-grounds at 442
industry in 485
spawning at 421
statistics for 439
quantity of herring from 457
smoked herring from 485
in 474
Newburyport, Mass., herring fleet of 468
Labrador cod fishery from .. 133, 142, 143, 144
mackerel catch of 309, 310, 311
fleet of 307
New England Fish Company, halibut bought by .. 25
Newfoundland, bait from 436
baiting at 183, 185
stations at 162, 454
catch of mackerel at 309
cod fishery at 135, 145
cod-fishing grounds of 134
cod gill-net fishery 230
gill-nets at 229
destitution at 445
fishermen of 183, 445, 454
fishermen's sports at 163
fishing-grounds 135
frozen-herring fleet 443
from 193

Page.

Newfoundland, frozen-herring trade with 439
halibut fishery at 4, 17, 44, 47
herring exports from 470
fishery at 462
methods of 464
fishing-grounds at 442, 461
spawning at 420
statistics of 458
trade 470
ice supply from 173
international difficulties at 187, 447
mackerel off 276
methods of herring fishery at 450
pickled-herring trade with 459, 460
squid fishery 184
New Hampshire, catch of mackerel in 306, 308
swordfish in 325
fish-inspection laws of 434
herring catch of 432, 438
fleet of 438
mackerel catch of 310, 311
fleet of 247, 306
smoked-herring laws in 481
statistics of mackerel inspection in 312
New Jersey, catch of Spanish mackerel in 552
fishermen on Savannah River 621
herring at 420
mackerel off 247
menhaden grounds off 331
off coast of 329, 383
statistics of 361
mullet at 555, 573
grounds of 560
protective laws in 370
Spanish mackerel at 545
New London, Conn., early halibut fishery of 34
flounder fishery of 349
halibut fishery of 3
fleet of 9
vessels of 33
mackerel fleet of 307
swordfish fleet of 318
New Meadows River, Maine 724
New Orleans, red-snapper fishery from 587
Newport, R. I., fish marketed at 606
swordfish fleet 318
New York, catch of mackerel in 308
Spanish mackerel in 552
early menhaden manufacture in 368
Fishmonger's Association of 551
frozen herring at 456
halibut fleet of 3, 4, 9, 349
Labrador cod fishery from 145
menhaden industry in 361, 368
pound-net fisheries of 597, 606
sardine industry in 491
shad fishery at 658
Spanish mackerel at 551
Night fishing for alewives 688
mackerel 261, 298
shad 652, 686
spot 536
on the Edisto River 632

Page.

Night fishing on the James River 640
Night seining for mackerel 259
Nippers for protecting hands 131
Noank, Conn., flounder fishery at 349
halibut vessels of 9
red-snapper vessels from 590
swordfish vessels of 318
Nobscusset Weir Company 601
Nootka, Alaska, cod at 212
Norfolk, Va., fish packed at 637
shipped to 609
Spanish mackerel 551
Norris, Thaddeus 545, 590
Norton Sound, Alaska, cod at 201
North Boothbay, Me., cod fishery from 123
North Cape, cod fishery off 142
North Carolina, catch of Spanish mackerel in 552
menhaden at 332
statistics of 361
mullet at 555
river fisheries of 625
Spanish mackerel in 545
North Haven, Me., herring fleet of 438
mackerel catch of 310, 311
fleet of 306
North Pacific Canning Company 42
Northport, Me 706
North River, North Carolina 633
North's History of Augusta, Me 717
Northumberland, shad fishery at 647
Norway, herring fishery of 473
sardine industry in 489
smoked codfish in 473
use of purse-seine at 272
Norwegian cod gill-nets 227
Norwegians in fresh-halibut fishery 6
Pacific cod fleet 219
Norwood Islands, James River 642
Notre Dame Bay, Labrador 135, 143
Nottoway River 633
Nova Scotia, bait from 436
baiting at 183, 193
brush weirs in 499
catch of mackerel in 309
fishery rights in 459
frozen herring from 441, 458
halibut fishery off 4, 40
herring statistics of 439
ice supply from 173
mackerel fishing at 277, 297, 298
smoked herring in 474
Noyack Bay, menhaden fishery in 379–409
Oakes, Capt. W. H 35, 36, 198, 270
Oak Orchard, gill-net fishery at 762
Oar-rests in seine-boat 252
Obstructions in Cape Fear River 625
James River 638
Potomac River 645
Savannah River 620
York River 642
Occohannock Creek 547
Ocean trout, canned 515
menhaden as 491
Ocean View, Del 533

Page.

Ocklockonee Bay, Florida 562
Oconee River, shad in 617
Oconto, seine fishery at 766
Ocracoke Inlet, cannery at 550
mullet in 560
Octopus punctatus 199, 216
Odell, D. J 499, 457
Ogeechee River, fisheries of 618
pound-nets in 609
sturgeon fishery in 622
Oil and guano factories 342
cod 225
cod-liver 131, 157
factory, cost of 344
hake 242
manufacture of, in France 368
menhaden 357, 638
grades of 363
manufacture of 343
statistics of 330, 360, 361, 362
uses of 362
porgy 600
refining of menhaden 343
salmon, manufacture of 750
skate 600
sturgeon 698
used for canned fish 515
in sardine packing 523
yield of, in menhaden 357
Okhotsk cod fishery 203, 219
Oldwife, menhaden called 329
Olive oil in canning fish 515
Ommastrephes illecebrosa 436
Oncorhynchus chouicha 216, 739, 740, 740, 752
gorbuscha 740, 753
keta 740, 741
kisutch 739, 740, 740, 741, 753
nerka 740
Ontario, Canada, catch of mackerel in 309
herring statistics for 430
Oregon, cod at 200
Oregon Inlet, North Carolina 555, 632
mullet in 560
Oregon Packing Company 745
Oregon, salmon canneries of 745
Orient, N. Y., pound-nets at 607
Orland, Me 709
Orleans, Mass., mackerel fleet of 307
Orphan Bank, cod fishery on 137
Orrington, Me 709
rental of fisheries at 712
Osborne, Henry L 121, 161
Osmerus mordax 678
Ossipee River 725
Osterhout, Isaac C 649
Outfit of dory hand-liner 125
Ovens for drying sardines 512
Owens, G. T., menhaden works of 369
Oysters in Chesapeake Bay 637
preserved 350
Pacific cod fishery, capital in 223
origin of 210
products of 225
natural history of 198

Page.

Pacific salmon industry, statistics of 753
Pagrus argenteus 586
Palatka, Fla., shad fishery at 614
Pamlico River, fisheries of 631
Pamlico Sound, fisheries of 632
movements of fish in 632
mullet in 560
Pamunkey River 642
Parasites of cod at Alaska 208
Paratractus pisquetus 593
Partridge Harbor, fishery at 146
Pasquotank River, North Carolina 633
Passadumkeag River 705
Pass Island, halibut fishery at 4, 5, 44
Patapsco River 654
Patent for canning menhaden 491
Patuxent River 654
Peconic Bay, menhaden fishery in 372–409
Pedee River, fisheries of 624
Pembroke, Me., herring fleet of 438
Pemaquid River, Maine 714
Penmaquan River, fisheries of 701
Pennsylvania, shad fishery of 646
Penobscot Bay, herring fishery of 423
weirs in 598
Penobscot River, alewife fishery of 708
bag-nets 691
dam built in 711
early history of 709
fisheries of 705–712
natural features of 705
salmon fishery of 706
smelt fishery of 709
salmon weir of 680
Pensacola, mullet fishermen of 561
red-snapper fishery of 585–590
Pens for keeping sturgeon alive 619, 625, 698
live fish 538
Perch, apparatus for capturing 539
catch of, in Delaware 538
Delaware River 654
the Susquehanna 653
fishery of Southern Delaware 538
season for 539
fyke-net fishery for 768
gill-nets for 530
in Albemarle Sound 636
Hudson River 659
Sacramento River 737
Susquehanna River 651
Perley, M. H., cited 441, 500, 699
on mackerel fishery 298
New Brunswick fisheries 686
smoked herring 460
Perquimans River, North Carolina 633
Peters, George T 484
Petroff's census report on Alaska 229
Pettingell, Capt. Moses 347
Pew, Capt. Harry 34
Philadelphia, frozen herring at 456
Spanish mackerel at 551
Phillips, E. B., on menhaden oil 365
Phycis, none in Pacific 200
Pickled alewives 689

Page.

Pickled halibut fins 106
herring 456
methods of curing 465
origin of 473
statistics of 432, 438, 439
trade, methods of 462
with Canada 459
mackerel 309
statistics of 312
shad 640, 641, 686, 709
value of 642
sturgeon 698
Pigeon Hill Ground, cod fishery on 137
Pike, called yellow pickerel 766
grass 768
seine fishery for 766
Pile-drivers and stake-lifters 760
Pillar Rock, Washington Territory 745
Pinkies, fishing vessels called 29
Pinwire, fish-curing at 141
Piscataqua River 673, 725
Planked shad 656
Pleasant Bay, Magdalen Islands 460
Pleasant River, Maine 703
Pleurogrammus monopterygius 205, 206, 208, 216
Plowing, mackerel 266, 288
Plows, mackerel 289
Plummer, John G 144
Plymouth Colony, mackerel fishery by 298
Plymouth, Mass., alewives at 670
cod vessels of 159
Pocket, mackerel 249, 265, 266
Pocomoke Sound 637
Pogies, early methods of capturing 367
for mackerel bait 293
Pogy bait for George's men 331
menhaden called 329
slivers for haddock bait 237
Point aux Basques, gill-net fishery at 761
Polar cod in Pacific 200
Pollachius chalcogrammus 200, 206, 208, 216
Pollock at Alaska 206
Shumagin Islands 216
caught on lake trawls 243
in Bering Sea 201
the Pacific 199, 200
Pomatomus saltatrix 587, 593
Popoff Island, Alaska, fishing station at 216
Porgies, catch of 550
for red-snapper bait 587
in Cape Cod weirs 600
Chesapeake Bay 638
pound-nets 609
on red-snapper grounds 586
Portage entry 757
Port Blakeley, salmon cannery at 753
Port Chatham, Alaska, cod at 202
Port Clinton, trawl fishery at 767
Portland Harbor, Maine, pound-nets in 598
Portland, Me., as herring market 435
fresh-halibut fishery of 3
haddock fishery of 234
fleet of 235
halibut fishery from 39

Page.

Portland, Me., herring fleet of 438
mackerel catch of 310, 311
fleet of 306
net-fishery of 295
smoked herring at 488
supply of bait from 127
Portlock Bank, Alaska 201, 212
cod on 207
Port Monmouth, N. J., canning factory at 491
Port Ontario, seines used at 766
Portsmouth, N. H., haddock fishery of 234
herring fleet of 438
mackerel catch of 310, 311
Portugal, sardine industry in 489
Portuguese in fresh-halibut fishery 6
George's fishery 189
on mackerel fleet 248
Pacific cod fleet 218, 219
Port Washington, Lake Michigan 757
Pot-nets, shad 636
Potomac River, fisheries of 644
natural obstructions in 645
Poultneyville, gill-net fishery at 762
Pound-net fisheries, location of 597
of Albemarle Sound 609
Atlantic States 595–609
Cape Ann 599
Cape Cod 599, 601
Chesapeake Bay 608
Connecticut 606
Delaware Bay 607
Great Lakes 598
Maine 598
Massachusetts 599–604
New Jersey 607
New York 606
Rhode Island 604
fishery for mullet 570
in Vineyard Sound 601
methods of 605, 760
of Great Lakes 757–761
methods of 758
season for 604, 609
on Great Lakes 760
statistics of 607
Pound-net stake-lifters 760
Pound-nets 667
catch of 609
construction of 549, 598, 758
cost of 603
in Buzzard's Bay 668
Chesapeake Bay, catch of 550
Connecticut River 665
James River 638
Neuse River 631
Ogeechee River 619
Potomac River 645
San Francisco Bay 731
Tampa Bay 570
the Susquehanna 653
introduction of 547
lath 601
laws relating to 609
mackerel in 305

Page.

Pound-nets, menhaden 341, 342
method of fishing 549, 608, 760
number of, in New Jersey 608
on Great Lakes 769
of Cape Cod, markets for catch of 601
patent 501
pile-drivers for 760
salmon 679, 682, 706
size of 603
Spanish mackerel 546
statistics of 599, 605
stock of 607, 609
value of 605, 608
Pounds, baby, in Detroit River 766
herring 429
shad 628
square 601
Poverty among Newfoundland fishermen 445
Preservation of sails with line 377
seines 373
Preservative for gill-nets 229
Preservatives for fish 350
Presumpscot River, Maine 724
Pribyloff Islands, cod at 212
Prickers, red-snapper 586
Prince Edward Island, hake at 241
herring statistics for 439
mackerel catch of 309
off 276
Prince's Bay, menhaden fishing in 383–409
Procter, George H. 32, 155
Procter, Joseph O 281, 348
Profits, division of, in cod fishery 132
in cod fishery 157
of cod-curers 224
cod fishermen 130, 224
George's cod fishery 196
haddock fishery 240
halibut fishermen 18
fishery 23
herring fishermen 427
mackerel hook fishery 291
seining 268
menhaden fishermen 332, 334
mullet fishermen 562, 571
Pacific cod fishermen 219
pound-net fishery 605, 607
red-snapper fishery 589
shad fishermen 616
squeteague fishermen 533
sturgeon fishery 622
swordfishermen 323
weir fishery 601
Propagation of shad, results of 645
Protective legislation for menhaden fishery 370
Providence, R. I., fish marketed at 606
Provincetown, Mass., cod fishery from 133, 149
vessels of 138, 150
mackerel catch of 310, 311
fleet of 307
gill-nets at 294
Provincials on mackerel fleet 248
Provisions on cod schooner 174
Ptilichthys Goodei 214

Page.

Puget Sound salmon 741, 753
Pulcifer, Capt. William 41
Pungo River, mullet in 560
Purse-davit, first use of 250
Purse-seine, appliances for using 250
care of 254
clearing the 374
construction of 253, 254
dipping out the 258
drying up the 257
fishery, growth of 271
hemp for 377
herring 403, 404
in Norwegian waters 272
introduction of 269
laws regulating use of 370
mackerel, description of 252
fishery with 247
in general use 247
Gulf Saint Lawrence .. 247, 275
vessels using 308
method of pursing 256
setting 255
menhaden 335, 337, 361, 368
origin of 269, 270
protests against 303
roller for 249
salt for preserving 254
school of menhaden in 339
set around a vessel 264
size of 253, 254, 374
mesh of 393
Purse-seining at night 259, 261
requirements of 340
Purse-weight for seine 257
Quebec, Canada, catch of mackerel in 309
herring statistics of 439
Quill-fish at Alaska 214
Quinnipiac Fertilizer Company 369
Quinn's, Oregon 745
Quohog Bay, Maine 697, 724
Racine, gill-net fishery at 762
seine fishery at 760
trawling at 767
Raia parmifera 214
Rainfall in Maine 674
Rainier, Oreg 745
Rappahannock River, fisheries of 643
Recontre, Newfoundland 442
Redfish in Tampa Bay 570
Red herring 473
Redhorse in Cape Fear River 626
Savannah River 621
Red Island, halibut fishery at 4
Red-snapper, bait for 587, 588, 590
sharks for 587
care of 587
description of 591
feeding-grounds of 585
fishermen 589, 590
fishery for 583-592
apparatus of 586
dangers of 589
history of 587

Page.

Red-Snapper fishery of East Florida 590
methods of 588, 590, 591
profits of 589
vessels in 587, 588, 589
fishing-grounds for 585, 587
fishing-lines for 586
fleet, statistics of 590
food qualities of 592
for bait 593
large size of 592
method of icing 587
pricking 586
price of 589
season for 589
value of 592
Reed, E. W., menhaden works of 369
Refrigeration of bait 186, 351
Rehoboth Bay, Delaware 534, 539
Rehoboth Beach, Delaware 537
Reproduction of Pacific cod 208
Rhode Island, catch of mackerel in 308
Spanish mackerel in 652
swordfish in 325
menhaden boats of 376
fishermen of 332
industry in 361, 366
pound-net fisheries of 604
Richmond, fish shipped to 609
River fisheries of Florida 613
Maine 673
laws relating to 726
the Atlantic States 611
Rivers of Atlantic States, temperature of 613
Roanoke River, North Carolina 632
Robbinston, Me., herring cannery at 498
sardine packers at 520
Roccus americanus 678
lineatus 678, 693
Rochester, N. Y., cod fishery from 145
Rockfish, apparatus for capturing 539
catch of, in Delaware 538
Neuse River 631
in Albemarle Sound 636
Cape Fear River 626
Hudson River 659
James River 639, 640, 641
Ogeechee River 619
Susquehanna River 651, 653
pound-nets 609
methods of capturing 539
handling 540
Rock fishery of Southern Delaware 538
season for 539
Rockland, Me., herring fleet of 438
mackerel fleet of 306
Rockport, Mass., mackerel catch of 309, 310, 311
fleet of 307
Roe, cod 157
mullet 573, 574
statistics of 576, 577
haddock 239
sturgeon 622, 623, 698
Rogue River salmon fishery 739, 741, 744
Romeo, pinkey schooner 30, 34

Page.

Rose Blanche, Newfoundland 442
Rosenstein Brothers 495, 520
Roseway Bank, cod fishery on 149
Royal's River, Maine 724
Russian River, salmon in 744
Russian sardines 491, 497
preparation of 518, 519
statistics of 521
Russians in Pacific cod fleet 218, 219
Sabine, Lorenzo 466
on Labrador fishery 143
Sable Island Bank, cod fishery on 124
halibut fishery on 4
swordfish on 317, 323
Sable Island, halibut fishery off 55
mackerel at 277
Sacht, a name for cod 202
Saco River, Maine 724
Sacramento pike 737
Sacramento River, pound-nets in 731
salmon canning on 733
fishery 731, 735
statistics of 753
species of salmon in 740
Saghalien, cod from 209
Sag Harbor, N. Y., menhaden at 375–409
Saginaw Bay, fish-spearing at 767
gill-net fishery at 762
Lake Huron 757, 760
Saint Andrew's Bay, herring at 443
Saint Croix River, fisheries of 699
Saint George Bay, halibut fishery in 4, 46
Saint George, Me., herring fleet of 438
mackerel fleet of 306
Saint George River, fisheries of 712
Saint Jacques Bay, Newfoundland 442
Saint John's River, Florida, description of 613
mullet in 558
fishery of ... 576, 577
Saint Lawrence Island, Bering Sea 201
Saint Lewis Sound, Labrador 135
Saint Mark's, mullet fishermen of 561
Saint Mary's River 614, 617
Saint Paul, Alaska, cod at 201
Saint Peter's Bank, cod fishery on 148
French fishery on 148
halibut fishery on 4, 42, 43
near 63
Salem, Mass., mackerel fleet of 307
menhaden at 347
pound-nets at 604
Salmo gairdneri 745
salar 678
Salmon, angling for 680
blueback 744, 745
or redfish 740
boats and scows 732
catch of 700, 706, 712, 718, 735
in Merrimac River 673
Pacific 753
canned, Pacific 729–753
testing of 748
canneries, capital in 752
labor at 747

Page.

Salmon canneries, profits and losses of 748
canning, history of 749
season for 734
chinnook 740
close-time for 727
coho 753
colors of 742
destroyed by seals 731, 747
dip-nets 679
diminution of 749
distribution of, in Maine rivers 679
species of 740
dog 740, 743, 744
drift-nets 679, 700, 718, 735
early abundance of 699, 717
exports of 752
fall 743
fishermen of Columbia River 745
fishery, Columbia River 740
Connecticut River 659
Eel River 739
future of 749
Greenland 93
Maine 679, 700, 701, 703, 704, 706, 710, 716, 717, 719, 724
Kennebec River 717
laws regulating 727, 749
methods of 679, 732, 746
Pacific 729–753
Penobscot River 706
Rogue River 739
Sacramento River 731
seasons for 733
Smith River 739
statistics of 708
outfit for 732
fishing-grounds for 732
food of 742
flesh color of 743
fly-fishing for 701
for cod bait 216
fresh 683
fyke-nets 737
gill-nets 732, 746
grilse 741
growth of 742
habits of 679, 740, 741
haddo 753
hatchery on Rogue River 740
high ascent of rivers by 742
hook-jawed 743, 744
humpback 740
iced 683
in Bering Sea 215
Cape Cod weirs 660
dip-nets 662
Housatonic River 666
Maine 678
Merrimac River 673
Penobscot River 705
industry of California 731–740
statistics of 753
king 740
male, habits of 741

Page.

Salmon, manner of spawning 742
methods of canning 733
smoking 683, 733
natural history of Maine 678
Pacific 740
nets in Connecticut River 660
ocean habits of 741
oil factory at Astoria 750
manufacture of 750
Pacific, total quantity of canned 753
peculiarities of male 743
pens in Connecticut River 662
pound-nets 679, 682
prices of 699, 710, 752
process of canning 747
quantity of, to case 752
quinnat 740, 744, 752
return to native rivers 744
salted 683, 734, 737, 739, 753
seines 662
set-nets 679
silver 216, 740, 743, 753
size of 679, 734, 740, 752
smoked 473, 683, 709, 719, 732, 733, 753
spawning habits of 741
spears 679
species of 739, 740
spring runs of 733, 741
Susquehanna 650
taken with hook 741
tin used in canning 747
traps in California 731
value of spring run of 741
weirs 661, 699
of Penobscot River 679, 680
Salmon Falls River, Maine 725
Salt bait in cod fishery 167, 168
Cadiz, for mackerel curing 288
for curing fish 132, 636
preserving purse-seines 254
halibut fishery 90
Liverpool, for mackerel curing 288
mullet curing 573
pens on cod schooner 151
quality of, carried on cod vessel 126
used in Alaska fisheries 221
fish-curing 216
Labrador fishery 141
Pacific cod fishery 222
on cod schooner 130, 152, 173
Salted bait 350
for red-snapper 587
clams for cod bait 168
halibut, method of curing 114
mullet 560, 572, 577, 578, 580, 581, 582
salmon 683, 734, 737, 739, 753
shad 649, 650
Spanish mackerel 550
Salting codfish 156, 181
cod in Alaska 221
Sammis, Col. H. S 614
Sampit River, fisheries of 624
Sanak, Alaska, cod bank off 213
San Diego, Cal., mullet at 560

Page.

Sand-lance in Bering Sea 201
Sandusky, trawling at 767
Sandwich Bay, Labrador 134
Sandy Hook, mackerel off 274
pound-nets at 547, 607
Spanish mackerel at 545
Sandy River, Maine 719
San Francisco, cod fleet of 217, 218
decrease of fish at 731
first cod in 209
quantity of salmon canned at 734
San Pablo, Cal., salmon fishery at 731
Santee River, fisheries of 624
Sarasota Bay, Florida 564, 567
mullet fishery of 576
Sardine bait, fish-eggs for 507
canneries 497, 520
canners, number of 520
wages of 523
canning, bathing the cans 517
oil used in 523
venting the cans 517
cans, sizes of 515
herring, decrease of 505
drying process 511
flaking 511
frying 514
method of preparing 510
salting 511
industry 489–524
in France 489
Germany 489
Norway 489
Portugal 489
Spain 489
Sweden 489
United States 489–524
origin of 492
statistics of 520
packers, names of 520
Sardines, boneless 516
canning 494
cooking 494
foreign trade in 523
French method of preparing 494
herring packed as 489
imports of 522
in mustard, statistics of 521
oil 495, 515, 521
spices 516, 521
tomato sauce 521
vinegar 516
marinees 516
method of boiling 514
canning menhaden as 490
origin of 489
preparation of 494, 508
pressed 489
Russian 489, 491, 497, 516, 518, 521
salting 494
sorting and packing 515
statistics of 438, 521
Satilla River, sturgeon in 622
Satillas, fisheries of the 618

Page.

Saugatuck, trawl fishing at 767
Saughkonnet River, pound-nets at 604
Sault de Sainte Marie, dip-net fishing at 769
Savannah, red-snapper at 590
shad fishery at 621
sturgeon trade of 622
Savannah River, shad fishery of 619
sturgeon fishery of 621, 622
temperature of 619
Saybrook, Conn 666
Sayward, Daniel, on topsail schooners 141
Scaled herring 480
Scaling herring, methods of 477
Scandinavian fishermen 6, 248, 763
Scap-net fishery on Great Lakes 767
Scatari, halibut fishery at 4, 44
Schizotherus nuttallii 220
Schooling of cod at Alaska 205
Schools supported by mackerel fishery 298
Schooner, cod, deck plan of 150
interior arrangements of 150, 170
outfit of 169, 217
rigging of 172
George's cod, outfit of 190
mackerel hook 277
origin of 124
seaworthiness and speed of 172
three-masted 149, 272
Schooners for collecting fish 765
in gronper fishery 592, 593
hake fishery 242
red-snapper fishery 588
mackerel 248
topsail, in Labrador fishery 141
Scituate, Mass., Deane's history of 301
mackerel fishery at 299
Scoop-nets, shad 621, 662
Scotch herring cure 434
methods of herring fishery 427
Scotland, consumption of herring in 471
exports of herring to 472
fish commissioners of 420
herring fishery at 427
Scott, Capt. P. A., on mackerel bait 346
Scrawl-body or halibut trawl 33
Scudder, N. P., on salt-halibut fishery 90
Sculpins as cod food 208
at Shumagin Islands 216
for cod bait 216
Scup in Massachusetts 602, 603, 667
Rhode Island 604, 606
Sea bass, bait for 349
catch of, in Rhode Island 606
fishery for 318, 349, 590
Seabrook, N. H., boats built at 138
Seal fishery at Magdalen Islands 460
of Newfoundland 445
Sea lions, cod eaten by 209
Seal Island Ground 189
cod fishery on 124
halibut fishery on 4, 32, 40, 42, 44
Seals, cod eaten by 209
destructive to salmon 747
fish destroyed by 731

Page.

Sea trout, canned 515
Sebastichthys at Sitka 200
Sebasticook River, Maine 719, 721
Sedgwick, Me., fisheries of 306, 310, 311, 438
Seguin Island, Maine 498
Seine boat and fittings 250
Seine-boats, construction of menhaden 336
cost of 252
description of 250
equipment of 250
increase of length of 250
menhaden 250, 251, 336
mullet 566
Seine, clearing the 374
fishery for mullets 563
of Great Lakes 765
Lake Ontario 766
fishing in the Susquehanna 651
Seines, alewife 671, 680
cod 142, 144
construction of Great Lakes 766
haul 347, 462
herring 432, 507
mullet 563, 575, 576, 577
purse, for mackerel 252
rock and perch 539
salmon 662
shad 639, 657, 685
smelt 691
spot 535
squeteague 529
tarring 373
varnishing 373
wade 529, 531, 534
Seining, purse, methods by day 255
the herring weirs 503
Seine-roller on mackerel schooner 249
Sellman, Henry 491, 492, 496, 520, 521
Seminoffsky, Alaska 201, 205
Seminoffsky Bank, Alaska 207, 213
Set-nets, alewife 688
salmon 679
shad 627
Setting a seine around a vessel 264
Shack fishing for cod 152
Shad, abundance of, in Connecticut River 660
alice or twaite 419
battery in the Susquehanna 651
bush-net 646
cast-nets 620
catch of 708, 719
in Albemarle Sound 637
Altamaha River 618
Chowan River 633–635
Connecticut River 664–666
Delaware River 654
Florida 614–617
Housatonic River 667
Hudson River 659
James River 639
Massachusetts 667
Merrimac River 673
Neuse River 631
Pamunky River 643

Page

Shad, catch of, in Potomac River 645
Rappahannock River 664
Susquehanna River 653
caught in weirs 342
with hook 650
close-time for 727
cost of, to fishermen 616
country supply of 663
decrease of 627, 633, 638
destroyed by eels 652
dip-nets 686
drag-nets 628
drift-nets 625, 685
Dutch net 628, 636
early held in disrepute 660
trade in 649
eggs of 684
family supply of 649
fishermen 615, 616
fishery, in Albemarle Sound 632–637
Altamaha River 617
Chatham, Mass 297
Cape Fear River 625
Connecticut River 659
Delaware River 654
Edisto River 623
Housatonic River 666
Hudson River 658
James River 638
Maine 683–687, 701, 702, 703, 704, 708, 710, 716, 724, 725
Merrimac River 673
New York Harbor 658
Ogeechee River 618
Pamlico River 631
Pamlico Sound 632
Potomac River 644
Rappahannock River 644
Saint John's River 614–617
Saint Mary's River 617
Santee River 624
Savannah River 619
Susquehanna River 645
Taunton River 667
Winyah Bay 624
York River 642
laying out gill-nets 622
laws relating to 657, 727
methods of 614, 615, 616, 627, 645, 651, 657, 658
rent of 639
statistics of 618, 619, 621, 624, 625, 626, 631, 664–666, 719
with trapsm 620
food of 654
qualities of Florida 615
for domestic supply 656
former abundance of 644, 648, 656, 699
value of 647
gilling-seines 657
gill-net fishery 652, 666
gill-nets 615, 618, 619, 621, 623, 630, 645, 665
grades of pickled 686
growth of 655

Page

Shad, haul-seine fishery, statistics of 666
haul-seines 621, 625, 628, 636, 645, 665
hickory 618
iced 614, 666
increase of, in Connecticut River 663
in pound-nets 606, 608, 609
life of 656, 684
low price of 660
mess 687, 724
methods of capturing 684
curing 686
migrations of 655
movements of 632, 654
natural history of 663
nets in Saint John's River 614
night fishing for 640, 652, 686
number of, to barrel 687
obstructed by dams 650
pickled 640, 641, 642, 709
planked 656
pound-nets 628, 645, 665, 666
price of 614, 649, 687, 710
proportions of buck to roe 630
reaches on Saint John's River 615
results of propagation of 645
return to place of spawning 655
river 684, 719
runs of, in Delaware River 655
Neuse River 631
Susquehanna River 646
salted 649, 656
scoop-nets 621, 662
sea 684, 700, 719, 724
seasons for 613, 615, 620, 626, 633, 639, 642, 655, 662, 683
seines 636, 639, 656, 685
vast size of 636
size of 615, 619, 648, 683
skim-nets 625, 629, 643
smoked 656
spawned, called racers 655
spawning grounds of 614, 620
habits of 684
season in Florida 615
spring 684
stake-nets 627, 636, 644, 658
traded for salt 649
trap-net 628
traps on James River 639
Trenton 655
twaite 419
value of, in last century 642
weirs 684, 719
weight of 656
white 639, 642
Shadine, menhaden as 491
Share, halibut fishermen's 18
Shares in mackerel fishery 289
Shark, Alaska 206
in Cape Cod weirs 600
thresher 388
Sharks, destroy menhaden nets 332
destructive to trawls 179
schooling of codfish 206

Page.

Sharks for bait 593
red-snapper bait 587
in menhaden weir 342
menhaden nets injured by 375
on red-snapper grounds 586
Sheboygan, gill-net fishery at 702
Sheepscot River, fisheries of 716
Sheepshead 550, 590
in Chesapeake Bay 638
pound-nets 608, 609
Tampa Bay 570
Shell-fish, laws against taking 450
Shelter Island, menhaden works at 373–409
Shetland Islands, herring at 419
Ship-chandlery in cod schooner 173
Shippegan Island, cod fishery near 137
Shore fisheries of Southern Delaware 527–541
Shrimp as food for cod 207
bait for Spanish mackerel 545
cast-nets 621
Shumagin cod fishery 210, 225
Shumagin Islands, birds at 215
cod at 201, 205, 207, 215
discovery of 215
vessels at 217
Siberia, East, cod at 201
Siberia, frozen mammoth in 351
Signal Office, temperature records of 613, 619
Simeonoff Bank, Alaska 213
Sinclair, Capt. Peter, on use of trawls 39, 159
Sinkers for cod gill-nets 228, 229, 230
purse-seine 253, 536
Siscowet Bay, pound-net fishery at 757
Sisson, Capt. B. H 344
Sitka, Alaska, cod at 200, 212
Skate in Cape Cod weirs 600
of halibut trawl 11, 111
oil from liver of 600
on Grand Bank 178
Skim-nets, shad 619, 625, 626, 629, 631, 643
Skowhegan, Me 717
Slaughter Beach, Delaware 528
Sling-ding gear 192
Slivering menhaden 346
Smelt bag-nets 691, 709, 715
bait 715
catch of 700, 704, 708, 709, 722
dip-nets 692, 702
fishery, Kennebec River 722
Maine 690–693, 702, 703, 704, 708, 712, 714, 715, 716, 722, 724, 725
methods of 690
with hook and line 692
on the ice 692
frozen 693
fykes 692, 703
gill-nets 692
in Bering Sea 201
Maine 678
markets for 693
methods of capturing 690
natural history of 690
preserved in ice-water 693
seines 691

Page.

Smelt, size of, in Maine 690
spawning habits of 690
weirs 690, 716, 722
Smiley, C. W 551
Smith, Capt. Henry O 440, 455
Smith, Capt. Joseph 249, 253, 261, 298
Smith, Capt. Sylvanus 349, 456
Smith River, salmon fishery 739
Smith's Island Menhaden Works 378
Smoke-houses, construction of 476
number of 488
Smoked alewives 474, 481, 672, 689, 702, 704, 713, 715
codfish bellies 473
haddock 473
halibut 90, 473
herring 456, 466, 473–488, 506, 609
artificial 483
boneless 484
export trade 482
grades of 482
hard 472
in oil 483
laws relating to 482
markets for 482
methods of curing 477, 487
packing of 480
statistics of 432, 438, 439, 484, 488
woods for curing 479
mullet 574
salmon 473, 683, 709, 719, 732, 733, 753
shad 656
whitefish 473
Smoking fish, methods of 473
herring, European methods 483
methods of 477
salmon, methods of 683
Soldering sardine cans 516
Sounds, cod 132, 157, 182
pickled 435
hake 24, 242, 243
for isinglass 243
South Carolina, catch of Spanish mackerel in 552
menhaden at 332, 369
mullet fishery of 577
river fisheries of 613, 653
South Channel, cod fishery in 180
Southern mackerel fishery, methods of 273, 310, 311
South Hadley Falls, Mass 663
Southold, N. Y., menhaden factory at 373–409
Southport, Me 38, 39, 123, 188, 306, 310, 311, 474
Spain, cod exports to 144
sardine industry in 489
Spanish mackerel 607
apparatus for capturing 546
bait for 545
canned 550
catch of 550, 552
fishery for 545–552
fishing-grounds for 545
in Chesapeake Bay 638
Massachusetts 667
pound-nets 606, 608, 609
markets for 551
method of handling 550

Page.

Spanish mackerel, prejudice against ... 545
salted ... 550
season for ... 550
weirs ... 602
Spanish mullet fishermen ... 562
Spawn, cod, for herring bait ... 507
haddock ... 239
Spawning grounds for shad ... 620
habits of cod on Grand Bank ... 167
eels ... 769
herring ... 420, 426
salmon ... 741
smelt ... 690
season of cod ... 206
at Alaska ... 199
shad in Florida ... 615
Spears, eel ... 696, 703
salmon ... 679
Spiller, mackerel ... 266
Spinney, M. B ... 694
Spirling for cod bait ... 231
Split-tails in Sacramento River ... 737
Splitting-keelers, mackerel ... 267
Sports of fishermen ... 163
Spot, apparatus for capturing ... 535
best time for catching ... 536
fishermen ... 534
fishery of Southern Delaware ... 533
gill-nets ... 530
methods of capturing ... 535
handling ... 537
price of ... 537
Spotted Island, Labrador ... 135
Spring Southern mackerel fishery ... 273
Spurling, small herring called ... 420
torching ... 499
Squalus acanthias ... 206, 209
Squeteague ... 567
disposition of catch of ... 532
fishermen ... 528
fishery ... 527, 533
fishing-grounds for ... 527
in Buzzard's Bay ... 603
Massachusetts ... 667
pound-nets ... 608
Rhode Island pound-nets ... 604
method of shipping ... 532
methods of capturing ... 529, 530
nets ... 529
season for ... 527
seines ... 529
Squid as food for cod ... 207
fishery at Newfoundland ... 184
for cod bait ... 127, 151, 184, 185, 199, 436, 437
red-snapper bait ... 588
giant, for cod bait ... 185
habits of ... 184
in Cape Cod weirs ... 600
pound-nets ... 607
jigging at Newfoundland ... 184
of the Pacific ... 199
lines and jigs ... 127
salted, for cod bait ... 127
Squids, Spanish mackerel ... 546

Page.

Stake-lifters for pound-nets ... 760
Stake-nets ... 619, 643
mullet ... 568
shad ... 627, 631, 636, 644, 658
Statistics of Albemarle Sound fisheries ... 636, 637
canned-salmon industry ... 734
Connecticut River fisheries ... 666
Delaware River fisheries ... 654
frozen-herring trade ... 457
Great Lakes fisheries ... 769
hake fishery ... 243
halibut fishery ... 3
herring catch ... 432, 437
Housatonic River fisheries ... 667
Hudson River fisheries ... 658
James River fisheries ... 639
Long Island pound-nets ... 607
mackerel fishery ... 304
inspection ... 312
Massachusetts pound-net fisheries ... 604
Mattapony River fisheries ... 643
menhaden fishery ... 360
mullet fishery ... 575
Neuse River fisheries ... 631
Pamunkey River fisheries ... 643
pickled-herring trade ... 466
Potomac River fisheries ... 645
pound-net fishery ... 606, 607, 609
pound-nets ... 605, 608, 609
Rappahannock River fisheries ... 644
salmon industry ... 734, 735, 736, 739, 740, 751, 753
sardines ... 520, 521
shad fishery ... 614–617, 618, 619, 621; 624, 625, 626
skim-net shad fishery ... 630
smoked-herring industry ... 466
sturgeon fishery ... 621, 622, 623, 624, 625, 626
Susquehanna fisheries ... 653
swordfishery ... 325
Willow Branch fishery ... 633–635
Steamer in red-snapper fishery ... 589
menhaden, crew of ... 332
description of ... 334
first used ... 368
Steam-tugs in gill-net fishery ... 762
Great Lakes fisheries ... 759
Steindachner, on cod ... 198
Steuben, Me., herring fleet of ... 438
Stearns, Silas ... 545, 552, 555, 558, 561, 562, 564, 569, 571, 574, 575, 576, 579, 580, 583, 584, 590
Stone, Livingstone, on Sacramento salmon ... 735
Stony Island, Labrador ... 135
Stop-fishing for mullet ... 569
Stop-nets, striped bass ... 694, 723
Saint Pierre, bait carried to ... 450
Straits of Belle Isle, fish-curing at ... 141
fishery in ... 146
Straits of Canso, mackerel fishery at ... 297, 298
landed at ... 291
Striped bass ... 650
catch of, in Delaware River ... 654
dip-nets ... 694
fishery of Kennebec River ... 723

Page.

Striped bass fishery of Maine 693–69
in Hudson River 659
Maine 678
Massachusetts 667
pound-nets 606
Rhode Island 604
modes of capturing 694
natural history of 693
salted 695
size of, in Maine 694
spawning habits of 693
stop-nets 694
taken in weirs 600
Sturgeon Bay, gill-net fishery at 761
Sturgeon camp on Winyah Bay 624
caviar 698
drift-nets 697, 698
export of 698
fishery, early history of 698
methods of 624, 697
of Altamaha River 619
Cape Fear River 626
Delaware Bay 540
Edisto River 624
Hudson River 658, 959
Kennebec River 723
Maine 697–699, 723
Ogeechee River 619
Port Ontario 766
Saint Mary's River 618
Savannah River 621
the Satillas 618
Winyah Bay 624
York River 643
outfit for 622
statistics of 621, 622, 623, 624, 625, 626
gill-nets 619, 622
grappling in Great Lakes 768
in Connecticut River 662
Great Falls 76
Maine 678
Sacramento River 737
San Francisco market 737
the Susquehanna 652
kept in pens 619
meat called Albany beef 659
Charles City bacon 659
method of dressing 622, 625, 698
natural history 697
pen for keeping 698
oil of 698
roe of 622, 623, 625
season for 622, 626
size of 622
soused 698
statistics of catch of 619, 637, 639, 643, 644, 645, 654
trade of Savannah in 622
Suckers, fishery for, in Great Lakes 766, 769
in Sacramento River 737
Sukkertoppen, Greenland 104
Sullivan, Me., herring fleet of 438
Sullivan River, fisheries of 704
Sumner, Hon. Charles, on Alaska 209

Page.

Sunday fishing, laws against 448
Superior City, Wis 757
Superstitions of fishermen 107, 109
Susquehanna bass 650
salmon 650
Susquehanna River, dams in 650
description of 645
drift-net fishery in 653
fisheries of 645
former abundance of shad in 648
statistics of 653
Swamscott, first use of trawls at 158
haddock fishery of 234, 235
mackerel fleet of 307
Swan, James G., on Pacific cod 200
Swansea, Mass 667
Swan's Island, Me 306, 310, 311, 438
Sweden, herring exports to 471
sardine industry in 489
Swedes in fresh-halibut fishery 6
George's fishery 189
Pacific cod fleet 218, 219
Sweep-nets, mullet 568
Sweep-seine fishing 738
Swift Islands, James River 642
Swivels on George's fishing-gear 192
Swordfish, apparatus for capture of 318
average weight of 325
bait 323
fishery 317–326
history of 323
landsman's description of 321
perils of 321, 322
products of 324
statistics of 325
vessels in 318
habits of 320
harpoon 318
lily-iron 319
lance 319
markets and prices 325
method of capturing 319, 320, 322
movements of 317
pickled 435
pulpit 320
statistics of catch of 325
Sydney, Cape Breton, mackerel at 276
Tailor or bluefish 638
Tallman, Benjamin, on menhaden 606
Tampa Bay, mullet fishery of 576
pound-net in 570
Tangier Island, Chesapeake Bay 547
Tangier Sound 637
Tar River, fisheries of 631
mullet in 560
Taunton River, fisheries of 667
Tautog, catch of, in Rhode Island 606
in Buzzard's Bay 603
Massachusetts 603
taken in weirs 600
Taylors in pound-nets 609
Temperature at Greenland 96
of air and water on Grand Bank 162, 165
Maine rivers 676

Page.

Temperature of Ogeechee River 618
river waters 613
Saint John's River 613
Savannah River 619
tables of, at Greenland 97
water, at Greenland 105
Terry, G., menhaden works of 369
Terry, Jesse, menhaden works of 373
Thomas, Capt. Henry B 458
Thomaston, Me 713
smelt trade of 693
Thompson, John H., on swordfish 325
Thumbing the hat for watches 75, 108
Thunder Bay, Lake Huron 757, 764
Ticonic Falls, Maine 719
Tides and currents at Greenland 104
Tides, herring fishery affected by 503
in Maine rivers 676
on George's Bank 194
Tilesia gracilis in Pacific 200
Toledo, catfish fishery of 768
trawl fishery at 767
Toll bait, method of using 284
Tollman, Benjamin, purse-seine introduced by 368
Tollman, John, menhaden works of 366
Tom-cod 703
in the Kennebec 723
caught with grapples 723
dip-net 702
fishery of Maine 703, 704, 723, 724
in Maine 678
Pacific 209
Tongues, cod 132, 182, 225
pickled 435
Topsail schooners in Labrador fishery 141
Tor Bay, Newfoundland 162
Torching for herring 428, 499, 503
Toussaint, trawl fishery at 767
Trailing for mackerel 300
Trap fishery at Long Island 606
south side of Cape Cod 601
net, shad 628
Traps, eel 696
fall 620
floating 599
hack 620
and fall 623
herring 429
shad, on James River 639
Trawl, baiting the 154
called bull-tow 79
cod 151
accidents to 179
fishery, history of 158
of Great Lakes 767
fish, inferiority of 160
haddock 236
method of using 237
hake 242
halibut 11, 110
first use of 39
methods of hauling 16, 112
setting 13
repairing 75

Page.

Trawl, method of baiting 112
hauling 153
setting 111, 176
underrunning 154
using 153
rigging of 108, 160
roller, halibut 10
used in cod fishery 138
Trawl-line cod fishery 148
halibut, construction of 10
method of hauling 177
rigging 175
underrunning 177
opposition to use of 158
tried in red-snapper fishery 589
Trawling, apparatus for 175
decline of, in Maine 160
French method of 158, 160
history of, in Maine 159
Treat, Amos 712
Treaties, convention of 1818 148
Treaty of 1783, fishery rights under 459
1818, fishery rights under 450, 459
Washington 275, 346, 446, 449, 450
rights granted Americans 450
Tremont, Me., herring fleet of 438
Labrador fishery from 147
mackerel fleet of 306
Treska, Russian name for cod 202
Tripland, Charles P 9
Troll line for Spanish mackerel 546
Trout, brook 521
canned 515
in pound-nets 609
Rappahannock River 643
Savannah River 621
ocean 491
canned 515
or squeteague 527
salt-water 570
sea 567
canned 515
Trout-line of Great Lakes 768
True, Frederick W 595, 597, 611, 670
on herring 426
traps 429
Truro, Mass., mackerel fleet of 307
Tunkhannock fishery 647
Tunk River, fisheries of 704
Turbot, American 37
Turner, Capt. James, on mackerel drailing 300
Turtle, catch of, in Delaware River 654
leather, at Cape Cod 600
loggerhead, at Cape Cod 600
Tuthill & Co., C. H., menhaden factory of 378–409
Unmak, Alaska, cod bank at 214
Unalashka, cod banks near 201
native fishermen of 220
Underrunning cod gill-nets 232
trawls 154
herring nets 431
the trawl 177
Unimak Pass, Alaska, cod bank at 214
Union Pacific Salt Company 222

Page.

Union River 705
Unity, Washington Territory 745
U. S. Fish Commission 370, 614
Vallejo, Cal., salmon fishery of 731
Van Burkalow, M. S 520, 532
Veniaminoff, Ivan, on cod fishery 205
Venting sardine cans 517
Vermillion, trawl fishery at 767
Vessels, cod, at Shumagin Islands 217
construction of 129
deck plan of 171
rigging of 172
Great Lakes, number of 769
Greenland halibut 110
haddock 235
halibut 3
profit of 24
herring 426
statistics of 438
in cod fleet 137
fresh-halibut fishery 6
frozen-herring trade 443
George's cod fishery 188, 190
grouper fishery 592, 593
hake fishery 242
hand-line cod fishery 124, 125
Hudson River fisheries 659
Labrador herring fishery 462
mackerel hook fishery 277
fishery 248
Magdalen herring fishery 462
Pacific cod fleet 217
red-snapper fishery 589
salt-halibut fishery 110
swordfish fishery 318
trawl-line cod fishery 149
mackerel, number of 306
menhaden 332
description of 334
statistics of 360, 361
mullet 566
outfit for hand-lining 125
of cod 169
routine life on cod 152
Victori Ground, halibut on 95
Vinal Haven, Me., herring fleet of 438
Labrador fishery from 147
mackerel fleet of 306
Vineyard Sound, methods of weir fisheries in 602
pound-net fisheries in 598, 601
Virginia, catch of Spanish mackerel in 552
menhaden statistics of 361
pound-nets in 608
river fisheries in 638
Virgin Rocks, cod fishery on 148
fishing season on 167
gear for fishing on 127
halibut fishery on 46
Waccama River, fisheries of 624
Wachna, in Pacific 200
Wade seines 530, 534, 535
Wages of fishermen 533
menhaden fishermen 332, 334
Pacific cod fishermen 224

Page.

Wages of sardine canners 523
Waldoborough, Me., herring fleet of 438
mackerel fishery at 297
fleet of 306
smelt trade of 693
Walker, W. W 687, 697
Wallem, F. W 483, 487, 489, 513
Waquoit, Mass., square ponnds at 601
Wareham, Mass., fishery at 609
Warren, Me 713
smelt trade of 693
Washington Territory, salmon canneries of 745
Washington treaty 346, 446, 449, 450
Waukegan, pound-net fishery at 757
Watches, arrangements of, on fishing vessels 107
Water carried on cod schooner 151, 174
Water, quantity of, carried on voyage 126
Weakfish, catch of, in Rhode Island 606
in pound-nets 608
Webeck, Labrador 134
Weir and net fisheries 436
Weir companies of Cape Cod 601
Weir fishery, expenses of 601
financial arrangements of 598
in Maine, season for 598
methods of 600, 602
species captured 600
Weirs, alewife 708
at Cape Cod 599
bar 500
brush 475, 499
advantages of 506
construction of 500
cost of 502
in Albemarle Sound 609
channel 501
early construction of 710
eel 696
floored, for shad 685
half-tide 685, 690
herring 428, 429
in New Brunswick 485
near Lubec 422
in Maine 598
Pamunky River 643
land lease for 603
manner of working 599
menhaden 341, 342
method of fishing 503
number of, in Rhode Island 605
patent 501
pocket, for shad 685
quantity of herring taken in 504
salmon 661, 679, 699, 700, 707
season for fishing 502
shad 719
in the Kennebec River 684
shoal-water 599
shore 501
smelt 690, 716, 722
Welch Point Menhaden Works 380
Wellfleet, Mass 672
mackerel catch of 309, 310, 311
fleet of 307

	Page.
Well-smacks	36
at Martha's Vineyard	603
construction of	41
for red-snapper	587
halibut	20, 34
in grouper fishery	593
halibut fishery	9, 35
Havana market fishery	592
red-snapper fishery	588
Wells for red-snapper	586
Wells' "Water-Power of Maine" cited	674, 705
Welsh, Mr., American minister	448
Wesconguns River, fisheries of	703
West Coast Packing Company	745
Westbrook, Conn	547, 664
Western Bank, abundance of halibut on	58
bait used on	151, 152
beginning of halibut fishery on	40
cod fishery, bait in	436
on	124, 148
season on	152
halibut fishery on	3, 4, 27, 32, 44, 47, 55, 64
Western Fur and Trading Company	225
Western Ground haddock fishery	234
West Indies, cod exports to	144
herring exported to	471
mullet exports to	580
roes exported to	580
shipments to	560
Westport, Mass., swordfish fleet	318
Westport, Me., herring smoking at	474
Labrador fishery from	146
Westport, Oreg	745
Whale-boats in Labrador fishery	138
menhaden fishery	367
Whale Deep	148
Whale fishery, yield of	361
Whale oil, adulterations of	363
Whale, white, in Cape Cod weirs	600
Whalley, E. W	605
Wheeler boat	763
Whitefish Bay	757
Whitefish gill-net	763
Great Lakes	769
menhaden called	329, 368
smoked	766
seine fishery for	473
Whitefish Point, gill-net fishery at	761
Lake Superior	766
White perch	678
White perch in pound-nets	669
White whale in weirs	600
Whiting as cod food	208
in Bering Sea	201
Wicomico River	654
Widows and orphans' fund	157
Wife, menhaden called	329
Wilcox, W. A	142, 426, 484, 551, 606, 611, 667, 668
Willard, H. E	703
Willow Branch fishery, record of	633
Wilmington, N. C., mullet at	578
Wilson, Lake Ontario	762
Wilson, Lewis, & Son	700
Windlass, patent, first use of	38
Windsor Locks, Connecticut River	666
Wind, velocity and direction of, at Greenland	96, 99
Winter fishery at Green Bay	764
Winyah Bay, fisheries of	624
Wiscasset, Me., Labrador fishery from	147
mackerel fleet of	306
Wolff, Julius	491
Wolff & Reessing	493, 495, 520
Wonson, John F	34
on early halibut fishery	35
Wonson, William H., on early halibut fishery	35
Wood Island, Me	498
herring at	421, 425
Wood's Holl, fish shipments from	603
Wood's Island, James River	642
Woolwich, Me., smelt trade of	693
Worms, marine, as food for cod	207
Wrecking vessels	592
Wright, Harrison	646
Wyoming, early shad fisheries of	646
Wyoming Historical and Geological Society	646
Yakutat Bay, Alaska, cod at	201, 212
Yarmouth bloaters	486
Yarmouth, Mass., register quoted	600
weir fishery	609
Yarmouth, Me	724
Yarrell, on English mackerel fishery	296
Yawl-boats on halibut vessels	10
Yellow-fish as cod food	208
at Alaska	205, 206
Shumagin Islands	216
Yellow pickerel	766
Yellow-tail shad, menhaden called	329
York, Me., herring fleet of	438
York River, Maine	642, 725

7495