

DEPARTMENT OF THE INTERIOR.

TENTH CENSUS OF THE UNITED STATES.

FRANCIS A. WALKER,
SUPERINTENDENT.

THE HISTORY AND PRESENT CONDITION

OF THE

FISHERY INDUSTRIES.

PREPARED UNDER THE DIRECTION OF
PROFESSOR S. F. BAIRD,
U. S. COMMISSIONER OF FISH AND FISHERIES.

BY
G. BROWN GOODE,
ASSISTANT DIRECTOR U. S. NATIONAL MUSEUM,
AND A STAFF OF ASSOCIATES.

THE OYSTER-INDUSTRY.

BY

ERNEST INGERSOLL.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1881.

THE HISTORY AND PRESENT CONDITION

OF THE CITY OF NEW YORK

FROM 1624 TO 1800

BY JOHN B. HEWITT

NEW YORK: PUBLISHED BY J. B. HEWITT, 1850

THE CITY OF NEW YORK

PRINTED BY J. B. HEWITT



DEPARTMENT OF THE INTERIOR.

TENTH CENSUS OF THE UNITED STATES.

FRANCIS A. WALKER,

SUPERINTENDENT.

THE HISTORY AND PRESENT CONDITION

OF THE

FISHERY INDUSTRIES.

PREPARED UNDER THE DIRECTION OF
PROFESSOR S. F. BAIRD,
U. S. COMMISSIONER OF FISH AND FISHERIES.

BY
G. BROWN GOODE,
*ASSISTANT DIRECTOR U. S. NATIONAL MUSEUM,
AND A STAFF OF ASSOCIATES.*

THE OYSTER-INDUSTRY.

BY

ERNEST INGERSOLL.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1881.

ANALYSIS.

Title.	Page.
I. THE OYSTER-INDUSTRY—DESCRIPTIVE AND STATISTICAL REPORTS.	
A. THE MARITIME PROVINCES OF CANADA	3
1. Geographical position and character of the oyster-beds	3
2. Manner of procuring the oysters	5
3. Future of the oyster-beds and oyster-trade	8
B. GULF OF MAINE	11
4. Former extent and condition of the native beds in the gulf of Maine—evidence of Indian shell-heaps	11
5. The time and causes of the extinction of the oyster in the gulf of Maine	16
6. History of the natural oyster-beds in the gulf of Maine since the settlement of the coast by Europeans	19
7. Oyster-culture in the gulf of Maine	21
8. History and present condition of the oyster-trade at Wellfleet and vicinity	23
9. History and present condition of the oyster-trade of Boston	27
10. The oyster-trade of Salem, Massachusetts, and vicinity	31
11. The oyster-business of Newburyport	32
12. The oyster-business of the New Hampshire coast	32
13. The oyster-business of Portland, Maine	34
14. The natural beds of Sheepscot Bridge, Maine	35
C. THE SOUTH COAST OF MASSACHUSETTS	36
15. Oyster-culture in Buzzard's bay and Vineyard sound	36
16. The oyster-laws of Massachusetts	43
D. TAUNTON RIVER AND COLE'S RIVER, MASSACHUSETTS	44
17. Oyster-culture and oyster-trade on Massachusetts affluents of Narraganset bay	44
E. COASTS OF RHODE ISLAND	46
18. Legal regulations of Rhode Island oyster-fishery	46
19. The planting-grounds of Narraganset bay	51
20. Southern oysters: transplanting and trade	53
21. Native and seed oysters	54
22. Enemies of the oyster in Narraganset bay	56
23. Statistics of the oyster-trade of Rhode Island	56
F. EASTERN COAST OF CONNECTICUT	58
24. Oyster-industries east of New Haven	58
25. Early oyster-trade at New Haven	61
26. Origin and development of the southern trade	61
27. Native oysters and oyster-planting in the vicinity of New Haven	63
28. Present condition of oyster-culture in the vicinity of New Haven	66
29. Laws of Connecticut relating to oysters	67
30. Limitations of oyster-culture in the New Haven region	71
31. Oyster-culture at Milford	78
32. Methods of catch and disposal	79
G. THE HOUSATONIC AND SAUGATUCK REGIONS	85
33. Oyster-fisheries of Bridgeport and Westport	85
H. THE EAST RIVER AND PECONIC BAY	88
34. Oyster-interests from Hell Gate to Port Jefferson, New York, and Norwalk, Connecticut	88
35. Peconic bay, or Eastern Long Island	97
I. THE SOUTH SHORE OF LONG ISLAND	98
36. The Great South bay district	100
37. The Rockaway district	100
J. NEW YORK BAY (excluding the city of New York)	110
38. History of oyster-industries of New York bay	110
39. Oyster-industries of New York bay, 1879-'80	114

Title.	Page.
I. THE OYSTER-INDUSTRY—Continued.	
K. OYSTER-TRADE OF NEW YORK CITY	121
40. Historical sketch of the oyster-trade of New York city	121
41. The oyster-trade of New York in 1880	126
L. COAST OF NEW JERSEY	134
42. Oyster-industries of the New Jersey "bays"	134
M. DELAWARE BAY	144
43. New Jersey and Delaware shores of Delaware bay	144
N. OYSTER-INTERESTS OF PHILADELPHIA	154
44. The merchants and oyster-business of Philadelphia	154
O. MARYLAND AND BALTIMORE	156
45. Oyster-fisheries of Maryland	156
46. Packing and shipping trade of Maryland	165
47. Statistical summary for Baltimore	170
48. The oyster-laws of Maryland	172
P. COASTS OF VIRGINIA	180
49. Oyster-fisheries and oyster-packing	180
Q. THE SOUTHERN ATLANTIC COAST	188
50. The oyster-products of North Carolina	188
51. Oyster-fisheries of South Carolina	190
52. Oyster-fisheries of Georgia	190
53. Oyster-interests of East Florida	192
R. THE GULF OF MEXICO	193
54. Oyster-interests of West Florida	193
55. Oyster-industries of Alabama	195
56. Oyster-industries of Mississippi and Louisiana	197
57. Oyster-industry of Texas	200
S. THE PACIFIC COAST	201
58. Oyster-industries of California	201
T. UTILIZATION OF OYSTER-SHELLS	205
59. Shell-lime and other applications of oyster-shells	205
II. THE NATURAL HISTORY OF THE OYSTER.	
U. GENERAL NATURAL HISTORY	209
60. The growth and habits of the American oyster of the Atlantic coast	209
V. FATALITIES TO WHICH THE OYSTER IS SUBJECT	225
61. Living enemies of the oyster	225
62. Fatalities to which oysters are subject	237
III. GLOSSARY OF TERMS.	
W. AN OYSTERMAN'S DICTIONARY	241
63. Phrases and words descriptive of mollusks and other invertebrates of the Atlantic coast	241
IV. GENERAL SUMMARY.	
X. STATISTICAL TABLES	251
64. Table showing, by states, the persons employed, capital invested, and value of products of the oyster-industry	251

ILLUSTRATIONS.

Plate.	Page.
XXX. Giant oyster, 14 inches long, from Damariscotta river, Maine	33
XXXI. Oyster tongs and nippers	79
XXXII. Inclosed dock for oyster-vessels at Perth Amboy, New Jersey—"The Creek" at Keyport, New York, with oyster-boats, skiffs, and scows	119
XXXIII. Oyster-barges at the foot of West Tenth street, North river, New York city	126
XXXIV. A Lake's bay shipping-house and "platform" for freshening oysters, Smith's Landing, Lake's bay, New Jersey	140
XXXV. Chesapeake oyster-dredges, with windlass	158
XXXVI. Baltimore oyster-shucking trough.—Oyster-knives of divers patterns, used in New England, New York, and the Chesapeake region	169
XXXVII. Development of the oyster, Figs. 1-16	170
XXXVIII. Do. do. do. 17-32	170
XXXIX. Do. do. do. 33-42	170
XL. Do. do. do. 43-52	170
XLI. Do. do. do. 53-66	170
XLII. Do. do. do. 67	170

SECTION X—[MONOGRAPH B.]

A REPORT ON THE OYSTER-INDUSTRY OF THE UNITED STATES

BY

ERNEST INGERSOLL.

I. THE OYSTER-INDUSTRY—DESCRIPTIVE AND STATISTICAL REPORTS.

A. THE MARITIME PROVINCES OF CANADA.

1. GEOGRAPHICAL POSITION AND CHARACTER OF THE OYSTER-BEDS.

DESCRIPTION OF THE EASTERN COAST OF NEW BRUNSWICK.—It is well known that eastern New Brunswick and the adjoining islands are the home of a breed of oysters, separated from those of the New England coast by more than a thousand miles of shore line.

In a study of the oysters of the United States, it is important to glance at this distant scene of their growth and industry, but more than a general view of the subject is not compatible with the purposes of the present report.

The eastern coast of the province of New Brunswick is washed by the waters of the gulf of St. Lawrence. At Cape Tormentine the coast trends eastward, along Nova Scotia, to the Gut of Canso, and then turns sharply northward, on the western side of Cape Breton island, which bars out the Atlantic. This part of the gulf is a great bight, with Anticosti island on the north, and Cape Breton on the east. Down in the bottom of the bight, so to speak, lies the long irregular shape of Prince Edward island, between which and the mainland flow the shallow but troublesome currents of Northumberland strait.

The shores of New Brunswick and Prince Edward are, for the most part, low bluffs of reddish soil, and sloping meadows. There is little solid rock, few prominent headlands, but a generally continuous line of shore, shelving very gradually into water nowhere deep. Many rivers come down along the coast of the gulf, and at the mouth of each there is an estuary or inlet, proportionate to the size of the stream, from the mighty channel of the St. Lawrence to the miniature bay of Bedeque. With the exception of two or three of the greater ones, all these inlets are so shallow that it is easy to pole a raft anywhere, and they are usually protected from the swell of the outer sea and the fury of the gales by a barrier of islands, or by projecting headlands and bars. This condition of things seems highly favorable for oyster-growth, since nearly all of these inlets contain colonies of these mollusks.

SHIPPEGAN AND CARAQUETTE TO PICTOU.—Beginning at the north, on the coast of New Brunswick, the most distant point at which I could ascertain that oysters had ever been discovered, was in the rear of Miscou island, at Shippegan, and in Caraquette bay, a harbor on the southern shore of the bay of Chaleurs.

In 1849, Mr. Perley, the queen's commissioner, reported to the government:

Some oysters of very large size and good quality are found at Tabusintac; but those of the finest description are found on extensive beds in Shippegan harbor, St. Simon's inlet, and Caraquette bay, from which localities they are exported every season to Quebec. The number of bushels exported from the port of Caraquette during the last eight years, is as follows:

1841.....	7,000	1845.....	2,010
1842.....	7,600	1846.....	1,915
1843.....	5,290	1847.....	425
1844.....	6,000	1848.....	5,432

Twenty years later, Mr. Venning, inspector of fisheries, wrote: "In Shippegan and Caraquette, close time for the protection of the oyster-beds has, for the first time (1869), been partially enforced. These beds are extensive and widely separated, and it is a matter of much difficulty to prevent occasional violations of the law." Again, Professor Whiteaves* was informed that oysters had been taken upon the flukes of anchors, in seven fathoms of water, "between Little and Big Caraquette banks, in the bay of Chaleurs." I see no reason why they should not also be found at the mouth of the Nipisiguit river, farther up the bay, on the same shore. South of Miscou and Shippegan "gullies" the coast seems too bold a one for oysters in great plenty, until Miramichi bay is reached, the whole interior of which is full of these mollusks. This is especially true along the south shore, where there are many islands, and at the innermost shallow extremity of the bay, where the Miramichi river comes in. Bettaouin is a particularly rich locality. Having rounded Escuminac cape, the headland south of Miramichi bay, a group

* *Canadian Naturalist*, vii, 344.

of islands is soon reached, lying off the coast and parallel with it, under the shelter of which, in Kouchibouguac and Richibucto harbors, there is an abundance of beds. Passing on southward, along the shore of Northumberland strait, Buctouche, Coeaigne, and Shediac bays follow in productive succession, beyond which there are no beds reported, until cape Tormentine is passed and the shallow coast of Nova Scotia is reached, extending from Pugwash to Pictou. These last two localities are of small account, and close the list for the mainland.

PRINCE EDWARD ISLAND.—Prince Edward island, however, is almost engirdled with oysters and their remains, except at the western end, where the precipitous red banks that give so picturesque an aspect to this coast, are unsuitable for oyster-growth. The localities where beds exist, or have existed, on the island are: Cascumpeque, Richmond bay, Grand river, and the Narrows, in a group; Malpeque, the harbor of New London, Hillsborough bay and river near Charlottetown, and Bedeque and Egmont bays. In addition to these main localities there is an almost continual line of shallow and sheltered coves and inlets, around the whole eastern coast of the island, where extinct or semi-fossil beds of oysters are to be found, embracing nearly every tidal bay or outlet.

CAPE BRETON AND NOVA SCOTIA.—Crossing now over to Cape Breton, a glance at the map will remind the reader that the whole interior of the island is occupied by the Bras d'Or, which enters by two narrow channels from the northeast, with Boulardrie island between them. "The Bras d'Or is the most beautiful salt-water lake I have ever seen, and more beautiful than I had imagined a body of salt water could be," says Mr. Charles Dudley Warner, in *Buddleck and That Sort of Thing*. "The water seeks out all the low places, and ramifies the interior, running away into lovely bays and lagoons, leaving slender tongues of land and picturesque islands, and bringing into the recesses of the land, to the remote country farms and settlements, the flavor of salt and the fish and mollusks of the briny sea. There is very little tide at any time, so that the shores are clean and sightly for the most part, like those of a fresh-water lake. It has all the pleasantness of a fresh-water lake, with all the advantages of a salt one. In the streams which run into it are the speckled trout, the shad, and the salmon; out of its depths are hooked the cod and the mackerel, and in its bays fattens the oyster. This irregular lake is about one hundred miles long, if you measure it skillfully, and in some places ten miles broad; but so indented is it, that I am not sure but one would need, as we were informed, to ride one thousand miles to go round it, following all its incursions into the land."

Here, as might be expected, the oyster lives in plenty, from St. Ann's to Mira river and St. Peter's bay.

"The few oysters to be met with off Nova Scotia," according to Purdy, "occur at Jeddore head, twenty or twenty-five miles east of Halifax harbor; also Country harbor, St. Mary's river, and Liscombe harbor, Guysboro' county, on the outside, and Pictou harbor, John river, Wallace, Charles river, and Pugwash (mentioned above), in Northumberland straits."

This catalogue appears to embrace the whole region known where oysters occur. In none of his dredging expeditions upon the Dominion's vessels did Professor Whiteaves meet with "traces even of oysters in any part of the area between Cape Breton and Prince Edward island, nor in any part of Northumberland straits, where the bottom is deeper than 5 or 6 fathoms—that is to say, not in any of the open parts". In a letter printed in the *Canadian Naturalist* for 1874, hereafter frequently to be referred to, the Hon. W. H. Pope, of Summerside, Prince Edward island, reiterates this assertion, but adds:

Some years ago I observed a quantity of oyster-shells on the sand at the north end of Tryon shoals (which are situated on the south side of the island); they were about a quarter of a mile from the shore. Some of the shells were filled with sand more compact than some of our sandstone rocks. When I first observed these shells, my opinion was that they had been washed ashore from beds situated in the deep water of the straits of Northumberland. It has since occurred to me that they are *in situ*, and are the remains of an ancient oyster-bed which had been destroyed by the sand. The existence of a soft, muddy bottom in the vicinity of these shells, supports the supposition that at some period this muddy bottom was more extensive than at present; that the oyster-bed was then formed, and was destroyed by the encroachment of the sand forming the Tryon shoal.

WHITEAVES ON THE SOUTHERN FAUNA OF THE GULF OF ST. LAWRENCE.—A suggestion of how it may be possible for oysters and so many other southern-dwelling mollusks to inhabit a sea so far north, and apparently so exposed to the arctic ice and freezing currents that sweep down past Labrador, as are these, is made by Whiteaves in the following paragraph:

On the admiralty charts of the gulf of St. Lawrence an irregular line of 60-fathoms soundings may be seen to extend from a little above the northern extremity of the island of Cape Breton, round the Magdalen group, and thence in a westerly direction to Bonaventure island. To the south and southwest of this line the water is uniformly somewhat shallow, while to the north, northwest, and northeast the water deepens rapidly, and in some places precipitously. Principal Dawson suggests that the subcarboniferous rocks of which the Magdalen islands are composed, and which appear again in the mainland, in Bonaventure county, may possibly cross up under the sea in the area between the northwest side of Cape Breton and the mainland of New Brunswick, as well as that of the counties of Bonaventure and Gaspé, in the province of Quebec. This may account for the shallowness of the water in the area in question. Whether this is the case or not, it seems not improbable that the submarine plateau inside of this line of shallow soundings may form a natural barrier to those arctic currents which sweep down the straits of Belle Isle in a southwesterly direction, and may tend to deflect their course in a bold curve into and up the river St. Lawrence.

SIZE AND QUALITY OF CANADIAN OYSTERS.—The oysters of this region are of large size, and have thick, strong shells. Oysters of eight or ten inches in length are not extraordinary. I have heard of shells dredged from extinct beds "as long as your forearm", but I saw none of these monsters. The best are those which

have straight and narrow or evenly-rounded shells, and grow singly. When the oysters grow in clusters, the fishermen consider it a sign of degeneracy. That, as a rule, the oysters found nowadays are smaller than those taken by the last generation, is probably a tradition, without better foundation than other popular suppositions that we live in degenerate days; the old shells dredged from the mud show no gigantic proportions.

The oysters differ in taste, and consequently in quality, with the locality. Those from Shediac, Bedeque, and Richmond bays are esteemed most highly, because they are of firm substance and strongly saline flavor. Those from the other beds are of fresher flavor, and some, for instance those in Hillsborough river, are disliked, because "thin and watery". This seems due mainly to the fact that they are subjected to more fresh water than is good for them when the tide is out. The oysters of poorest quality of all, according to common report, come from the Richibucto region, although there is the deepest water in which I have known them to be taken.*

CHARACTER OF THE BEDS.—The depth of water in which they live varies, from places so shallow that they are left quite exposed by the lowest tides, to a depth of 40 feet. This last is reported from Richibucto. Perhaps the average depth may be put at 10 feet.†

The oysters occur in beds of varying size and shape. Some of them will be only a few rods, others several acres in extent. The slow accumulation of living upon dead oysters, the drifting of the sediment, and the growth of other organisms, have built many of these beds almost up to the surface, leaving a deep channel between neighboring colonies. The foundations of such beds have been proved to be in some cases more than 20 feet below their crests. Here and there, however, as in some parts of Richmond bay, and at Caraquette, the beds appear to be less well defined and of more modern origin. The height which the oyster-beds attain above the general level of the bottom, probably furnishes a solution of the well observed fact, that the ice becomes unsafe over an oyster-bank, while it is firm elsewhere; the ridge of the beds would form currents in the tides that would wear the ice over them with more force and rapidity than elsewhere.

These oysters seem to have few enemies. In a list of animals found associated with this mollusk on the beds at Shediac, Professor Whiteaves marks the mussels, *Mytilus edulis* and *Modiola modiolus*, the *Natica heros*, two starfishes and a sea-urchin, as "more or less inimical"; but he adds: "So far as I could see, these do not exist in sufficient abundance in Northumberland straits to be of any serious disadvantage." One of the old oystermen at Shediac told me he had only seen three starfishes in his whole life. The shells of all sorts of bivalves here are almost universally perforated by a sponge, but no harm seems to ensue to them when living.

2. MANNER OF PROCURING THE OYSTERS.

EARLY OYSTER-FISHING.—The methods of procuring oysters employed in the maritime provinces are substantially those followed in the United States, so far as the summer fishing is concerned. But in winter, oysters are often raked through the ice. That this is an ancient custom, appears from a paragraph in Charlevoix's *History of North America*:

Oysters are very Plenty in Winter on the Coasts of Acadia, and the Manner of fishing for them is something singular. They make a Hole in the Ice, and they thrust in two Poles in such a Manner, that they have the Effect of a Pair of Pincers, and they seldom draw them up without an Oyster.

THE OYSTER-INDUSTRY AT SHEDIAC.—The two most famous localities for oysters are Shediac and Summerside.

Shediac is a village of about 800 to 1,000 people, situated on the south side of Shediac bay, an inlet from Northumberland straits. The harbor extends for about four miles inland, and into its upper end flow one or two small rivers. The outermost point of the harbor is Point du Chêne, where the terminus of the Intercolonial railway from St. John is located. The harbor of Shediac is commodious, and protected by Shediac island; but the depth of water is not great, and the few foreign vessels that come here annually for deals, are obliged to anchor off the point. Their cargoes are conveyed to them, from the mills at the head of the bay, in rafts. Shediac is an ancient settlement of the Acadians, and has been the scene not only of Indian battles, but of French garrisons, and of sanguinary conflicts between French and English, during the long contest which raged for the possession of these shores during the early part of the last century and previously. Once or twice, long ago, it was burned to the ground, and has suffered a third conflagration since my visit. At one time it was hoped to make it a port of importance, but its sole fame at present rests upon its oysters; and this is a fading glory, for the beds are nearly depopulated of the excellent bivalves that formerly flourished in such abundance.

From the long railway wharf at Point du Chêne, itself founded upon oyster shells, the beds once existed in thick succession along both shores of the bay, and for some distance up the Shediac river, clear around to the

* Oysters are abundant at Cocaigne, Buctouche, Richibucto, Burnt Church, and other places on the coast, but in general they are too far within the mouths of fresh-water streams, and their quality is greatly inferior to those affected by sea-water only.—PERLEY. *Report on the Fisheries*, 1849.

† You inquire: "Do you think oysters would thrive in somewhat deeper water than that in which they are now found, if sown there?" I think they would thrive in the deepest part of any inland water, if placed upon suitable ground.—POPE. Letter to Whiteaves, *Canadian Naturalist*, vii, 347.

Grandique, a stream that empties into the northeastern corner of the bay. The number of these beds is said to be about fifty, and they cover the soft bottom of the harbor with great mounds.

Procuring the services and guidance of Frank Giuvien, I started out one dark morning to see the beds and the process of raking. It was raining hard, the wind was chill and fitful, and the general appearance of the surroundings somber in the extreme. The boat was a large, red, yawl-shaped one, and it lay some distance out in the water, hard aground, although the tide was well up. Pulling off their shoes and stockings, Giuvien and his assistant soon had it afloat, erected the mast, and then came to carry me on board 'poose-back.

Having gone a third of a mile from shore, and crossed the deepest part of the bay (in water of 4 to 6 fathoms), we struck the first bed, finding it, by sounding with a pole, not more than five feet below the surface. Ramming the pole hard down we "hung" the boat by my holding on to it, while Giuvien thrust down his great rake, and his assistant his "tongs". But nothing was taken alive except one or two quahaugs, and we moved on. Trying several beds, all coming within a fathom or less of the surface, and some being of great extent, we succeeded in two hours in raking a dozen and a half of small oysters and about three dozen fine quahaugs, besides some mussels. This was a fair sample of the condition of the whole bay.

The rake and tongs used do not differ from those well known to oystermen in the United States, except, perhaps, that they are ruder, generally being of home manufacture.

In the winter, when the ice forms over the whole bay to a thickness of three feet or so, the oysterman finds his way out to a position over some of the beds, with the location of which he is perfectly familiar, and cuts a large hole in the ice. Through this he lowers rake and tongs, and brings up load after load of living mollusks and dead shells. Here this is the most profitable time of the year for the oysterman; or, rather, it used to be. Twenty-five or thirty years ago, not to go further back, the trade in oysters at this town was extensive, amounting to probably about 1,000 barrels a year. Most of this crop was shucked and sent to St. John in kegs. In earlier times it was not uncommon for one man to rake up a sleigh-load of oysters, through the ice, in a single afternoon. Now 200 bushels a year is all that is produced, and this in a very desultory fashion. No one devotes himself to it but the French fishermen, and farmers use their leisure in raking occasionally.

At Richibucto the oysters grow in the channel, and clear across the inlet, in water as deep as 35 feet. There, consequently, rakes are used attached to poles so long and unwieldy that they require two men for their manipulation. This great bay has been nearly depleted, however. In the Canadian Fisheries Report, Mr. J. McD. Sutherland, local officer there, wrote to Mr. Venning, inspector of fisheries, as follows:

There are a good many oyster-beds in the river, but with the exception of one at Indian island (near to the south beach), the oysters are very small, and of so poor a quality, that none have been sent away for years; in fact, they will not sell. The only beds from which any are taken at present, are two at Kingston bridge, and one or two farther up the river, and only in very small quantities, as they are of so poor a quality that it is difficult to find sale for them. There is a very large bed at Indian island, and the oysters are very large and of excellent quality; but they are scarce and hard to get. Not more than 30 or 40 barrels were taken from it last year. A man may rake all day, and perhaps get only a bushel. There are hundreds of barrels of shells on this bed, and some farmers are making arrangements to get the shells off it as manure for their farms. If anything could be done to protect or increase the oysters in this bed, I think it deserves attention. The only suggestion I can offer is, that the shells and dead oysters be removed, and raking prohibited for a number of years. There are some beds on which the oysters are all dead, from which large quantities of shells are taken every year by the farmers.—(Page 76.)

The present point of greatest abundance of the oyster on the mainland seems to be in Miramichi bay, at Bettaouin. In 1876, Giuvien went there in a small vessel, with several others from Shediac, on a raking expedition. They found the oysters were distributed everywhere over the harbor so thickly, that every square foot of the bottom seemed to be occupied. They seemed to lie in little connected clusters right upon the sand, which was so soft that mooring-stakes were easily driven into it. They found on the ground ships and schooners that took away over 4,000 barrels during the single fortnight they remained. These bought their cargoes, at the rate of \$1 a barrel, from the small boats (each operated by two men) that swarmed in the harbor. The ships took their cargoes to Quebec, various smaller craft carried loads elsewhere, and the 65 small boats that came down there from Caraquette all intended to go home with full loads when the selling season closed. Four years of this onslaught have now almost exterminated this great oyster-community.

So much for the mainland, where, I believe, the tongs and rake used from small boats in summer, and the rake through the ice in winter, upon wild beds, every man owning his own implements and fishing for his own good at odd moments, comprise the whole of oystering.

THE OYSTER-INDUSTRY OF PRINCE EDWARD ISLAND.—Crossing now to Prince Edward island, a somewhat more systematic, if not more scientific, pursuit of this industry is to be seen. The headquarters of the business is at Summerside, a small, wooden, unattractive town of about 800 inhabitants, situated at the extremity of Bedeque bay, on the southern side of the island. It is a landing place of the steamers from Shediac, and also of the line to Montreal. This district was originally settled by French; but when the island was ceded to Great Britain, these people were expelled, and the inhabitants are now almost wholly Scotch and English. From Summerside are sent the famous "Bedeque" oysters, so called from the bay in which they were found.

The true Bedeque oysters are, however, now extinct, or at least so nearly so as to be entirely unprofitable for raking. The bay is an inlet half a dozen miles long, in which the water is nowhere more than 3 or 4 fathoms deep,

except in the channel that leads to the wharves of the fort. The whole sandy bottom of this bay is described as formerly one vast oyster-bed. At the upper end it was so shallow that, when the tide was out, even children might wade about and pick up oysters, which were often found clinging to the eel-grass, with their hands; such oysters were the best of all. Finally, the head of the bay became so choked up, that in the winter, at low tide, the ice was let down until it rested full weight upon the beds. But now the bay has lost its ancient suitability as a home for the bivalves, and few remain. "Bedeque" oysters, therefore, like those of the once-celebrated "Porier" bed at Shediac, now come from elsewhere, but still pass in the market under the brand-name by which they attained their fame for excellence. The chief source of supply at present is Richmond bay, an inlet on the north shore formed by the union of several estuaries and filled with islands and sand-bars. That region, however, has many subdivisions. It consists of a great, irregular, interior basin of shallow water, sending its arms back into the country in all directions, and receiving long, wooded capes that jut out and form sheltered bays in great number. The water-access from the ocean to this lake is through Malpeque bay and the Narrows. The term "Richmond bay" is really restricted to the innermost part of it, while the western portion is called Grand river. The shores are low, the bottom is soft, sandy mud, and no force of the outside storms ever penetrates these calm recesses. Here then, if anywhere, ought we to find oysters, and here they occur in vast numbers.

The people who live on the shores of this broad estuary are of varied nationality, and nearly all own farms, or cultivate the land for others. They may therefore be called farmers, as a class. But in the spring for a little while, and from the first of September until November seals the water under its icy cover, they all become oystermen. A few of them own small sail-boats, two-masted or sloop-rigged, worth from \$30 to \$50, and of far more use than beauty. As a rule, however, they go out to the beds in rude, flat-bottomed, square-sterned, awkward boats, called "flats". These are worth \$10 each, and every family owns at least one, with its oars and the anchor. Rakes or dredges are not used at all here; only a pair of tongs, worth about \$2 50. It does not require much capital, therefore, to enter upon the business.*

Oyster fishing begins on September 1 and lasts until the ice forms. On this island no fishing through the ice is practiced, and all that is done, with the exception of a few days in the spring, must be done at once. During this season, therefore, all else is pretty much abandoned, and four or five hundred persons will be found engaged in the work in the western half of the island; it is considered a good day's work when a boat brings home in the evening two barrels to each of the crew. In so sheltered a place as Richmond bay the state of the weather, which is likely to be very rainy, chilly, and uncertain, makes little difference with the work.

About one-half of the fishermen are heads of families, the other half being made up of boys and young unmarried men, and the vagabond element. Some of the more well-to-do farmers buy on the shore the catch of the latter class, to a considerable extent, and add it to their own stock, paying from 50 to 80 cents a barrel on the shore. The main part of the catch, however, is hauled day by day to Summerside, from 2 to 10 miles distant, at an expense of from 10 to 15 cents a barrel, and sold to the warehouses there. Sometimes the Summerside dealers go out to the shore and buy, but more frequently procure what is not brought to their doors, by sending out empty barrels to different persons and engaging them to be filled. The barrels used are second-hand flour barrels, worth 15 to 20 cents, and holding two and a half bushels, or from three to four hundred oysters each. The price paid for these oysters varies from year to year. The highest rate ever reached was in 1875, when \$2 50 per barrel was paid at the warehouse. Since then, partly owing to the stimulus given by the high price, and the consequent increased supply, the price has declined, until this September (1879) it went as low as 80 cents a barrel, but recovered before the end of the month to \$1, which may be called the average price. A stormy season will lessen the supply and augment the value. Little distinction is made by the warehousemen in buying in respect to locality, but in selling it is found that the fine single oysters from Grand river will bring a considerable advance over those from Malpeque and other points. The rule is: the deeper the water, the better the oyster. It is conceded that the old Bedeque oyster was the best of all.

With the fall crop of oysters the farmer-fishermen expect to pay for their winter's supply of provisions, chiefly flour. But little cash, therefore, is used in the transaction, the buyer exchanging a barrel of flour for from five to seven barrels of oysters. The average receipts of the oyster-fishermen are difficult to estimate; but those best competent to judge thought that the men who paid strict attention to the business received from \$50 to \$70 a year from it. This may be put down as about one-fourth of their total annual income. The working classes on the island think they are doing very well if they make \$300 a year. Every one of them is a year in debt. When the warehouseman delivers his flour in exchange for the oysters, it is really the crop of the next fall that he is buying, for the oysters he has just received were owed to him for the previous winter's provisions. It is so with all the merchants in town, who obtain a good portion of the season's catch for their own use, in pay for dry-goods, groceries, &c.

The amount of cash capital involved in the business of oyster-dealing, therefore, is disproportionate to the apparent business done, since so great a part of it is by barter. In the vicinity of Summerside it is probably within

* The dredge has never, to my knowledge, been employed in the waters of Prince Edward island. Oysters are fished with "tongs" from depths varying from 3 or 4 feet to 12, and even 15, feet.—POPE. Letter to Whiteaves, *Canadian Naturalist*, vii, 345.

bounds to say that \$25,000 would cover the capital of all the dealers combined; and they represent all the oyster-trade there is on the island worth mentioning. The business is not now so good as formerly, on account of the "hard times" that now oppress the Canadas; and a profit of 20 per cent. is considered large; but in former years 50 per cent. of profit was often realized without much risk.

At the eastern end of the island the only locality for oysters, within recent times, is in Hillsborough bay and its tributaries. This water is on the south shore, and is the harbor of Charlottetown, the chief town of the province. Old men remember when oysters were so abundant there that they seemed inexhaustible. Rich beds were to be found along the west side of Hillsborough bay, over in Orwell and Pownall bays, along the channel into the inner harbor, and everywhere there and up Hillsborough, East and West rivers. The finest of all grew attached singly to the eel-grass at the heads of the various little inlets, where one could wade out and get them; and at certain places the beds were so crowded that a boat could take eight bushels in an hour.

Now, however, these bays are almost depopulated of their oysters, and not more than \$500 worth annually, it is said, are raked there. These are all used in Charlottetown, being raked and peddled by two men who make a scant business of it. Charlottetown, in addition, consumes nearly a thousand barrels from the western end of the island, esteeming her own of far poorer quality.

Concerning the oysters of the Bras d'Or I could learn but little, but became satisfied that no trade in them existed, beyond a limited home consumption by those who fished and their neighbors.

3. FUTURE OF THE OYSTER-BEDS AND OYSTER-TRADE.

FORMER AND PRESENT ABUNDANCE.—A few words ought now to be said upon the relative former and present abundance of the oysters of this region and the causes operating toward their increase or decrease.

To begin with: I am convinced that if it were possible to make a comparison between the actual number of oysters on the beds fifty years ago with the number to-day, the disparity would not be great. The production has changed geographically, rather than numerically. Ancient areas no longer yield so fully, but new ones have been discovered.

The most famous of the old localities was Shediac, where the "Porier bed" sent to the interior settlements the best mollusks known. This bed lay between Shediac island and the north shore of the bay, and has been abandoned for many years; but a fisherman told me, he thought a week's profitable raking might be done there now. After the exhaustion of the Porier bed, the large, salty, fat "Bedequé" oysters were placed in the market, and acquired a high reputation. The demand soon exhausted them, but a few could at present be got anywhere in the bay, now that they have rested so long. Meanwhile the eastern end of Prince Edward island had lost its oysters, and those of the productive beds on the mainland were of poor quality. The shore-people began to think the era of good oysters had passed by. More thorough and careful search was thus stimulated, and the results were, first, the discovery that the beds in Cassumpeque, Malpeque, and Richmond bays were much more extensive than had been supposed, and, second, the disclosure of wholly new localities in Miramichi bay and elsewhere.

The causes of the extinction of the old traditional beds are various. It is easy to see that the inordinate attack made upon the new locality of Bettaouin during the last four years will shortly be fatal to it. It has nearly proved so now, just as the other natural storehouses of these mollusks along the coast have been depleted by excessive and heedless use.*

On the contrary, in the extensive region on the north side of Prince Edward island, whence the trade is now mainly supplied, there seems to be no doubt of a steady growth in numbers, and no degeneracy in size and quality.

CAUSES OF EXTERMINATION.—The general law of the Dominion forbids the taking of oysters, at any point, between the 1st of May and the 1st of September, when they are spawning. This law excites great disgust among the fishermen, who assert that the proper way to afford legal protection to the industry is to prohibit winter-fishing. As a result, the law is constantly broken.† The summer-raking, they say, does more good than harm; it is positively beneficial, for it stirs up the beds and contributes to their widening. In the constant moving of the boat the tongs or rake must rarely strike the ground twice in the same or nearly the same place, and only a few of the mollusks are taken here and there. "Oysters thrive on muddy bottoms," writes Mr. Pope, "but they will not live if imbedded in the mud. Many oyster-beds have been destroyed by mud alone. The annual fishing of oyster-beds, if not carried to excess, improves them. In the process of fishing the bed is broken up, the shells and oysters lifted out of the mud, and a supply of material (cultch) afforded, such as the oyster *spat* requires, and without which it must perish." This is undoubtedly true to a great extent, as has been proved in the United States.

* The close time is now (1869) rigidly enforced, but these beds (in Shediac harbor) have been so much reduced by years of indiscriminate raking, that a long time will elapse before they are restored. * * * The oyster-beds in Richibucto harbor and river are now greatly reduced and almost valueless; and the only mode of restoring them is to prohibit raking entirely for a number of years, or to lease them for natural and artificial culture.—VENNING, *Report on Canadian Fisheries*, 1870-76.

† Oysters are caught and exposed for sale in every month in the year, and salmon are destroyed upon their spawning-beds with the utmost impunity.—POPE. Letter to Whiteaves, *Canadian Naturalist*, vii, 347.

In fishing through the ice, on the contrary, every living thing, and most of the loose dead matter within reach of the long rake, are scraped up. A barren spot of mud alone is thus left upon the bed. In summer all the *débris* brought up by the tongs is thrown overboard, and is washed clean as it sinks waveringly to the bottom, forming a loose layer of clean shells, etc.,—precisely what the spawn needs to find support upon and cling to. It is equal to putting down “stools”.

It appears, however, that sometimes this throwing back is a great harm, because living ones may be so few and the proportion of dead shells so large. Thus the local officer, Mr. John McD. Sutherland, in Kent county, in 1869, wrote that the beds at Richibucto had been destroyed mainly through the practice of throwing back the shells and dead oysters, which covered the living ones and killed them. “I do not think,” he adds, “the digging of mud for manure in any way injures the oysters, as there are none in the mud so taken, but a large quantity of very small mussels.” The ice-rakers, contrary to this advisable method of throwing back the shells, pile the worthless stuff they bring up on the ice, where it either remains to be floated out to sea when the ice breaks up, or is carted away to be spread on the fields. The bed is not only scraped perfectly bare of its oysters, therefore, but nothing is left for even the spawn to attach itself to; present and future are both destroyed.

This is a reasonable, and I believe a true, explanation of the decline of the yield at Shediac and at many other points where it has been customary to rake in winter, so far as man’s agency is concerned. The fact that the Richmond bay region, which is never raked through the ice, thrives under steady spring and fall work, supports this notion. The midsummer rest may or may not be worth the giving, but the strength of the law should certainly be opposed to working through the ice.

Many beds have ceased to produce within historical times, apparently for no other reason, than that by the natural process of growth, one generation of oysters resting on the dead remains of the last, has built up the deposit until it has come too near the surface. The clearing of the country, and the consequent increased amount of drifted matter and sediment brought down by the streams that empty into the estuaries where the beds are situated, aid to bring about this result, by raising the general level of the bottom, clogging the surface of the beds, and thus lessening the depth of the water, until at some unusually low tide in winter the immense weight of the ice is let down upon the bed, crushing and freezing all its life. This appears to be the case in the bay of Bedeque. As for the extensive submarine deposits of oyster-shells that girdle the eastern and northern shore of Prince Edward island, we do not know how old they are nor what killed them. Possibly the general geological elevation of this coast brought them all too near the surface at once. I put much faith in this hypothesis. It has been said that drifting ice tears up the beds; but I, personally, could not learn of any appreciable damage ever occurring in this way. All the beds are well sheltered from the bergs and floes that swing up and down Northumberland strait, and follow the currents through the stormy breadth of the open gulf. It is said to be one of the most favorable conditions that conduce to the oyster-prosperity of the Malpeque region, that there the ice disappears earlier than from the confined southern coasts of the island.

I find some discussion of this subject by the Hon. W. H. Pope, in his communications to Professor Whiteaves, from Prince Edward island, already quoted by me. He says:

It is probable that many of the oyster-beds ceased to be productive of oysters ages before the settlement of the country by Europeans. Extensive deposits of oyster-shells are now found covered by several feet of silt. How were the oysters upon these beds destroyed? The natural process of reproduction and decay would cause the oyster-beds, formed on the bottom, to rise so near to the surface of the water that the ice would rest on them. The weight of heavy masses of ice upon the beds would injure the oysters, and the moving of the ice, when forced by tide or wind across the bed, would soon destroy them. I have observed the more elevated portions of an oyster-bed over which the ice had been thus forced. Several inches of the surface of the bed, including all the living oysters, had been driven before the ice, and the shells and oysters so removed had been deposited in a miniature *moraine* on the slope of the bed where the water was sufficiently deep to allow the ice to pass over it. This crushing and grinding process would destroy many of the oysters; some would be crushed and broken, others smothered in the *moraine*. The gradual silting up of the river would prevent the running of the ice, and the oyster-beds would in time be covered, as we now find them. Deposits of oyster-shells (covered with mud) 20 feet in depth, are found in rivers in the deepest parts of which there are not 14 feet of water.

Oysters upon natural beds are seldom, if ever, killed by frost. I have known oysters to thrive upon a hard and stony bottom, notwithstanding that the ice rested upon them once in 24 hours throughout the winter. Some of these oysters grew adherent to a small flat rock, about 8 inches in thickness. The oysters on the top of the rock were killed when they attained their second year’s growth, I think, by pressure, as those on the edges were never injured by ice or cold.

Oyster-beds in rivers in which sawdust is thrown in large quantities, would probably be injured by it. The sawdust would, I think, be carried by the current over the beds, and the roughness of their surface would detain some of it. The interstices between the shells and oysters would probably become filled with sawdust and mud. Mud and decomposing sawdust constitute a most offensive compound.

There is another harmful influence exerted upon the oysters, however, by civilization, namely, the mud-digging. The whole bottom of each and all of these oyster-bays is a comminuted mixture of decomposed shells and vegetable matters, which goes under the name of mussel-mud. No one has ever sounded the full thickness of this, I think; but it has been dug to the depth of 20 feet by the rude horse-power scoops that are employed to dip it up. It makes the best of manure, and hundreds of thousands* of loads have been spread upon the neighboring farms

* During the past ten or twelve years millions of tons of oyster-shells and mud have been taken up by our farmers from oyster-beds, by means of dredging-machines worked by horses on the ice. In many instances the beds have been cut through, and in some places the deposits of shell have been found to be upward of 20 feet in thickness.—POPE. Letter to Whiteaves, *Canadian Naturalist*, vii, 345.

every year. It is sold by the dredgers at 10 cents a load, and it costs from 10 to 15 cents a load to haul it. Three hundred loads a day might be raised, if demanded. In the excavation of this fertilizer two features work disadvantageously to the oyster. In the first place, the actual bottom is torn to pieces—the home destroyed and the mollusks themselves eradicated. Secondly, the operation sets free great quantities of fine silt, which spreads through the water far and wide, falls upon the oysters, and smothers or chokes them. The bay has lost its ancient purity, and is no longer a suitable place for oyster-habitation. When, however, the work of the mud-diggers is completed, the excavation they leave is gradually taken possession of again by mollusks. This has happened particularly at West river, near Charlottetown, where the whole bottom, for a long distance, was dredged up and taken away, oysters and all, and it encourages belief that perhaps when Bedeque and the other bays are thoroughly robbed of their manuring deposits, the desirable bivalves that once inhabited them will return to their ancient haunts to begin a new era of existence and generation.

OYSTER-CULTURE IN THE PROVINCES.—Nothing in the way of oyster-cultivation, properly speaking, has been attempted in the Provinces, that I could learn of. When the oyster dealers in St. John find themselves overstocked in summer, they sometimes throw a lot of oysters overboard near Navy island, raking them up as they are wanted. An attempt to plant some there several years ago, resulted in all being stolen within a few months. Occasionally a schooner-load of oysters is brought down from Buctouche, Miramichi, or some other northern bay, where they are of poor quality, and are dumped for a few months in Shediac bay to “fatten”. The improvement is said to be very rapid and striking. Near Charlottetown, some years ago, a citizen took up a large quantity of oysters from a distant part of the harbor and laid them down near his home, forming a bed convenient to his hand, and the position of which was kept a secret in the family. A similar experiment in transplanting was made by Judge W. H. Pope, of Summerside, two or three years ago, near New London, Prince Edward island, only upon a more extensive scale and with a commercial view. His experiments did not wholly succeed, but seemed to show satisfactorily that the improvement resulting from transplantment and care would be profitable, if attended to on a large scale and in an enlightened way.

Such desultory work seems to be all that has ever been attempted in the Provinces toward oyster-culture. No seed-oysters have ever been sent southward or received from the United States. They could be procured for about \$2 a barrel at Shediac and Summerside, and there remain enough of the genuine Porier and Bedeque breeds to start new beds of these varieties in favorable spots elsewhere.

EFFORTS TOWARD PROTECTION.—The danger of utter extinction which menaces the mainland beds is not a new one. It was long ago pointed out that such a danger exists, and that measures ought to be taken to preserve to the colonies this rich food-resource which was being so rapidly wasted. Mr. Perley announced it to the government in 1849 in these words:

From the manner in which the oyster-fishery of the gulf-shore is now being conducted, all the oysters of good quality will, in a few years, be quite destroyed. The preservation of this fishery is of considerable importance, and it might be effected as well by judicious regulations and restrictions as by encouraging the formation of artificial beds or layings in favourable situations. Several persons on the coast intimated to the writer their desire to form new and extensive beds in the sea-water, by removing oysters from the mixed water of the estuaries, where they are now almost worthless, if they could obtain an exclusive right to such beds when formed, and the necessary enactments to prevent their being plundered.

Feeling the importance of the matter, Judge Pope's experiment on Prince Edward island, already alluded to, was made only in pursuit of his belief that the matter was practicable. He wrote to Professor Whiteaves in 1874:

The area of productive oyster-beds in the Dominion is comparatively limited and altogether inadequate to supply the demand for oysters, which is now enormous, and which is increasing every year. Unless the existing beds be protected and improved, and new beds formed, the day will soon come when the oyster-beds of the Dominion will cease to produce. * * * The rivers and estuaries of this island [Prince Edward] are admirably adapted for the cultivation of oysters. The oysters found in its bays are not to be excelled in flavor, and if fished late in the autumn they will keep good for months. I see no reason why hundreds of thousands of acres of oyster-beds should not be formed in these bays, which would produce vast quantities in quality much superior to the oysters of Virginia. The material for the formation of such beds is at hand in the ancient ones; the oysters with which to sow them could be had at little cost during the warm, calm days of summer.

Professor Whiteaves adds his testimony in the following paragraph, which refers chiefly to the mainland:

Many once productive beds in various parts of the gulf now yield almost nothing, and there is too much reason to fear that, unless precautionary measures are adopted, the oyster-fisheries of the Dominion will soon become a thing of the past. The raking of the beds has been palpably excessive and wasteful; no such thing as cleansing the ground and scattering the spat during the close season has ever been practiced; the pollution of the ground by refuse of mills, by silting up, and a variety of other causes, has led to the present state of ruin and decay which we now see. Neglect, waste, and excessive cupidity have almost destroyed these oyster-beds, and will ultimately entirely do so, unless remedial measures are adopted.

With the design of fostering the oyster product and industry, Mr. Venning, inspector of fisheries in New Brunswick, has made many attempts to induce the use of capital in this direction, and regulate the dredging by legal measures. He tried hard to get the government to divide the bay of Shediac into two equal portions, and to lease the oyster-privileges to responsible persons for a term of years, under regulations that should not admit of the extirpation of the mollusks. Such a hue and cry was raised by the ignorant natives, however, that the project had to be abandoned. He called a public meeting at Shediac and tried to represent how much it would be for their advantage to cease their destructive, indiscriminate raking, but utterly without effect. “My grandfather rake

oysters, my fadder he rake oysters when he want 'em, and by Gar! I rake him too!" That was the only argument he could get. He offered to allow them to arrange that they control, in common, one of the halves of the bay, leaving to him the other half; but they would submit to no regulation, and listen to no suggestions toward an improvement of method.

EVIDENCE FROM THE SHELL-HEAPS OF ABUNDANCE IN THE PAST.—That the oyster-beds of this region had been a food-resource to the Indians for many generations before white men came to these shores, is proved by the *kjökkenmöddings* or refuse shell-heaps which occur along the coasts. These relics of aboriginal homes and feasts also stand as evidence that formerly oyster-beds flourished where none have been known within the historic period, and connect the remote, isolated fields of the gulf of St. Lawrence with the oyster-bearing regions in Massachusetts bay and south of Cape Cod. The idea prevails that an elevation of the land and sea-bottom, or a lowering of the average temperature of the climate to a fatal point, on the intermediate coasts, or both, have caused the death of the reefs which once existed.

To the very extensive submarine beds of dead shells all through the waters of that part of the gulf between Cape Breton and Gaspé and around Prince Edward island, I have already alluded. They hardly bear upon our present inquiry, except to prove the extreme antiquity of the molluscan population of that district. Passing down the coast, I heard of old beds and a few living oysters at Jeddore head, near Halifax, "also Country harbor, St. Mary's river, and Liscombe harbor, Guysboro' county, on the outside." In the bay of Fundy I could not learn of a single living oyster, but it appears that formerly they dwelt there.

In his *Field and Forest Rambles*, Dr. A. Leith Adams tells us that he examined several shell-heaps on islands in the bay of Fundy and along the fiord of the St. Croix river for many miles. "Although a large number had evidently been leveled and utilized for top-dressing, enough remain to show that, whether as articles of food, bait, or both, the aboriginal races collected vast quantities of the well-known clam and *quahog*, besides two species of oyster (*Ostrea borealis* and *Virginiana*), and the common forms of *Natica*, *Crepidula*, *Solen*, etc., the *débris* of which strew the coasts of several of the inlets in the bay of Fundy, their numbers evincing the profusion of each species. It has, however, been asserted by no less an authority than Dr. Gould, that all, especially the three first species, are becoming rapidly extinct north of Cape Ann, Massachusetts" (p. 35).

Having given the substance of the opinion of Dr. Gould and some others as to the reason for the decadence, Dr. Adams goes on to tell what he found in the *kjökkenmöddings* along the bay of Fundy, particularly at Passamaquoddy bay. The mound was one of several facing the sea on a flat, so that the waves of high tides had washed much of it away, "disclosing a perpendicular section composed almost entirely of clam-shells, interspersed with mussels, whilks, and the common *Planorbis*. The former were extremely abundant, and for the most part in fragments; however, I procured several very large ones, averaging 3 by 4½ inches in breadth, which the fishermen of the neighborhood told me were very much larger than any recent specimens they had seen." He then describes the bones of quadrupeds, birds, and fishes that occur in these refuse-heaps, and mentions the absence of charcoal.

This brings me to the border of Maine, and introduces the proper census inquiry into the "shell-fisheries" of the United States, which occupies the succeeding chapters.

B. GULF OF MAINE.

4. FORMER EXTENT AND CONDITION OF THE NATIVE BEDS IN THE GULF OF MAINE. EVIDENCE OF INDIAN SHELL-HEAPS.

DESCRIPTION OF THE NEW ENGLAND SHELL-HEAPS.—In beginning an account of oysters on the coasts of the gulf of Maine, which extends from Nova Scotia to Cape Cod, the most prominent fact in relation to them appears to be their former abundance in comparison with their present extinction. The historical aspect will, therefore, be the first to be considered. The readiest way to begin this is to proceed to Damariscotta, a seaport village in Lincoln county, Maine, where exists the greatest monument extant to the antiquity of the oyster in these waters.

Above the village, the Damariscotta river pursues a narrow course between precipitous banks for about a mile, after which it expands into a shallow basin, about one mile long by one-half to one-quarter of a mile wide, known as Salt bay. At its northern extremity are rapids and cataracts, formed by a rocky ledge lying across a narrow channel, and above this is the extensive fresh-water area of Damariscotta pond. The falls at the head of Salt bay limit the tide, and furnish water-power for several sawing and flouring mills.

Salt bay is nowhere more than a few feet deep, unless it be here and there in the direct channel, plowed out by the swift tide, and the bottom is gravel, or was so anciently. It is so far inland that its waters are always comfortably warm, and it is, therefore, not surprising to find that it formed the chosen home of a large and flourishing colony of oysters, that seem to have found there the most congenial conditions for growth. The evidence of this is afforded in the great shell-heaps that have made the locality celebrated among antiquarians,

These "heaps" consist of piles of oyster-shells, varying from one to six or seven feet in depth, packed closely together, and all ready to crumble, unless handled with great care. They begin in small quantity down nearly to the falls at the bridge connecting Damariscotta and Newcastle, and thence continue uninterruptedly on both sides of the river, up to the southern end of the bay. Here the heaps reach their greatest magnitude, and are best observed upon the point of land which juts out into the southwestern part of the bay. Beyond this point, however, scattering heaps are found along the shores. It has been estimated that not less than 8,000,000 cubic feet of shells are thus piled up, and easily accessible.

It was once supposed that these beds were fossil, or that they had been formed by water in some way, and then elevated above the sea-level. But an examination soon dispelled this notion, which nobody now believes. Their position, structure, and contents, show conclusively that they are the work of human hands,* and a product of the very earliest American oyster-fishery of which we have any knowledge.

If one digs down through them, he finds at the depth of a few feet that he comes suddenly to the earth and gravel of the natural soil. This is seen plainly in section at several points on the western shores, where the water has eroded the bank. The line of demarcation between the shells and the soil is sharp; there is no intermingling whatever.† In many places, however, the shells from above have slid down the face of the high bank, entirely concealing its face, and covering the beach below. This gives a fictitious appearance of great depth, which has deceived some writers upon the matter, I think. The shells are almost invariably single. In an hour's digging I found but one specimen where the two valves were together. They lie in all sorts of positions, in close contact with each other, and so loosely that it is easy to pick them out of the bank one by one.‡ They are all of very large size and some even gigantic. Shells have been taken out repeatedly that exceeded a foot in length, and one of 15 inches is reported. They are, as a rule, long, narrow, and somewhat curved or scimitar-shaped. Broad and straight ones are found, however. The shells are thick, but they flake away so in removal from the heap, that scarcely more than the harder, nacreous, inner layers are usually obtained. Nearly all trace of color, inside and out, has disappeared.

They are not everywhere of uniform depth, but thin here and thicker there, as though cast up in heaps, and the soil over them is very thin, and consists only of decayed loam; but there was once a small forest of spruce trees there, and there still remain some very large and aged trunks and an abundance of bushes. At one place on the eastern side the most extensive deposits of all crown the summit of a bluff or knoll 60 feet or more in height, the face of which seems terraced with shells, which extend back many rods from the river-bank.§ Scattered through the banks, also, are the shells of the soft clam, quahaug, mussel, scallop, and various other remains, as I shall mention hereafter.

When the earliest explorers landed upon the shores of North America, they found that the Indians of all regions were acquainted with the edible qualities of the various shell fish, and ate all that we now make use of.|| They understood perfectly, also, the superior value of the clam and oyster, and everywhere along the New England coast were accustomed to assemble at favorable points and have feasts of mollusks and maize, with much merry-making. That fine old institution of Rhode Island and Connecticut, the clam-bake, almost the only thing that was allowed to warm the cockles of a Puritan's heart, and still the jolliest festival in summer experience alongshore, perpetuates the practice of the aborigines. Here, in southern Maine, appears to have been a particularly favorable spot, isolated from the southern abundance of bivalves, and here the Quoddy Indians came in great numbers. There is every evidence that these shores were much more thickly populated by the red men than the coast regions either east or west of it. The word "Damariscotta" is said to mean "river of little fishes", and its neighboring streams were equally famous for their finny wealth. In addition, the soil was fertile, the game very abundant, and the climate pleasant. It may be said that, for an Indian district, the population was dense.

* The evidence seemed conclusive, that these shell-mounds were not extinct oyster-beds, left exposed by some former uplift of the Atlantic coast, but the work of aboriginal tribes, who repaired to this favored region at certain seasons of the year, and celebrated their feasts with the delicious bivalve which must have formerly abounded in these waters. That these feasts were held periodically and, perhaps, at considerable intervals, is shown by the condition of the larger deposits, and especially the large one which slopes to the water's edge on the west bank of the river.—MOSES, *Proceedings Central Ohio Scientific Association*, i, p. 74. See also, Dr. Jeffries Wyman's account in *Second Annual Report, Peabody Museum of Archaeology, Cambridge*, 1869.

† The deposits are entirely free from any admixture of soil or *débris* of any sort, and one is struck with the appearance which a fresh section presents, the clean, white wall of shells looking like a kiln of freshly baked porcelain.—MOSES, *loc. cit.*, 74. Wherever we found a deep section of shells so lately made that the surface had not decomposed, the open appearance of the shells was marked. They were not mingled with fragments of bone or broken shells or with sand, presenting, in this respect, an entirely different appearance from the great deposit of oyster-shells by water at the mouth of the St. Mary's river, Georgia, which I had an opportunity of carefully observing two years ago.—CHADBOURNE, *Trans. Maine Hist. Soc.*, vi.

‡ Another circumstance that strikes the explorer, is the extremely loose condition of the shells, even at the base of a deposit of great depth. The shell may be drawn out with the greatest ease from any portion of the bank, and, with a little caution, in an entire state, although readily crumbling if not handled with great care.—MOSES, *loc. cit.*, 74. The shells lie very loosely, are remarkably white and friable, being in a state of partial decomposition and readily falling to pieces when handled.—MOSES, *loc. cit.*, i, p. 73.

§ One of the deposits, as surveyed by Mr. John M. Brown and myself, has the following dimensions: Shape, oval; length, 180 feet; breadth, 100 feet; depth, 6 feet; height of base above high-water mark, 4 feet. The top of the loftiest mound is 31 feet above high-water mark. It descends abruptly toward the river, and at its base the action of the water has formed a fine shell-beach.—MOSES, *loc. cit.*, 75.

|| See paragraph 6.

No doubt, however, the chief attraction in the district was this isolated colony of oysters, and that they were made incessant use of, is attested by the size of the heaps. As a rule, there is little or no perceptible interstratification of earth to suggest a period when no shells were thrown down, and the forest had time to grow and drop its moldering leaves, the dust an opportunity to settle. Land-shells are very few, which would not be the case had weeds and bushes grown over the beds. The increase of the banks, then, as a whole, was steady from the beginning to the end.

How long ago that beginning was, is a question very difficult to answer. Most persons, I believe, are inclined to exaggerate the length of time required to pile up even so great a deposit as this. The shells are very large and heavy. They will probably average twice the size of the ordinary oysters seen in Fulton market. The greed of savages, when food is plenty, is as well known, as that a vast quantity of oysters may be eaten before the appetite cloy. It is evident that large numbers of Indians permanently resided in the vicinity, and probable that still greater numbers came from a distance to the coast in summer. This was in accordance with their habits everywhere. Taking these various considerations together, it will be seen that it would not require so extraordinary a period, as might at first appear, for the accumulation of the heaps, although so extensive; at the same time it is evident that oysters were exceedingly numerous there. But it is also probable that not only were the shells of the oysters eaten on the spot, thrown down on the bank, and thus piled up, as you can see the degenerate descendants of these Indians doing to this day, but that visiting Indians were in the habit of procuring large quantities of the mollusks, shucking them here, and carrying them away to the interior in vessels of wicker, birch-bark, and pottery. They came down the Penobscot and other rivers in large canoes in the autumn, filled up their buckets with oysters, and departed. In the cold weather of early winter they would keep good for days and weeks, and form a luxury in their up country wigwams, that would remind them most pleasantly of sunny summer-days beside the sea. Thus this bay became a shucking-ground, as well as a place for feasts. Possibly a system of barter was instituted, by which certain men lived on the spot and devoted themselves to getting and selling oysters in exchange for clothing and weapons and game. We know there were arrow-makers and canoe-builders, and so on; why not oyster-divers and dealers? Indeed, it is not improbable that the small neighboring oyster-beds of Sheepscot and Thomaston were designedly planted by the Indians with young mollusks obtained from Damariscotta, with a view to continued and convenient supplies.

The Indians probably procured their oysters by wading out and picking them up at low tide. This was the work of the women and children, while the warriors sat on the bank and ate till they were satisfied, or superintended the proper freighting of the canoes. But many were also got, no doubt, by diving, which would be done mainly by the young men. It is doubtful whether they used anything in the shape of a rake, grapnel, or tongs. I could find no evidence of anything of this sort, but if such were used, they were doubtless made of wood (stone would be too unwieldy), and therefore would completely perish.

Another question is, how did they open these monstrous shells? There are three ways: one is by fire—roast a mollusk a few minutes and he opens his valves; evidences of fire, in the shape of ashes and charcoal, are recovered at various depths in various parts of the deposit,* and it is probable that this was the usual and cheapest method. Another way was by striking a brisk blow on the side of the shell just over the "sear", or attachment of the adductor muscle. This seems to paralyze the animal and his muscles relax. I have seen a heavy stone implement that looked as though it had been used for this purpose, and was different from the ordinary hammering stones. At Wellfleet, also, I dug from a shell-heap a rough stone tool, evidently fashioned by men, which exhibited signs of long usage both as a hammer and as a wedge or knife with which to pry open the valves. But any of their stone knives or smaller hatchets would have been eminently suitable for this service, and there was hardly need of a special instrument for the purpose. There is an implement in the possession of Dr. R. C. Chapman, of Damariscotta, however, that appears to have been made expressly for such service, and would accomplish the matter as deftly as our modern knives.

However, Damariscotta is only one of the many points along the coast of the gulf of Maine where these shell-heaps, and extinct deposits under the water, show that the oyster once flourished. The most easterly point that I can make sure of is Mount Desert island; for at Eastport no oysters or remains of them have ever been found native, a report to the contrary notwithstanding.

In the George river are extinct beds, concerning which more will be said hereafter; then comes Damariscotta, already described, and next is Sheepscot river, where there were once plenty of oysters, but no shell-heaps of consequence, and the next point is Casco bay.

* In these places, in deep sections, we found fragments of charcoal mingled with the shells under conditions that showed conclusively that it could have been deposited there only as the shells were deposited. * * * So common did we find the coal, that I feel confident it can be found there by any careful observer.—CHADBOURNE. *Trans. Maine Hist. Soc.*, vi. In digging down from the surface of one of these heaps, fragments of charcoal were found at a depth of 3 or 4 feet, and here and there a layer of the same substance. Above and below these layers was sometimes a conglomerate mass of shells, apparently burned to lime by the action of fire.—MOSES, *loc. cit.*, 74. Mr. Morse found at the very foundation of one of the highest heaps the remains of an ancient fire-place, where he exhumed charcoal, bones, and pottery. * * * These small mounds are composed of the same materials as the others, but had a larger admixture of earth. They appear to have been the heaps of refuse gradually collected around the encampments. WYMAN. *2d Ann. Report Peabody Mus. Arch.*, 1869, p. 18.

Everywhere that any digging has been done in Portland harbor, in the neighborhood of Harpswell, in the Back cove at the mouth of the Presumpscot, or elsewhere in the upper and sheltered part of Casco bay, these monster shells have been met with. In the harbor they are buried seven feet deep, so rapid has been the filling up by sewage and other refuse, but behind the city, out of the way of drifting matter, they are struck only about two feet under the surface of the bottom mud. Near Harpswell they are so accessible at low tide, that they have been dredged up to some extent and used for manure upon the neighboring farms, where they very soon go to powder. Upon nearly all the islands in the bay, also, have been found kjökkenmöddings, which have been extensively explored and collected from for museums of archæology by Mr. Fuller, Professor Morse, Professor Wyman, and others. These heaps are especially noted for the great quantities of the bones of the extinct auk, *Alca impennis*, that they have yielded.

Not far southward of Casco bay are the Scarborough headlands, which were perhaps the first of all our shell-heaps to attract attention. Southgate, in his history of the town, says:

The excellent opportunities for fishing and hunting which distinguished Scarborough, made it one of the favorite resorts of the natives. The place of their most ancient residence within the town was the point (Plummer's) south of Oak Hill. The site of their village overlooks the river, marshes, and bay on the south, and was protected upon the north by a high ridge of slate. There remains at that place a large bank of shells from one to ten feet in depth, supposed to have been deposited there by these Indians. * * * Some of the fields on the south side of Blue point consist almost entirely of shells brought there by the Indians, and there are similar traces of them on the opposite shore of Black point.

SHELL-HEAPS OF OTHER LANDS.—Shell-mounds, like that at Damariscotta, at various points along the shore of Massachusetts, and in many other parts of the Atlantic coast of America, are found nearly all over the world. They all tell the same story of savage life, and usually of an extremely degraded state of society, and an intensely hard struggle for daily bread. It is a proof of no great sagacity to discover that mollusks were good for food. Many animals, and even birds, found that out long ago. They are present in greater or less profusion upon all coasts, and are more likely to be accessible than any other form of food, since they cannot get away, do not require to be cultivated, and are equally plenty at all seasons. Nevertheless, it is only within a very few years that these heaps of shells near the beach have attracted the attention of antiquarians, as storehouses of materials out of which something of the history of now prehistoric times might be reconstructed. Indeed, their character has been mistaken altogether, until within the memory of men now living; for where they had been noticed at all they had at once been set down as "old beaches", left high and dry by the sea, and this in spite of the fact that it was well known that just such structures were even now being piled up by various tribes of savage men in remote corners of the globe. For instance, Captain Cook and Captain Grey both reported, that on the northwest coast of Australia the natives, when they had any houses at all, dwelt in the flimsiest of huts along the coast line, and that there were around them "vast heaps of shells, the fish of which we suppose had been their food". Some of these mounds were described as covering half an acre and being ten feet thick. Down in New Zealand precisely the same thing was observed. Captain Cook reported a similar state of affairs in Patagonia, while the Indians of Alaska and the Eskimos of Greenland accumulated shells and bones in vast quantities round their doors, like their neighbors in savagery on the equator and at the antipodes. Finally, it dawned upon students of archæology that the prehistoric inhabitants of Europe might have had similar habits, and, if so, masses of castaway shells would remain to mark the site of their huts and villages. This led to an examination of the "old beaches", when it was quickly seen that they were the product of human agency—were, in fact, the very remains the archæologists were searching after.

The most famous and extensive of these mounds in Europe were those of Denmark. They have often been described under the name of kjökkenmöddings, from two words meaning "heaps of kitchen-refuse".

Examination has made it evident that these deposits were scattered along the whole coast, following the ins and outs of the deeply indented shore; but they never occur inland, although the changes in elevation of the coast have in some cases placed considerable new land betwixt them and the beach, just as, in other cases, the encroachment of the sea has destroyed them in part, or wholly submerged them. It is in the northern half of Denmark, however, that the most exploration has taken place; and it shows conclusively that the people who built them evidently made their homes always on the shore, just out of reach of the tide, only now and then, perhaps, following the chase into the interior.

These heaps are much like that of Damariscotta. Some are of large extent and thickness, and hillocky; others of less size, but elongated; a third sort in the shape of a ring, with a depression in the center, where we may suppose the hut was built when last the place was occupied. Sir John Lubbock's description of one of the most productive of the heaps, that at Meilgaard, in 1863, will give a good idea of the whole—

In the middle this kjökkenmödding has a thickness of about ten feet, from which, however, it slopes away in all directions; round the principal mound are several smaller ones of the same nature. Over the shells a thin layer of mold has formed itself, on which the trees grow. A good section of such a kjökkenmödding can hardly fail to strike with astonishment any one who sees it for the first time, and it is difficult to convey in words an exact idea of the appearance which it presents. The whole thickness consists of shells, oysters being at Meilgaard by far the most numerous, with here and there a few bones, and still more rarely stone implements or fragments of pottery.

The four species of shells most abundant in the Danish mounds are: the oyster, *Ostrea edulis*, L.; the cockle, *Cardium edule*, L.; the mussel, *Mytilus edulis*, L.; and theperiwinkle, *Littorina littorea*, L.

All of these mollusks are still used for food; besides them, various other sea- and land shells occur in small quantities. Sir John Lubbock points out that the shells of nearly all these mollusks average of far larger size than they are ever known to attain off those coasts at the present day; while the oyster has entirely disappeared, and even in the Kattegat itself occurs only in a few places. "Some oysters were, however, still living at Iselfjord at the beginning of this century, and their destruction cannot be altogether ascribed to the fishermen, as great numbers of dead shells are still present; but in this case it is attributed to the abundance of starfishes, which are very destructive to oysters. On the whole, their disappearance, especially when taken in connection with the dwarf size of the other species, is evidently attributable in a great measure to the smaller proportion of salt in the water." The lack of saltness alluded to arises from the fact, that the elevation of the shores and bottom of the Kattegat has been so great as to admit only a little of the tide, while an increased quantity of fresh water flows in.

Besides these mollusk-shells, the remains of fishes, quadrupeds, and birds are very numerous and highly interesting. Professor Steenstrup, who has paid great attention to this matter, estimated that the mound at Havelse contained from ten to twelve bones in every cubic foot.

Of the fishes, the most common are the herring, the dorse (a kind of cod), the dab (a kind of flounder), and the eel. Among the bones of birds there have been recognized skeletons of the capercaillie (a very large grouse), the wild swan, various ducks and geese, and of the great auk, *Alca impennis*, whose bones fill our American mounds also, and which has now become extinct.

The mammals are represented in the mounds by the stag, the roe-deer, and the wild boar, for the most part—97 per cent., according to Professor Steenstrup. Besides these, bones of the buffalo, dog, fox, wolf, marten, otter, porpoise, seal, water-vole, beaver, lynx, wild-cat, hedgehog, bear, and mouse. Such domestic animals as the ox, elk, reindeer, hare, sheep, and hog are absent. The dog was probably kept to be eaten; or at least it is certain that he became an article of food on occasions.

The bones, little and big, are all badly crushed and broken, and all in the same way, so that the parts missing in one skeleton will exactly coincide with those in all the rest, if they could be got together. The long bones of the arms and legs, for example, are all split open in the manner best adapted for the extraction of the marrow, "which is in itself satisfactory proof of the presence of man."

The flint and stone implements dug up from these shell-heaps are very numerous, but show little skill. "A very few carefully formed weapons have been found," says Sir John Lubbock, "but the implements generally are very rude. Small pieces of very coarse pottery have also been discovered, and many of the bones from the kjökkenmöddings bear evident marks of a sharp instrument; several of the pieces found by us were in this condition, and had been fashioned into rude pins." Sir John continues:

"The kjökkenmöddings were not mere summer-quarters; the ancient fishermen resided on these spots for at least two-thirds, if not the whole, year. This we learn from an examination of the bones of the wild animals, as it is often possible to determine within very narrow limits the time of year at which they were killed. For instance, the remains of the wild swan, *Cygnus musicus*, are very common, and this bird is only a winter visitor, leaving Danish coasts in March and returning in November. It might naturally have been hoped that the remains of young birds would have supplied evidence as to the spring and early summer, but, unfortunately, as has already been explained, no such bones are to be found. It is therefore fortunate that among the mammalia two periodical phenomena occur, namely, the shedding and reproduction of stags' antlers, which, with slight variations according to age, have a fixed season; and, secondly, the birth and growth of the young. These and similar phenomena render it highly probable that the 'mound-builders' resided on the Danish coast all the year round, though I am disposed to think that, like the Fœngians, who lead even now a very similar life, they frequently moved from spot to spot. This appears to me to be indicated not only by the condition of the deserted hearths, but by the color of the flint flakes, etc.; for, while many of these retain the usual dull, bluish-black color which is characteristic of newly-broken flints, and which remains unaltered as long as they are surrounded by carbonate of lime, others are whitened, as is usual with those which have been exposed for any length of time. Perhaps, therefore, these were lying on the surface during some period of desertion, and covered over only when the place was again inhabited.

"Much as still remains to be made out respecting the men of the Stone period, the facts already ascertained, like a few strokes by a clever draughtsman, supply us with the elements of an outline sketch. Carrying our imagination back into the past, we see before us on the low shores of the Danish archipelago a race of small men, with heavy, overhanging brows, round heads, and faces probably much like those of the present Laplanders. As they must evidently have had some protection from the weather, it is most probable that they lived in tents made of skins. The total absence of metal in the kjökkenmöddings indicates that they had not yet any weapons except those made of wood, stone, horn, and bone. Their principal food must have consisted of shellfish, but they were able to catch fish, and often varied their diet by game caught in hunting. It is perhaps not uncharitable to conclude that when their hunters were successful, the whole community gorged itself with food, as is the case with many savage races at the present time. It is evident that marrow was considered a great delicacy, for every single bone which contained any was split open in the manner best adapted to extract the precious morsel."

We have already seen that these mound-builders were regular settlers and not mere summer-visitors, and, on

the whole, seem to have lived in very much the same manner as the inhabitants of the Tierra del Fuego, who dwell on the coast, feed principally on shellfish, and have the dog as their only domestic animal. A very good account of them is given in Darwin's Journal, from which I extract the following passages, which give us a vivid and probably correct idea of what might have been seen on the Danish shore long, long ago:

The inhabitants, living chiefly upon shellfish, are obliged constantly to change their place of residence; but they return at intervals to the same spots, as is evident from the pile of old shells, which must often amount to some tons in weight. These heaps can be distinguished at a long distance by the bright-green color of certain plants which invariably grow on them. * * * The Fuegian wigwam resembles in size and dimensions a hay-cock. It merely consists of a few broken branches stuck in the ground, very imperfectly thatched on one side with a few tufts of grass and rushes. The whole cannot be so much as the work of one hour, and it is only used for a few days. * * * At a subsequent period the Beagle anchored for a couple of days under Wollaston island, which is a short way to the northward. While going on shore we pulled alongside a canoe with six Fuegians. These were the most abject and miserable creatures I anywhere beheld. On the east coast the natives, as we have seen, have guanaco cloaks, and on the west they possess seal-skins. Amongst the central tribes the men generally possess an otter-skin, or some small scrap about as large as a pocket-handkerchief, which is barely sufficient to cover their backs as low down as their loins. It is laced across the breast by strings, and, according as the wind blows, it is shifted from side to side. But these Fuegians in the canoe were quite naked, and even one full-grown woman was absolutely so. It was raining heavily, and the fresh water, together with the spray, trickled down her body. * * * These poor wretches were stunted in their growth, their hideous faces bedaubed with white paint, their skins filthy and greasy, their hair entangled, their voices discordant, their gestures violent and without dignity. Viewing such men, one can hardly make one's self believe they are fellow-creatures and inhabitants of the same world. * * * At night five or six human beings, naked and scarcely protected from the wind and rain of this tempestuous climate, sleep on the wet ground, coiled up like animals. Whenever it is low water they must rise to pick shellfish from the rocks, and the women, winter and summer, either dive to collect sea-eggs or sit patiently in their canoes, and, with a baited hair-line, jerk out small fish. If a seal is killed, or the floating carcass of a putrid whale discovered, it is a feast. Such miserable food is assisted by a few tasteless berries and fungi. Nor are they exempt from famine, and, as a consequence, cannibalism is accompanied by parricide. In this latter respect, however, the advantage appears to be all on the side of the ancients, whom we have no right to accuse of cannibalism.

If the absence of cereal remains justifies us, as it appears to do, in concluding that they had no knowledge of agriculture, they must certainly have sometimes suffered from periods of great scarcity, indications of which may perhaps be seen in the bones of the fox, wolf, and other carnivora, which would hardly have been eaten from choice; on the other hand, they were blessed in the ignorance of spirituous liquors, and saved thereby from what is at present the greatest scourge of northern Europe (p. 234).

5. THE TIME AND CAUSES OF THE EXTINCTION OF THE OYSTER IN THE GULF OF MAINE.

DATE AND EXTENT OF THE EXTINCTION.—I attempted to show, in the last section, to how wide an extent the oyster grew north of Cape Cod, and how recent was its disappearance in many localities. It is worth while to inquire what has caused this sudden and widespread extinction. At Mount Desert, at Bath, Maine, in Casco bay, at Scarborough, New Hampshire, and Salisbury, Massachusetts, in the Parker and Rowley rivers, in the Charles, Mystic, and Weymouth rivers, Massachusetts, and everywhere on Cape Cod, the native oysters are wholly extinct. A few remain in Great Bay, near Portsmouth, New Hampshire, and at Sheepscot, Maine. Possibly, also, a few could be searched out at Damariscotta and Wellfleet, but this is very doubtful. What has killed them all? Beginning with those beds whose extinction was prehistoric, there are three theories, either of which is at the service of the reader, or he may, if he chooses, combine them. One is, that the Indians used them up; another, that the polluting of the water, by the refuse of mills and manufactures, had its influence; the third, that the elevation of the coast, which geologists tell us has been proceeding steadily for many centuries, brought about conditions fatal to this fixed mollusk, so far as the precise locality of particular beds was concerned. In George river, to begin at the extreme east, we are told that the death of the oysters is very recent. They continued plenty up to 1836, according to the account of old residents of the district, who are under the impression that their subsequent extinction was due to the sawdust coming down from lumber-mills, and brought in by the eddying tide.*

In regard to the decline of the great deposits above Damariscotta there is much to excite curiosity. After all, there was only a limited area of this oyster-growth—at most a square mile of water suitable for their habitation, and it is certain that they were sought for year after year by a large number of persons. It would not be strange, therefore, if, unable to propagate fast enough to supply the demand, they finally became extinct. I believe that this calamity would not have been long delayed had the red men been left alone for a few decades longer. Indeed, it has been gravely doubted whether any oysters were in existence in Salt bay when the locality was first discovered by white men. The traditions are uncertain, but I think they give satisfactory evidence that the first settlers found at least a small number of oysters here, and that their disappearance is comparatively recent, probably within the present century. I am satisfied that the first white men found still alive here the remnants of the great oyster colony which the Indians had been foraging upon for many generations, perhaps, and had at last nearly exterminated.

POSSIBLE EFFECTS OF NATURAL SEDIMENT UPON THE DAMARISCOTTA BEDS.—The influence of the Indians having been considered, various other causes are assigned for the utter extinction of the oyster in this region. Dr.

* It is convenient to mention the following facts: In 1853 oysters were planted in Oyster river, near the George, but without success. In 1864 it is said that a few living large ones were taken there, and it is probable that a few still exist. The saw-mills have all ceased to run on these rivers, and I see no good reason why the beds should not be restocked with success. The original locality was near the railway bridge. There are no shell-heaps here.—*Letter from the Hon. E. K. O'Brien.*

R. C. Chapman, of Newcastle, Maine, who has paid much intelligent attention to the matter, has constructed a theory in this wise: He points to the fact that the fresh-water pond above the island and rocky falls at Damariscotta mills is about 60 feet higher than the level of Salt bay. The tide never goes beyond these rapids. He believes that at one time the pond contained a far greater volume of water than now, and that it had either no outlet at all into Salt bay, or else a very small one; but that finally the weight of the water broke through the barrier of rock and gravel at the falls, and made for itself this new channel oceanward. This breakage would of course burden the new outrushing current with an enormous amount of loosened soil and broken rock, which would be swept onward until it settled in thick sediment all over the bottom of Salt bay, and for a long time after the water would be murky with clouds of mud. Such a catastrophe would undoubtedly kill the most, if not all, of the molluscan life in such an inclosed body of sea-water as Salt bay is; and the oysters would survive it least of all. But I am not convinced that there is evidence that any such a sudden, grand disaster ever occurred at that spot, or, if it ever did, I am of the opinion that it was antecedent to the beginning of the shell-heaps. We are all more fond of conjuring up some grand cataclysm to account for mysteries in nature, than to accept an explanation commended by its simplicity.

POLLUTION OF THE WATER BY MILLS AND FACTORIES.—One of the first acts of the new settlers was the erection of saw-mills at the falls, where they found a splendid water-power. These mills began at once to pour great quantities of saw-dust into the stream, which was carried out into Salt bay and the river below, where it was bandied back and forth in the tireless tides until it sank. Sawdust very soon becomes water-logged and goes down. At the same time woodmen were clearing the forests and draining the swamps, and farmers were breaking the turf. Each of these operations tends to increase the running off of the rain and the carrying away of a far greater amount of silt than under natural conditions. The oysters thus found their clear, salt home freshened by an unusual influx of rain-water, the currents always roily, and themselves gradually being smothered in the sediment of sawdust and earth deposited everywhere, except, perhaps, in the deepest and swiftest parts of the channel. Thus an end was made of what, with care, might no doubt have been nurtured into a most flourishing oyster-colony.

At the northeastern extremity of Salt bay a little stream, known as Oyster creek, comes in from toward the village of Nobleboro. The mouth of this creek is out of the way of the currents from the mills, and, in general, it is the part of the bay least likely to suffer harm from sediment. The men who fish for eels through the ice in winter say that underneath the foot or so of thick sawdust and mud that now covers the bottom, and has perceptibly lessened the general depth of the water within a hundred years, there is everywhere a layer of oyster-shells. Here in the creek, however, these are not covered up, but may be seen lying, large and white, on the bottom, as the bridge is crossed. Moreover, men now living assert, that sixty or seventy years ago a few of the bivalves were still to be had there, and that during the previous half century there were a great many in the bay. They believe that later than that scattering individuals might have been found, and some men go so far as to say that in the "quick-water" at the base of the falls a few oysters may even now be obtained. There are some supporting facts, and I do not think it unlikely.

The covering of the formerly gravelly or shelly bottom of the bay would not only smother existing mollusks, but, in the case of our subject, would prove fatal in another way. The spawn of the oyster requires some clean, firm support to which to attach itself. The soft, wet matting of sediment would not do at all, and all the ova would drift out to sea or become the food for fishes, and in either case produce nothing.

No longer than forty years ago, however, I am told, a dead spruce tree was dragged to the surface opposite the shell-heaps, whence it had fallen, top foremost, into the stream. The branches were clogged full of sawdust; but clinging to the twigs were innumerable young oysters that had not had a chance to grow to any great size before they were choked by the drifting sediment. Whence came the spawn for this growth, if there were then no living oysters in Salt bay or vicinity? It is possible some might be got, by careful search, in the Oyster creek corner yet.

As for the long, thick shells dredged up in the lower Penobscot river and in Portland harbor, indicating so extensive a habitancy there of these mollusks in ancient times, possibly the death of many of them dates back to Postpliocene days. Opposed to this thought, nevertheless, is the fact that shell-heaps upon the islands in Casco bay show that a few oysters, at any rate, still existed when Indians dwelt there. No one has ventured on an explanation of their extinction, that I am aware of, except Mr. C. B. Fuller, curator of the Portland Society of Natural History, who suggests that, by the breaking away of the barrier represented by the present chain of islands in the bay, the water of the outer sea was let fully into what had previously been a sheltered basin. This water was so very much saltier, as well as colder, than that to which the oysters had been accustomed, that they were unable to survive the change.

CLIMATIC CHANGES.—Professor A. E. Verrill, however, evidently considers a change in climate the cause of the loss to the world's economy of these storehouses of food. In his *Invertebrates of Vineyard Sound*, this writer remarks that the occurrence of large quantities of oyster-shells beneath the harbor-mud at Portland, associated with *Venus mercenaria*, *Pecten irradians*, *Turbonilla interrupta*, and other southern species, now extinct in that locality, and the occurrence of the first two species in the ancient Indian shell-heaps on some of the islands in Casco bay, though not now found living among the islands, indicates that the temperature of those waters was higher at a former period

than at present. These facts also point to the most satisfactory explanation of the existence of numerous southern shells, associated with the oyster and *Venus mercenaria* in the southern part of the gulf of St. Lawrence, though not now found in the intermediate waters along the coast of Maine nor in the bay of Fundy.

These remarks, it will be observed, apply to the whole coast, and are highly suggestive. In their light it is useless to speculate upon the few remaining localities until Wellfleet, on the cape, is reached.

EXTINCTION OF THE WELLFLEET BEDS.—In Wellfleet harbor, as has already been shown, oysters were native and widespread at the time of the discovery of the country by Europeans. The settlers began at once to make use of them, and continued to do so as long as they lasted. Here we ought to know something definitely about their extinction, but all the information is scattered and inexact.

Wellfleet was anciently known as Billingsgate, at least that part of it on the western side, on account of the abundance of the fish there, and this name became an oyster-brand during the last century. In the *Massachusetts Historical Collections*, iii, is preserved a topographical description of Wellfleet, by Levi Whitman, dated 1793, in which is given considerable information upon our subject. Mr. Whitman asserts his opinion that “no part of the world has better oysters than the harbor of Wellfleet. Time was when they were to be found in the greatest plenty, but in 1775 a mortality from an unknown cause carried off the most of them. Since that time Billingsgate oysters have been scarce, and the greater part that are carried to market are first imported and laid in our harbor, where they obtain the proper relish of Billingsgate”.

Forty years later Gould wrote, in his *Invertebrates of Massachusetts*:

They say that Wellfleet, where the southern oysters are planted for Boston use, was originally called Billingsgate, on account of the abundance of fish, and especially oysters, found there; that they continued to be abundant until about the year 1780, when from some cause they all died; and, to this day, immense beds are shown there of shells of native oysters which perished at that time. They say that before that time no such thing was thought of as bringing oysters from the south.

The Wellfleet oysterman, whom Thoreau talked so long with on his visit to the cape in 1849, and the charming report of whose conversation is given us in that pleasant author's *Cape Cod*, placed the date of the disappearance of the oyster there as 1770. “Various causes are assigned for this, such as the ground frost, the carcasses of blackfish left to rot in the harbor, and the like, but the most common account of the matter is, and I find that a similar superstition with regard to the disappearance of fishes exists almost everywhere, that when Wellfleet began to quarrel with the neighboring towns about the right to gather them, yellow specks appeared in them, and Providence caused them to disappear.”

Nowadays, the citizens of the village repeat these traditions—all but the one about Providence—I did not hear that—and hazard no new theory. It is perhaps most truthful of all to say, that excessive raking nearly depopulated the beds, and that the blowing in of sand from the stripped hills, and the polluting of the tide-water by the offal of the fishing-vessels that throng the bay, destroyed the growth of the young. No doubt rotting carcasses of schools of blackfish left on the beach (as has happened many a time) and the subtle anchor-frost helped—“that is, a degree of cold so great as to cover the bottom with a coating of ice, and thereby to cut off the oysters from all access to air and nourishment.” It is very probable, nevertheless, that many native oysters are still living in Wellfleet bay, perpetuating the old stock.

WYMAN ON THE EXTINCTION OF FOOD-MOLLUSKS IN FLORIDA AND ELSEWHERE.—I find some exceedingly pertinent remarks on this subject in Dr. Jeffries Wyman's report on the shell-heaps of Florida. They are as follows:

It seems incredible to one who searches the waters of the St. John's and its lakes at the present time, that the two small species of shells above mentioned could have been obtained in such vast quantities as are brought together in these mounds, unless at the times of their formation the shells existed more abundantly than now, or the collection of them extended through very long periods of time. When it is borne in mind that the shell-heaps afford the only suitable surface for dwellings, being most commonly built in swamps, or on lands liable to be annually overflowed by the rise of the river, they appear to be necessarily the result of the labors of a few living on a limited area at any one time. At the present, it would be a very difficult matter to bring together in a single day enough of these shells for the daily meals of an ordinary family. That they formerly existed in larger numbers than now, is by no means improbable. It is well known, with regard to both animals and plants, that after flourishing for considerable periods in given areas, they at length yield in their struggles for existence against changed conditions. The oysters of which the gigantic shell-heaps on the Damariscotta river in Maine are built were, without doubt, obtained from the adjoining waters, but to-day they are well-nigh extinct, and the same is in a measure true of some of the deposits on Cape Cod, as at Cotuit Port. Analogous changes have been observed by European archæologists. The oyster-banks near the mouth of the Baltic, from which many of the ancient shell-heaps of Denmark were formed, have disappeared, partly through increasing freshness of the water, and partly through the ravages of the starfish. The last of them have disappeared from the Iselfjord during a century, so that none are found further south than the northern end of the island of Seeland, and in large quantities only on the more northern shores of the Kattegat. The water chestnut, *Trapez natans*, once very abundant in some of the Swiss lakes during the age of the lake-dwellers, has now become extinct in those regions.—*Smithsonian Report*, 1865, p. 365.

As the oysters of the ancient period were very much larger than those now found on the coast of Maine, it is also the case that the shells from the mounds of the St. John's surpass in size, though to a less marked degree, those of the actual period.

6. HISTORY OF THE NATURAL OYSTER-BEDS IN THE GULF OF MAINE, SINCE THE SETTLEMENT OF THE COAST BY EUROPEANS.

TESTIMONY OF CHAMPLAIN, POITRINCOURT, AND WINSLOW, 1605-1620.—Beyond the most general allusion, the very earliest mention of oysters in these waters occurs in 1606. The second voyage of exploration along our coast found an anchorage in Massachusetts bay. "There were many very good oysters here," he relates, "which we had not seen before, and we named the place Port aux Huïstres." Mr. Slafter, a commentator upon the history of these voyages, says "it is plain that this port, which they named Oyster Harbor, was either that of Wellfleet or Barnstable. The former, it will be remembered, Champlain, with De Monts, entered the preceding year, 1605, and named it, or the river that flows into it, St. Suzanna du Cap Blanc. * * * It is obvious that Champlain could not have entered this harbor the second time without recognizing it. * * * We may conclude, therefore, that the port in question was not Wellfleet, but Barnstable. This conclusion is sustained by the conditions mentioned in the text."

In another edition of Champlain's map (1632) the "Rivière aux Escailles" is drawn emptying into the same part of the bay which Ogilby, in his map of this part of America, published in 1670, calls "Port aux Huïstres". This name survived, indeed, to a much later time. In Rees's Cyclopædia (1819), "Oyster bay" is given as "a harbour for small vessels in the southwest limits of Barnstable, Massachusetts. It derives its name from its excellent oysters".

Champlain (second voyage, 1606,) also relates that he found oyster-beds in Chatham harbor, on the south side of Cape Cod, and makes the following general statement: "All the harbors, bays, and coasts from Chouïacoet [Portland, Maine] are filled with every variety of fish. * * * There are also many shellfish of various sorts, principally oysters." In this case, too, Rees preserves the recollection so long, that I wonder it has ever been lost, for in his Cyclopædia he mentions an "Oyster Island Harbour on the coast of Massachusetts, which, from its latitude (lat. 41° 35', long. 70° 24'), must have been in the neighborhood of Chatham".

These records by Champlain and Poitricourt embrace the earliest notice that I can find of oysters on the northern coast, but careful searching through all the early narratives of exploration and settlement around Massachusetts bay, produces much additional testimony. For instance, in 1621, in a letter from Plymouth, preserved in *Mourt's Relation*, Edward Winslow writes to an English friend: "Oysters we have none near, but we can have them brought by the Indians when we will." This shows they were not far away. Two years later we read the sad report that "one in geathering fhellfish was so weake as he flucke fast in y^e mudd, and was found dead in y^e place. At last moft of them [Wefton's people in Massachusetts bay] left their dwellings & scattered up & downe in y^e woods, & by y^e water fide, wher they could find ground nuts & clames, hear 6 and ther ten".*

HIGGINSON, WOOD, AND JOSSELYN, 1630-1638.—In 1630 Higginson, in his *New England's Plantation*, gives "muskles and oysters" as a part of the great wealth of the waters beside which the Pilgrims had placed their colony; and seven years afterward Thomas Morton added his witness: "There are great store of Oysters in the entrances of all Rivers; they are not round as those of England, but excellent fat, and all good. I have seene an Oyster banke a mile at length."†

In 1634 William Wood, in his *New England's Prospect*, speaks of "a great oyster bank" in Charles river, and another in the "Misticke", each of which obstructed the navigation of its river. Ships of small burden, he says, were able to go up as far as Watertown and Newton, "but the Oyster-bankes doe barre out the bigger Ships." In reference to the Mystic, and the large amount of ship-building upon it, Wood says, "Ships without either Ballast or loading, may floate downe this River; otherwise the Oyster-banke would hinder them which crosseth the Channell."

"The Oysters," adds Wood, "be great ones in form of a Shoe-horne; some be a foot long; these breed on certain banks that are bare every spring tide. This fish without shell is so big, that it must admit of a division before you can well get it into your mouth."

This bank appears to have been a very well-known and prominent feature in those days, though no popular tradition of it remains. For example, Winthrop's *History of New England*, edited by the Rev. John Savage, p. 106, contains under date of August 6, 1633, the following statement: "Two men servants to one Moodye, of Roxbury, returning in a boat from the windmill, struck upon the oyster-bank. They went out to gather oysters, and, not making fast their boat, when the flood came, it floated away, and they were both drowned, although they might have waded out on either side; but it was an evident judgment of God upon them, for they were wicked persons."

In Hubbard's *General History of New England*, written in 1633, is another account of the same incident, or accident, as one of several instances where the visible wrath of Jehovah, apparently so manifest to the Puritan, had instantly followed transgression. I quote the passage:

The like judgment befell two lewd persons that lived in service with one of Roxbury, who, rowing in a boat from the windmill hill in Boston, struck upon an oyster-bank near the channel, and going out of their boat before they had fastened her, to get oysters, the tide came in before they were aware, and floated away the boat; and, they not being acquainted with the channel, were both drowned on the bank, though they might at first safely have waded through to the shore.

* Bradford's *History of Plymouth Plantation*, in Coll. Mass. Hist. Soc., vol. iii, 4th sec., p. 130.

†New English Canaan, p. 90.

There are other references to this matter. John Josselyn, Gent., in his *Account of Two Voyages to New England*, printed in 1638, describes Boston and its environs. Charles river is portrayed with minuteness, and the expansion above the "Narrows", now known as the Back bay, is indicated. "Toward the southwest," he writes, "in the middle of the bay, is a great oyster-bank, toward the northwest is a creek; upon the shore is situated the village of Medford; it is a mile and a half from Charlestown."

This is mixed, and throws small light upon the precise position of either of these banks, which must have been of considerable importance to Bostonians at that time, and particularly to the poor. This appears from the foregoing, and from a paragraph in a very interesting tract preserved in the Geneva library, written by an unknown French refugee who visited Massachusetts in 1687; describing the prosperity of Boston, the author says: "This town carries on a great trade with the islands of America and with Spain. They carry to the islands flour, salt-beef, salt-pork, cod, staves, salt-salmon, salt-mackerel, onions, and oysters salted in barrels, great quantities of which are taken here."

LOCATION OF THE CHARLES RIVER BEDS.—It is a less easy task than it would at first appear to determine the location of these ancient beds of oysters. For that in the Mystic river I have no data sufficient to guide me with any exactness; any one may guess within a mile of it. There is better information in regard to the Charles river beds.

The "lewd persons" who lost their careless lives were returning from the windmill. This, it is known, stood upon one of the hills in the common—possibly that which now upholds the soldiers' monument. The tides at that time washed the shore of the higher parts of the common, along where Charles street now passes, and boats could doubtless come almost up to the foot of the mill with their loads of grist. Returning out through the bay, they would pass close by any oyster-banks that lay off Cambridge port.

Through the discussion of a paper which I had the honor to read before the Boston Society of Natural History, in September, 1879, upon Massachusetts oysters, some new facts of interest were brought to light bearing upon the point now under consideration. Prof. F. W. Putnam remarked that when, twenty years ago, the ground was being broken at the corner of Berkeley and Boylston streets, for the foundations of the building devoted to this very society, in which we were then sitting, many immense oyster-shells in good condition were struck at a depth of several feet. This part of Boston is all "made ground", extending over former tide-flats in the "Back bay" of Charles river. It is possible that these aged buried oysters grew on the anciently noted bed, the site of which therefore is now appropriately indicated by the Natural History Rooms and the noble Institute of Technology.

PLYMOUTH AND NEWBURY, 1660-1700.—Meanwhile Plymouth had pulled her people out of where they had "stuck fast in y^e mudd", and discovered that her mollusk-fisheries were valuable, as the following quotation from the records evince:

"Att the generall court held att Plymouth the fourth of June, 1661—

It is enacted by the Court that five shillings shalbee payed to the Countrey vpon every barrell of Oysters that is carryed out of the Gouv^tment, and that the Countrey bee not defrauded, hee shall enter them with the Towne Clarke before hee carry them away, or else to forfeit twenty shillings p barrell on any carryed away not entered."*

"Att the 2cond Session of the Generall Court held att Plymouth, for the jurisdiction of New Plymouth, the seaventh of July, 1680—

This Court doth order that all such as are not of our collonie be heerby prohibited of fetching oysters from Taunton River with boates or any other vessells; and incase any such shall p sist on in soe doeing after warning given to the contrary, this Court doth order John Hathway, of Taunton, and doe heerby impower him to make seizure of such boates and vessells for the collonie's vse."†

Moving a little farther eastward, I find that the oysters in Parker and Rowley rivers were valuable to the settlers in that region. In his *History of Newbury*, Mr. Joshua Coffin remarks:

Certain it is that vast quantities of lime of the best quality were annually made in Newbury for nearly a century, for export as well as for home use. Prior to this time lime was manufactured from oyster- and clam-shells. Lewis, in his *Minute and Accurate History of Lynne*, informs us, under the year 1696, that immense numbers of great clams were thrown upon the beaches by storms. The people were permitted by a vote of the town to dig and gather as many as they wished for their own use, but no more, and no person was allowed to carry any *out of town*, on a penalty of twenty shillings. The shells were gathered in cart-loads on the beach and manufactured into lime.

NEW HAMPSHIRE AND MAINE.—Still farther on, Durham river, Brainford county, New Hampshire, was known, as early as 1697, as "Oyster river", just as its neighbor was called "Lamprey river", because of the mollusks in the one and the "eals" in the other. The "Great Bay" into which the Durham river flowed was full of oysters, and tradition has it that no more than a century ago vessels used to come there and be loaded with these oysters, while previously the neighborhood had always been able to obtain all they wished with little trouble.

In Scarborough and Casco bays, and along Mount Desert, I am inclined to believe that oysters were extinct before the occupation of that region by white men. But I think, that if it is true that George river is the stream ascended by Weymouth during the first decade of the seventeenth century, he undoubtedly subsisted his crew, while there, upon the oysters, though he does no more than mention "muscles", without distinction of kind.

This George river is the most eastern point at which I have been able to discover any trace of oysters in the

* *Plymouth Colony Records*, vol. xi, 1623-1682, Laws, p. 132.

† *Ibid.*, vol. vi, 1678-1691, p. 44.

United States. It is an insignificant stream, that flows down to the sea at Thomaston. The mouth of the stream, as is the case always along that deeply indented coast, is in the form of a deep estuary, and forms a good harbor. At a point about fifteen miles inland, measured along the river, the Knox and Lincoln railway crosses. Just above the bridge a trifling stream known as Oyster river comes in, and the confluence of the two streams is in a broad, shallow expansion, about marking the head of the tide. It was just at this point that the first-comers to this region found an abundance of oysters within a restricted space. Oyster river, a little stream that "makes in" between Thomaston and Warren, was the principal point. According to the Hon. E. K. O'Brien, of Thomaston, tradition asserts that sloops used to go there to load oysters for the neighboring colonies. They were abundant, also, on the main George river, by Edward O'Brien's ship-yard, in Warren. These old oysters are reputed to have been of huge size, a report borne out by the remains of shells which now exist. Similarly, I believe, the first settlers found at least a few oysters at Damariscotta, though history is silent and tradition is uncertain. It is positively known, however, that the ancient Sheepscot settlement found in its oyster-beds a source of constant profit, both by consumption and sale, and they are not altogether exhausted from that river yet, in spite of sawdust and chips.

LOST OYSTER LOCALITIES ALONG THE GULF OF MAINE.—It is probable that there were many other localities, now forgotten, where the oyster existed along the gulf of Maine at the beginning of the seventeenth century, besides those I have indicated, namely, Wellfleet, Barnstable, Weymouth, Boston, Ipswich, Newbury, Portsmouth, Sheepscot, Damariscotta, and George rivers. Nor must it be forgotten that this catalogue does not embrace the prolific field bordering Buzzard's bay, whence the colonies were constantly supplied overland. Add to this plenitude of oysters the inexhaustible abundance of several species of "clams", so-called, scallops, lobsters, and so forth, and it is no wonder that the shellfish are constantly alluded to in the narratives of the early struggles of the Pilgrims against starvation, as a blessed source of food; for it may well be supposed that without them they would hardly have survived the rigors of those dreadful first winters. Even their quality found a champion, who thought them first rate. Josselyn informed his readers that the Indians fed much on lobsters, and adds:

Some they rost, and some they dry as they do *Lampres* and *Oysters*, which are delicate breakfast meat so ordered; the *Oysters* are long shell'd. I have had of them nine inches long from the joynt to the toe, containing an *Oyster* like those the Latines called *Tridacuan*, that were to be cut into three pieces before they could get them into their mouths, very fat & sweet.

In the face of this testimony, briefly indicated, it is curious that it should ever have been denied that the oyster was indigenous in Massachusetts bay, as has been done more than once, and still more strange that so well informed a naturalist as A. A. Gould should not have felt strong enough to affirm it. In Binney's edition of his *Invertebrates of Massachusetts* it is stated:

It is also a question on which there are various opinions, whether the oyster was indigenous in Massachusetts bay, or whether all which grow in the various oyster-beds owe their parentage to inhabitants of the Dalaware, Chesapeake, and Oyster bay, etc. That they now [1866] grow spontaneously, and, for aught we can learn, always have grown so, on the south shore, there is no reason to doubt; and that they are occasionally found of patriarchal appearance in all parts of our bay is certainly true. But the question is, whether these places are their natural habitat, or whether they have been accidentally dropped where they were found. Many incline to this latter opinion, especially the younger oystermen and some scientific gentlemen; but the old settlers of Cape Cod are of a different opinion.

Mr. Gould would not have allowed this non-committal, and consequent doubt as to his own belief, had he consulted history. Indeed, we may fairly give him the credit of believing better than he wrote, for in his first edition (1841) he records that "old men relate that they were accustomed to go up Mystic river and Charles river, and gather oysters of great size, before it was the custom to bring them from New York. And even now individuals of enormous size are occasionally brought from both these places, and probably might be found, by special search, at any time".

7. OYSTER-CULTURE IN THE GULF OF MAINE.

EARLY ATTEMPTS AT OYSTER-CULTURE.—I have ventured elsewhere to suggest that the oyster-beds in the Sheepscot and George rivers may have been planted there by the Indians, who carried over from Damariscotta, by paths yet traceable, a quantity of full-grown oysters, and placed them in those streams, in order to keep them alive conveniently near home. If this supposition is correct, it is probably the earliest instance of oyster-culture in North America. Nevertheless, oyster-culture proper—that is, the propagation of oysters in permanent beds, which annually increase by their native spawn—remains almost unknown in the gulf of Maine, and uniformly unsuccessful, except at one point. This is not wholly inattention to the matter, but the lack of suitable conditions for successful growth.

In a letter from General Benjamin Lincoln, of Hingham, Massachusetts, to the Rev. Mr. Belknap, author of the *History of New Hampshire*, dated December 12, 1791, it is remarked:

We have undoubtedly been criminally inattentive to the propagation of the oyster in different parts of our shores; we can probably fill our channels with these shellfish with much more ease than we can fill our pastures with herds and flocks.

Had General Lincoln studied the case more deeply, he might have had to change his opinion of the "great ease". More than half a century before—indeed, in the year 1711—"a plan for forming an oyster-bed in Plymouth

harbor was projected by a company of thirty-one persons, whose names are on record. Oysters were procured and deposited in a certain place, deemed the most eligible, with the hope that they might thus be propagated; but it was ascertained by the experiment that the flats are left dry too long for their habit, which requires that they be covered at all times by water".*

OBSTACLES TO SUCCESSFUL OYSTER-CULTURE IN THE GULF OF MAINE.—This coast is a precipitous and rocky one, affording few suitable points for oyster-culture; most of these were occupied by the native beds, which have succumbed. Other localities have been rendered unfit for oyster-life, by the pollution of the water, through various agencies of civilization. The climate, also, appears to be too severe for any but native breeds. Virginia oysters have frequently been left through the winter in deep water, but have very rarely lived; and, if they did so, would spawn at so late a day that the autumn chill proves fatal to the young. I have heard of a bag-full of oysters, supposed to be from Virginia, surviving for several years in Sheepscot river, but the case is hardly authentic. All attempts at the cultivation and propagation of Virginia or New York oysters have, therefore, been abandoned as entirely futile on the Maine coast or in Massachusetts bay, except at Wellfleet. The severity of the winters, the violence of the tempests, the scarcity of good bottom, and the abundance of starfishes and other enemies, make planting unprofitable, if not impossible.

EXPERIMENTS AT SALEM AND WELLFLEET.—As an instance of the data upon which I found my conclusion, I give the following information, furnished by the Messrs. Newcomb, oyster-merchants in Salem, Massachusetts.

In regard to the advisability of planting oysters in the vicinity of that town, Mr. Newcomb had little encouragement to offer. Some that had been brought from Fire island by his father, many years ago, and were put down in the harbor channel, were found some years later to have lived and to have grown very large and good. The present firm put 1,000 bushels in water five feet deep, at low-tide, in Bass river, one season, but every one of them died during the winter. There is no very good ground for planting anywhere in that harbor.

At Wellfleet, Cape Cod, however, something is being done, with good prospects. In years past it frequently happened that the oysters bedded at Wellfleet would spawn and young ones attach themselves to stones, and to the wharfs and bridge piers, in myriads. Most of these would be left exposed at low-tide, and consequently were killed by the first frosty day. A large number, however, survived every winter, scattered here and there in submarine and protected situations. This induced the experiment of trying to preserve some throughout the year, and causing them to perpetuate themselves. This failed as far as Virginia seed was concerned, but the Taunton river or "Somerset" seed, tried by Mr. S. R. Higgins (the pioneer in this work) in 1878, lived and throve. In 1879, having sprinkled a portion of the bottom of the bay with clean shells to catch any stray spawn, he deposited a quantity more of this hardy seed, and in 1880 will add largely to his stock, which, as yet, has suffered no serious harm. He has been followed in his enterprise by several other gentlemen in Boston and Wellfleet, and the business bids fair to be an entire success.

The planting grounds are off Great island, where there is from three to six feet of water over the beds at low tide. The bottom is hard sand, with a thin layer of mud over it, the kind of bottom most highly esteemed. The enemies of the oyster are few, and the currents so arranged as to make a large catch of spawn probable. The water is very salt, the growth of the mollusk rapid, and the result a bivalve of high quality. The great drawback is the winter, and this is not greatly feared. The harbor freezes entirely over, but the oysters are planted in a depth of water so great as to be out of reach of the ice. However, even if the ice rests upon them, provided they lie flat, it will only crowd them into the sand, and will not kill them under ordinary circumstances, but if it is shifted about by wind or tide when upon the beds, it will tear them to pieces. There is not much chance of extensive damage in this way. What will prove fatal to all of them, however, is "anchor frost", if it occurs under the beds. But the chances are that this will not happen for several winters together.

One of the gentlemen engaged gave me the following figures as an estimate of probable investment and returns, but it was considered by other shippers too sanguine a view. The cost of planting 500 bushels of seed from Somerset would be \$250. He calculated that they would at least be doubled in number at the end of the ensuing year, making 1,000 bushels, and that by the next spring (allowing 500 for loss by accidents and death) there would be 1,500 bushels on the bed. There would now be 1,000 bushels of these ready to take up, at a cost of 20 cents or so a bushel. These would sell for at least \$1 a bushel, leaving 80 cents profit. Thus—

Cost of original bed, 500 bushels.....	\$250
Took up in two years, 1,000 bushels, at 20 cents cost	200
	450
Received for 1,000 bushels.....	1,000
Profit accruing in two years.....	550

This doubling of the investment in two years is not unreasonable, in my opinion, besides having a good growing bed left over; but requires a continuance of good weather and other fortunate circumstances, and takes no account of the numerous petty expenses occurring, from time to time, in the care of the beds.

SUITABLE LOCALITIES FOR OYSTER-CULTURE NORTH OF CAPE COD.—I have been asked in particular as

* Thacher's *History of Plymouth*, p. 170.

to the probability of success in restocking the former haunts of the oyster in the rivers of Maine, and especially at Damariscotta. I learn that occasionally oysters, of what origin I do not know, have by accident been dropped into the tide-water below the bridge, in Damariscotta, and have afterward been fished out grown to a large size. The reader will remember, that about forty years ago, a great quantity of young oysters were found collected in the branches of a tree which had tumbled over into the river near the lower end of Salt bay. These facts go to show that some kinds of oysters will live and spawn there yet; whether anything but native seed would, or not, is doubtful. Furthermore, the site of the former beds is now so covered with mud and sawdust and eel-grass, that much of the space is rendered unsuitable, while the clearer bottom of Oyster creek is liable to be drained so dry by some of the ebb-tides in winter, as to allow the ice to rest fairly upon the bottom, which would probably be fatal in that climate. Hereafter no sawdust will be thrown into the river and bay, if the law is enforced as it might be, but nothing can prevent the roiling of the water by a heavy rain. On the whole, I fear only a very limited cultivation of oysters is possible in that locality, even if a successful beginning could be made.

The same dismal remarks will apply to George and Sheepscot rivers. In the former stream I am informed that an attempt at planting was made a few years ago, but failed. In Sheepscot river nothing has been tried, but it is hinted that, even if other conditions were favorable, every seed-oyster would be secretly transferred from river-bottom to frying-pan before time had been given to begin to spawn. Police measures would prevent this, however.

At Portland, Mr. C. B. Fuller thinks the only suitable situation to attempt the cultivation of oysters, in that region, is in the mouth of the Presumpscot, where the water is shallow, warm, and comparatively fresh; but he doubts the ability of southern oysters to survive the winter. However, it is intended by one of the dealers to try the experiment with seed oysters from Prince Edward island.

In the Great bay, behind Portsmouth, New Hampshire, beds of native, living oysters still flourish, and by judicious transplanting of these a large additional yield might be accomplished. There is much suitable ground, I judge. It is likely that the present inferior quality of these oysters might be greatly improved by cultivation. It is very probable, also, that Somerset or Wellfleet seed would exist through a winter, become acclimated, and prosper in this well-sheltered and firm-bottomed inlet. I wonder that some one has not yet made the experiment.

Unless it be Mystic river or Barnstable harbor, I know of no other likely place for oyster-cultivation on the northern side of Cape Cod. Where rocks, mud, or ice are not obstacles, starfishes and other enemies are likely to annoy, or proper protection of the beds to be impracticable.

8. HISTORY AND PRESENT CONDITION OF THE OYSTER-TRADE, AT WELLFLEET AND VICINITY.

EARLY OYSTER-CULTURE: HISTORY.—Realizing that their natural resources in oysters had disappeared, and that any attempt to preserve the beds by a system of propagation was unsuccessful, the people of the coast of Massachusetts bay turned their attention many years ago to replacing their oysters by importations from more favored regions, which should be kept in good condition during the warmer half of the year, by being laid down in the shore-water, and so held in readiness for the autumn-trade. This operation was called “planting”, but it is a misuse of the word, and the other popular phrases, “laying down” or “bedding”, express the fact more truthfully. It is not oyster-culture at all, but only a device of trade to get fresh oysters and increase their size and flavor, which adds proportionate profit in selling. It is neither intended or desired that they shall spawn.

Just when this practice began on Cape Cod—for Wellfleet, whence had come the latest and best of the native oysters, naturally became the headquarters of the trade—is uncertain; no doubt it was some time before the opening of the present century. There is a gentleman now living in the village of Wellfleet, Mr. Jesse D. Hawes, who is eighty-four years old. He cannot remember when they did not bring some oysters every fall from New York bay, to use at home and sell in Boston.

It is surmised that when the native beds became exhausted, the inhabitants got into the habit of going to Buzzard's and Narraganset bays, then to the Connecticut shore, and finally to New York, and laying down more and more yearly in Wellfleet harbor, until finally a considerable business grew. Egg Harbor, New Jersey, was also a ground much frequented a little later by oystermen.

By the year 1820, I am informed by Mr. F. W. True, who made inquiries for me on this subject, 12,000 to 14,000 bushels were brought to Wellfleet yearly, and ten or twelve shops were opened by Wellfleet men for their disposal in Boston and Portland. This accounts for the striking fact, that there is hardly an oyster-dealer on the New England coast, north of Cape Cod, who is not a native of Wellfleet, and a certain small circle of old names seems to inclose the whole trade. Besides the citizens, however, many strangers came in and procured the privilege of bedding down imported oysters to fatten on the flats of this hospitable harbor. In 1841, Mr. Gould, the conchologist, wrote that the whole trade at Wellfleet then employed 30 vessels of about 40 tons each, and the services of about 120 men for three months of the year. This yielded to the town a revenue of about \$8,000 annually.

EARLY OYSTER-CULTURE: METHODS.—The process of “bedding down” was as follows: Each proprietor of a space upon the flats chartered the services of a vessel, in the latter part of the winter, to go to some specified oyster-ground and purchase a certain number of bushels, for which he gave the captain money. The vessel was

chartered at a round sum for the trip, or else was paid at a rate varying from 15 to 20 cents a bushel freight, on the cargo. When the vessel arrived home she anchored in the distant channel, and the oysters were unloaded into dories, 50 bushels to a dory. The dories then proceeded to the grounds, which had been already divided into rectangles a few rods square, by rows of stakes, and deposited a load of 50 bushels in each rectangle or "square". In order that the oysters might be distributed as evenly as possible over the bottom, the dory was rowed to the center of a square, and anchored at both ends. The dorymen then threw out the oysters with shovels into all parts of the square. This was done when the water was high over the beds. When the tide was out the oysters were redistributed with forks or "spreading-machines". The similarity of this procedure to the seeding of a field is obvious, and sufficiently explains the phrase "oyster-planting". It afforded occupation to a distinct class of men, who did it by contract, the ordinary price being about 10 cents a bushel for placing them upon the beds. The season for bedding began in February, as soon as there was a surety of no further danger of hard freezing, and continued until April, the ground chosen being the hard surface of the flats in the western portion of the bay, where the beds would be left dry about two hours at each low-tide. The oysters had very little fresh water near them, and their growth was variable, seeming to depend on the weather, but in what way, or just how it effected them, I could not learn. In a favorable season they grew very rapidly, in respect to both shell and meat, so that the 100 bushels put down in April would fill 300 bushel measures when taken up in October. The percentage of loss was always considerable, however, probably never less than one quarter, and now and then amounting to the whole bed. Drifting sand, sudden frosts, when the beds were exposed, disease, and active enemies, were the causes that operated against complete success. I could not obtain satisfactory information concerning prices during the first quarter or half of the present century, and am inclined to believe they did not differ much from the present rates, except that selling rates were uniformly higher, and far more profit was realized than is now possible. Dr. Gould describing the winter-work in his *Invertebrates of Massachusetts*, states that in the autumn the oysters are taken up, selected, brought to market, and sold at wholesale for \$1 per bushel, the cost of planting, attending, taking up, etc., amounting to 20 cents per bushel. Thus a profit of 30 cents on a bushel, or about 40 per cent. on the cost, is realized; and the town of Wellfleet thereby realizes an income of about \$8,000 annually.

INTRODUCTION OF VIRGINIA SEED.—It was asserted by citizens of Wellfleet, both to me and to Mr. True, that not until 1845 were any oysters brought to Wellfleet from Virginia, and that the cause of their importation then was the high price asked for "seed", as the oysters purchased in the Somerset river, in Connecticut, and in New York, for bedding, were erroneously termed. William Dill is credited with being the first captain engaged in the Chesapeake trade. I think, however, that there is an error here, for Gould mentions in his book that in 1840, 40,000 bushels were brought to Wellfleet annually from Virginia, at a cost of \$20,000. Nevertheless, it was not until about 1845 or 1850, that the business began to confine itself to Virginia oysters, and a large business to be done. At its height, about 1850, it is probable that more than 100,000 bushels a year were laid down in the harbor; some say 150,000. One consignment alone of 80,000 bushels was remembered by Mr. S. R. Higgins, who kindly gave me the many facts noted above. The favorite ground was at the mouth of Herring river.

This great business gave employment to many men and vessels, and was eagerly welcomed by the Wellfleet people. Responsible men were accustomed to meet the incoming vessels and take contracts to bed the oysters. The ordinary price was 9 cents a bushel. They hired help at day's wages, and often made a good profit. Fifty men would thus often be busy at once.

During the summer partly, but chiefly in the fall, these great deposits, which would perish during the cold winter, but were now well-grown, were raked up and sent to the warehouses in Boston, Portland, and minor ports, in freight vessels and in packets. Usually the oysters were owned and bedded by dealers, who used them in their regular trade, but some were owned by speculators, who took them to market, or sold them to dealers as they lay upon the beds, the purchaser taking all risks. The measure used for oysters in those days was a half-barrel holding a bushel, called a "bushel-barrel".

DECLINE OF OYSTER-TRADE.—The war of the Rebellion, however, interfered somewhat with the oyster-trade, and it began to decline, so far as Wellfleet was concerned. Then the various dealers in northern ports, having learned something, began to bed near home in their own harbors, and so saved freightage. Finally, the steamers from Norfolk and the railways entered into so serious a competition, that fully ten years ago Wellfleet bay was wholly deserted by the oystermen, as a bedding-ground, though her vessels still continue to carry cargoes in winter from Virginia to Boston, Portland, Salem, Portsmouth, and the Providence river, to supply the active trade and fill the new beds, which the dealers at these various ports had learned could be established at home.

The reader thus discovers how important a part Wellfleet has played in the history of the oyster-trade of New England. A hundred thousand bushels of the bivalves once grew fat along her water-front, and thousands of dollars were dispensed to the citizens in the industry they created. Now, a little experimental propagation, of the value of a few hundred dollars, and about 6,000 bushels of bedded oysters from Virginia, worth perhaps \$5,000 when sold, form the total active business. The oyster-fleet, however, remains, though greatly diminished and carrying its cargoes to Boston, Portland, and elsewhere, instead of bringing them to be laid down in the home harbor. It will be long before Wellfleet, and its neighbor, Provincetown, lose the prestige of old custom as oyster-carriers.

WELLFLEET OYSTER-FLEET IN 1878-'80.—The vessels registered at Wellfleet, that habitually take part in the oyster-trade, and formed the fleet of the seasons of 1878-'79 and 1879-'80, are the following, all schooners :

Name.	Tons.	Name.	Tons.	Name.	Tons.
Lizzie D. Barker	76	Edward Rich	74	Addie F. Cole	76
Nathan Cleaves	80	Alice P. Higgins	92	Emma A. Higgins	94
Effie T. Kemp	63	Lizzie Smith	77	Carrie G. Crosby	58
Flora A. Newcomb	70	Benjamin Oliver	78	Nil Desperandum	80
Mary Steele	70	Benjamin S. Wright	108	E. H. Norton	57
George T. Littlefield	112	Gertrude Summers	64	Ida R. Freeman	59
Lucy M. Jenkins	70	H. W. Pierce	74	Abby Frankfort	71
Asa H. Peroere	99	Maria Webster	58		
Mary E. Whorf	65	Lucy J. Keeler	94	Total tonnage.....	2,239
Walter L. Rich	80	Charles F. Atwood	70		
Newell B. Hawes	90	Nannie E. Waterman	80		

PROVINCETOWN OYSTER-FLEET, 1878.—From Provincetown there also hails a fleet of schooners in the oyster-trade, that may as well be put down here, since all remarks will apply to both. Those running in 1878-'79 were :

Name.	Tons.	Name.	Tons.	Name.	Tons.
Ellie F. Long	98	Freddie W. Allton	86	Etta E. Sylvester	90
Freddie Walter	82	M. E. Higgins	94	Mary Snow	71
Willie L. Swift	101	Kit Carson	94	R. A. Lunbard	65
William Matheson	111	John M. Fiske	81		
Teresa D. Baker	87	Lottie Bell	96	Total tonnage.....	1,539
Mary Matheson	115	Belle Bartlet	76		
Lottie Burns	97	Delia Hodgkins	95		

CHARACTERISTICS OF CAPE COD OYSTER-SCHOONERS.—This list of 46 schooners comprises, I think, the whole of the Cape oyster-fleet; and there are few vessels engaged outside of these ports. They were noted in the old days, as now, for their swiftness in speed and firmness of structure, and were the origin and prototypes of the famous Boston clipper-ships. The original cost of these fine vessels was, on the average, about \$7,000; now they are not worth over \$4,000 each. In summer they go on mackerel-fishing voyages, which occupy a little more than half of the year. In the winter and spring they carry oysters, varying it with frequent coasting trips. Four voyages after oysters annually would probably be a fair average, and not more than a third of the vessels' yearly receipts, as a rule, will be derived from this source. They are commanded by captains of experience, and go back and forth quickly, safely, and profitably. Capt. Jesse Freeman, now one of the leading fish-merchants of the village, told me that he had sailed between the Chesapeake and northern ports 316 times before he was forty years old, that is 158 voyages. His opinion was that no cargo wore upon a vessel less (others say the opposite), and it was usually of much profit to the owners. In the spring, oysters for bedding are brought cheaper than those designed for market in winter.

THE CREWS AND THEIR PROFITS.—The crew of an oyster-vessel usually consists of two (often three) men before the mast, with a cook, mate, and captain. One-third (as a rule), sometimes one-half, of the freight-money goes to the owners, and the remainder to pay the men and furnish food. The wages of a mate in 1879 were \$30 a month; of a cook, \$25; and of a seaman, \$15 to \$16. Food for a voyage costs from \$40 to \$50. In addition to his share, the owners give the captain \$15 a month.

Suppose, then, a load of 3,000 bushels, with freight at 18 cents a bushel, bought after 30 days' voyage. The proceeds would be divided as follows:

3,000 bushels, at 18 cents	\$540 00
One-third to owners	\$180 00
Mate's salary	30 00
Three men, at \$15	45 00
Cook's salary	25 00
Provisions	45 00
	325 00
Remains for general bills and captain	215 00

THREE SEASONS' WORK DONE BY A WELLFLEET SCHOONER.—As an example of the history of an oyster-schooner's voyages, I give a copy of what was done in two years by one of the vessels in the above list. Her length was 86 feet; breadth, 23 feet; depth, 8 feet 6½ inches; measurement, 97.95 tons. She was owned by fifteen partners, and in 1876 cost in Newburyport \$9,819 63. The record of her trips from 1877 to 1879 stands:

Spring 1877, first trip, 3,000 bushels, at 18 cents freight	\$540 00
Spring 1877, second trip, 3,406 bushels, at 18 cents freight	613 08
Spring 1877, third trip, 3,012 bushels, at 18 cents freight	542 16
Spring 1877, fourth trip, 3,550 bushels, at 18 cents freight	639 00
Spring 1877, fifth trip, 3,286 bushels, at 18 cents freight	591 48
	2,925 72
Whole stock	2,925 72
Great generals (or expenses charged to account of vessel)	460 15
	2,465 57

One-half schooner's share.....	\$1,232 78
Two and one-half per cent. of whole stock to captain.....	73 14
	<hr/>
	1,159 64
By charter on load to plant.....	140 00
	<hr/>
	1,299 64
Mate's wages.....	\$289 50
Bills paid by captain.....	53 42
	<hr/>
	342 92
	<hr/>
Balance due owners.....	956 72
<hr/>	
1877.	
Nov. 26. 3,475 bushels, at 18 cents freight.....	625 50
Dec. 26. 3,579 bushels, at 18 cents freight.....	644 22
<hr/>	
1878.	
Feb. 6. 3,746 bushels, at 18 cents freight.....	674 28
March 7. 3,621 bushels, at 18 cents freight.....	651 78
April 16. 3,463 bushels, at 18 cents freight.....	623 34
May 6. One load to Providence.....	400 00
	<hr/>
	3,619 12
	<hr/>
One-third schooner's share.....	1,206 37
To bills paid by captain.....	109 08
	<hr/>
Balance to owners.....	1,097 29
<hr/>	
1878.	
Dec. 18. 3,765 bushels, at 18 cents freight.....	677 70
<hr/>	
1879.	
Feb. 1. 3,885 bushels, at 18 cents freight.....	699 30
March 4. 3,789 bushels, at 18 cents freight.....	682 02
April 5. 3,732 bushels, at 16 cents freight.....	597 12
April 26. 3,600 bushels, at 15 cents freight.....	540 00
	<hr/>
	3,196 14
Port charges.....	296 32
	<hr/>
	2,899 82
	<hr/>
One-third schooner's share.....	966 61
Schooner's bills.....	44 34
	<hr/>
Balance due owners.....	922 27

FINANCIAL PROFITS OF THE OYSTER-SCHOONERS.—In settlement with the owners of the schooners just referred to, for these three oystering seasons, the summaries stood as follows:

	1877.	1878.	1879.
Credits.....	\$826 89	\$1,206 37	\$966 61
Bills.....	226 89	448 95	250 08
Balance due owners.....	600 00	757 42	716 53

This was divided among the owners in the following proportions:

		1877.	1878.	1879.
A.....	11-32ds.	\$206 25	\$260 26	\$246 20
B.....	6-32ds.	112 50	141 96	134 34
C.....	2-32ds.	37 50	47 32	44 78
D.....	2-32ds.	37 50	47 32	44 78
E.....	1-32d.	18 75	23 65	22 39
F.....	1-32d.	18 75	23 66	22 39
G.....	1-32d.	18 75	23 66	22 39
H.....	1-32d.	18 75	23 66	22 39
I.....	2-32ds.	37 50	47 32	44 78
J.....	1-32d.	18 75	23 66	22 39
K.....	2-32ds.	37 50	47 32	44 78
L.....	1-64th.	9 37	11 83	11 19
M.....	1-64th.	9 37	11 83	11 19
N.....	1-64th.	9 37	11 83	11 19
O.....	1-64th.	9 37	11 83	11 19
	64-64ths.	599 98	757 12	716 46

It is probable that this season (1879-'80) the sum of the freights paid to Wellfleet and Provincetown schooners on oyster-cargoes alone, will exceed \$75,000, and the losses and casualties will be few. The competition of the steamers between Norfolk and Boston, of the railroads, and particularly the recent custom of opening so many oysters in Virginia, has been severely hurtful, however, to the oyster-schooner interests.

I may add an odd note of interest to naturalists. At Wellfleet are found many marine invertebrates not known elsewhere north of Virginia, which the naturalists of the United States Fish Commission say were probably introduced with imported oysters.

STATISTICAL RECAPITULATION FOR WELLFLEET AND VICINITY:

Number of planters, wholesale-dealers, and shippers	3
Number of vessels and sail-boats engaged	46
Present value of same	\$185,000
Number of sailors employed (three months).....	250
Earnings of same.....	\$15,000
Total earnings of schooners	\$75,000
Annual sales of—	
I. Native oysters..... bushels..	600
Value of same.....	\$500
II. Chesapeake "plants"	6,000
Value of same.....	\$5,000
Total value of oysters sold annually	\$5,500

9. HISTORY AND PRESENT CONDITION OF THE OYSTER-TRADE OF BOSTON.

EARLY HISTORY OF THE OYSTER-BUSINESS.—The natural resources of the harbor in oysters, and the extent to which they entered into its early commerce, have already been hinted at in paragraph six.

When the natural beds in the Charles and Mystic rivers gave out, Boston derived its oysters from the natural beds at Wellfleet and in Buzzard's bay, but mainly from the first named. When, in turn, these became exterminated, toward the close of the last century, Boston dealers began to bring shiploads of oysters from the shores of Buzzard's and Narraganset bays, directly to the city in winter, and in the spring bedded at Wellfleet supplies for the ensuing summer and autumn. This has been explained in the account of Cape Cod, preceding this. These cargoes were taken up in the early fall, and sent in sloops and schooners to Boston. There the schooners were dismantled and tied up, or else the cargoes were transferred to hulks (old mastless vessels) and covered with so thick a layer of sea-weed that no frost could get at them. These hulks were towed up into the docks close to Faneuil Hall, the recollection of which is preserved in the name of Dock square, and there the oysters were sold to retail-dealers, peddlers, and other customers, either in the shell or opened. Another favorite place for the oyster-vessels to lie was about where the Boston and Maine railway station now stands, in Haymarket square. At that time a canal, well remembered by old citizens, ran through from the Charles river to the city wharf, following what is now Blackstone street. Another wharf for oyster-boats occupied the present site of the New England hotel. Prices then ranged higher than now in some respects and lower in others. A bushel in the shell (at wholesale), or a gallon opened, cost \$2: this was "in liquor", the "solid" gallon being a recent invention. In the restaurants they charged ninepence (12½ cents) for a "stew", and fourpence (6¼ cents) for a "dozen" of fourteen; or you could buy a better quality for 7 cents.

There was a queer custom in vogue in those days, half a century ago. Besides the hawking about the streets, which has survived, a few men used to "bag" them. Taking a bag of the bivalves on their backs, they would go in the evening to a house where there was a lively family, or, perhaps, where a company of friends had assembled. A carpet would be spread in the middle of the parlor on which the damp bag would be set, when the peddler would open the top, shuck an oyster, and pass it upon the half-shell to his nearest customer; then another for the next, and so on. Some lively scenes must have been enacted around that busy bagman, as his knife crunched rapidly through the brittle shells, and the succulent morsels disappeared down fair throats.

Meanwhile, more and more oysters were being brought every winter from Long Island sound, Newark bay, New Jersey, and southern waters, mainly in Cape Cod vessels, as I have shown, but somewhat, also, in Boston's own craft, for in those days there were more mackerel-fishermen hailing from the city than there now are.

INTRODUCTION OF VIRGINIA OYSTERS.—When oysters first began to be brought to Boston from Virginia I could not ascertain with precision. The patriarch of the business, Mr. Atwood, of the firm of Atwood & Bacon, says that when he began dealing in Water street in 1826, oysters were being brought regularly from Chesapeake bay in small quantities. He thinks the first cargo arrived about 1824. Mr. J. Y. Baker assures me that in 1830, 20,000 bushels from all quarters sufficed for Boston. About 1840 Gould estimated that 100,000 bushels would cover the consumption of all Massachusetts. Business rapidly increased, however, as the subjoined figures of the importations

* Seventeen of these schooners, worth \$68,000, are registered at Provincetown, which otherwise does not appear as an oyster-locality.

of oysters in cargoes from Virginia, by Atwood & Bacon alone, will show. Besides these there were eight or ten other dealers in the city. Atwood & Bacon received—

	Bushels.		Bushels.
In 1846.....	32,575	In 1853.....	123,097
In 1850.....	90,354	In 1855.....	105,752
In 1851.....	90,587	In 1857.....	83,000

These were by their own nine vessels alone; they had occasional cargoes otherwise. The largest lot (1853) cost them \$41,853, which gives an idea of values. Freight in those days was 17 cents.

At present very few oysters, indeed, are bedded in the vicinity of Boston, while of propagation there is none whatever. The grounds in the harbor were never very excellent, and became less so as the city increased in size. The encroachments of the building and filling in along the water-front over-ran the old limits of the bedding-grounds, and even the ancient natural beds. Where the Boston and Maine railway's car-house stands, a leading dealer not many years ago laid down 42,000 bushels in a single season. It was known as White island at that time. The South Boston flats are being graded up into streets, and the Charles, Mystic, and Malden rivers, Bird island, and other places were long ago abandoned, because the wharves or the sewerage of the city has destroyed their usefulness to the oysterman. Instead of bedding in his own harbor, therefore, the Boston dealer, as a rule, now rents ground in Buzzard's or Narraganset bays, and lays down there (the principal grounds being about the mouth of Providence river) the Virginia oysters he proposes to use for his summer- and autumn-trade, or else he has abandoned the practice altogether. The process of bedding will be dwelt upon in the chapter upon the Rhode Island fisheries.

THE OYSTER-TRADE DURING THE REBELLION.—The coming on of the war of secession found the Boston oyster-trade in its most flourishing condition. More cargo-oysters were brought then, than ever since; prices were high and profits large. The shipping interests fostered by it were large, too, for the competition of railways and steamers had hardly made itself felt. Most of the large dealers ran lines of vessels of their own, as well as chartering additional assistance in the spring. In the demand for fast sailers which the oyster-business created, is found the origin of that celebrated model of sailing vessel that made America famous on the seas—the clipper-ship. The first of these were made by Samuel Hall, a noted ship-builder, at his yard in East Boston, and were named Despatch, Montezuma, Telegraph, and Express. They were from 90 to 120 tons, old measurement, and carried an average cargo of 2,500 bushels of oysters. Six months in the year these clippers were devoted to bringing oysters from Virginia. There were thirty-five or forty of these “sail” running, and in the summer they would go fishing. The freight tariff on oysters was then 20 cents, and during the war it went as high as 25 cents a bushel.

The war interfered sadly with the business of oystering. Often the military operations did not admit of the cultivating and raking of the beds in Virginia and Maryland, or of the schooners from northern ports going where they wished to buy. A period of higher costs and shortened sales was in store for the dealers, and they have not yet quite recovered the prosperity of 1860. The greatest period of depression was 1874–75, when the business was almost a failure. I think none of the dealers “suspended”, however.

ATTEMPTS AT OYSTER-CULTURE.—In the course of this business, as long ago as the traditions of the trade go back, a few bushels were now and then laid down in various parts of the harbor to keep them from spoiling. But this was not at first a regular and systematic thing. The bedding-grounds were usually in the Charles, Mystic, Malden, and Pines rivers, often above the bridges, or on the Winthrop shore. Later all the dealers bedded on the South Boston flats, which are now being wholly filled up by the New York and New England railway. There was a large, oval, bare space here, occupied by all the dealers in the city, who had it regularly divided. Mr. J. H. Wiley's father's portion was at the extreme end, and was bounded by eel-grass. He experimented by putting oysters over, upon, and among the eel-grass, and found that they did far better than those on the open flat, which had been occupied for a long time, and ebbed dry. Mr. Wiley supposed that the reason was, that it was new ground, from which fresh and plenteous nourishment was to be derived. The grass afforded so much protection, also, that many oysters used to survive the winter.

THE BOSTON OYSTER-FLEET OF 1878–79.—At present (1879–80) the only vessels, so far as I could learn, registered in Boston and engaged in the oyster-carrying trade, are the following schooners, all the property of a single firm:

Name.	Tons.	Name.	Tons.
William H. West.....	68	J. M. Ball.....	87
Eddy Pierce.....	96	Neponset.....	74
Alice.....	89	Longwood.....	66
Barty Pierce.....	95	Leona.....	100

OPENED OYSTERS IN THE BOSTON MARKET.—Another great change from ancient methods of conducting the business has been caused by the introduction of opened oysters from Norfolk. These are received twice a week (Tuesdays and Fridays) by steamer direct from Norfolk, and on other days, to a less extent, by steamer from Norfolk to New York, and thence by railway. In the neighborhood of 250,000 gallons were thus handled in Boston during the winter of 1879–80, for they come only between September and April. They are shipped in barrels and kegs.

The effect of this innovation has been very marked upon the trade; whether for good or ill there are two opposite opinions, the general verdict being that this feature works against the best interests of the trade. In their favor, it is said, in general, that they can be sold cheaper than any other oysters, and hence are accessible to the poorer class of people; that they are as good as the cargo-oysters, and that in the increased number sold is compensation for the diminished percentage of profit. I will quote some opinions expressed to me in this direction:

The Boston Oyster-Company considered the innovation of Norfolk opened oysters not unfavorable to business generally, although hurtful to the cargo-trade. Although higher profits were received five or six years ago, three times as many gallons are sold now as then, and hence dealers can afford to take less. Selling more cheaply a grade of goods equal to the old stock opened here, they give better satisfaction and sell more. There is less risk, also, than with cargoes, in which they had relinquished large dealings. They washed all their oysters from Norfolk carefully, and had heard no complaint of ill-health resulting from eating them.

The Chesapeake Oyster-Company deal almost wholly in opened oysters, and believe in the Norfolk trade, for the same reasons as given in the report of the "Boston" company, and say that, with their refrigerator barrels, they have no trouble with warm-weather losses. One of the advantages of this new business is, that a man can begin it with small means, since the stock may be procured in quantities as small, or large, as desired.

R. R. Higgins thought the oysters opened in Norfolk as good by the time they got here as those of the same grade opened here out of cargoes. He used them largely, and had opened a branch-house in Norfolk in order to compete with the Norfolk shippers on their own ground. By sending to his customers full packages, he avoided the complaints against the Virginia shippers, that they sent "seant" barrels, pretending to allow for a "swell" of the contents, which does not occur.

This, I believe, completes the list of those who would not be glad to see the Norfolk opened oysters disappear from the market. Indeed, so strong is the prejudice, that an effort was made about two years ago to induce the legislature to forbid their importation into the state; but this failed, it being opposed not only by certain consumers and carriers, but by two or three of the wholesale-dealers themselves. In opposition to them it is asserted that their quality is poor; that they are unhealthy; that the losses attending them are greater than with cargoes, and that they unduly cheapen all superior grades of stock. Two grades are brought to Boston, but for one of the "selected" come ten barrels of the "common", the cheapest and poorest oysters brought to the Norfolk market. The alleged injuriousness of them is said to arise from their too great age when they arrive. It is almost impossible, any way it is arranged, to get the stock from Norfolk to Boston's customers in less than a week. If they are put upon the steamer in Norfolk immediately upon being opened, come speedily, and the weather remains cold, little fault will be found. It is rare, however, that this favorable conjunction of circumstances occurs, and a large percentage of almost every cargo is thrown away. One firm dumped overboard 300 gallons out of a single shipment recently. Under such circumstances the wholesaler will save all he can, including now and then some he ought to throw away; and the same thing will occur in the shop of the retailer, so that frequently the consumer gets oysters not fit to eat. Rumors of sickness and death resulting are common enough, but I failed to trace any to a trustworthy origin in truth. They are often dirty, and are washed again and again, until the aroma and delectable flavor is all gone from their lacerated and rinsed remains. They are only fit to be cooked in a method calculated to disguise their insipidity, by the time Vermont, Maine, or Canada get them for dinner.

Nor does it appear that a large increase of sales has followed the introduction of this new stock. Trade has changed rather than amplified, while prices have been reduced in a marked manner throughout the whole list. If, now, the wholesale-dealer clears 5 cents a gallon on Virginia oysters, in shell or out, he thinks himself doing well. Most of the business is done on a much smaller margin. Considerable profit, however, is made on the "superior grade" of Norfolk stock; but only a little of this is brought on. Worse than this, however, for Boston merchants, is the fact that Norfolk cuts out much of their regular custom. A man anywhere can buy five or ten gallons and have them sent to him just (or very nearly) as cheap as the wholesaler who gets his thousand gallons. The natural result is, that many retailers and large consumers, like the hotels, do send direct to Virginia. With the cargo-method this is out of the question. All consumers near Boston or other importing cities must go there for supplies. Take it all in all, Boston thoroughly deprecates the innovation, but comforts herself with the conviction, that already she sees signs of general dissatisfaction, and looks forward to a speedy abandonment of the new for the old method.

KINDS OF OYSTERS SOLD IN BOSTON.—A large variety of oysters are to be found on sale in Boston from widely different points. Those from the shore of Connecticut used to be highly esteemed, but they have gone out of the Boston market. The "Cape" and "Providence" oysters are better of late, and the expense of bringing them on is much less than from Connecticut. About five years ago the very choicest brand eaten came from Wareham, at the northern extremity of Buzzard's bay. Now these are poor, and better ones come from Cotuit, on the "heel" of Cape Cod, and the best of all (in my judgment) are from the Sandwich shore, particularly Monument river. The size, fine appearance, and saltiness of the "Cape" or "native" oysters recommend them for "bench" stock, to be eaten raw. You see advertised also the Blue-point, Saddle-rock, Stamford, and Norwalk oysters, more familiar to New Yorkers; but they are kept for a special, small custom, as "fancy".

BOSTON OYSTER-DEALERS AND OYSTER-MEN.—It is not easy to get at the exact number of persons in Boston who derive their daily support from the oyster-business. The hired help of the wholesale dealers amounts to about 125 persons the year round, with the addition of about 250 more who are engaged with greater or less steadiness to “shuck” during the colder half of the year. The majority of these persons are married; and I believe that, including the dealers themselves, to multiply by four in each case would fairly estimate the number of souls represented—that is, the mouths fed. There are, then, in this wholesale trade, deriving their whole support, about 500 persons; deriving one-half their support, about 1,000 persons.

It is asserted that there are about 1,000 retail-shops, fish-markets, hotels, and restaurants in the city where oysters form a regular part of the sales. I was unable to verify this, but am inclined to believe it rather under than over the actual number. It would be a low estimate to say, that an average of one family of five persons in each case is supported by the molluscan share of the business, which would add 5,000 persons to the 750 in the wholesale department, and give a total of 5,750 persons in Boston estimated to derive their living chiefly out of the oyster and clam. Most of the wholesalers run restaurants and lunch-counters. The wages paid vary with the kind of employment and the employer, all the way from \$4 to \$25 per week. The lowest rates are paid to the girls in the restaurant-kitchens, who get from \$3 to \$5 per week and their board, and to the waiters in the restaurants, who receive about \$8 a week and board. The men who pack, attend to shipments and delivery of orders, who aid in bedding, and do the heavy work of the establishment, will average from \$12 to \$15 a week. The large addition employed between September and May are “openers” or “shuckers”, who are paid by the solid gallon, and work only when there are oysters to be opened. They are, as a rule, a rough, ignorant class of men. In summer they do ordinary laboring jobs, like working on the streets and carrying hods. Their pay has been a shilling (17 cents) a gallon for some years, but last season (1878-’79) 18 and occasionally 20 cents was paid; and in consequence of a strike on their part it is expected that 20 cents will be the ruling price in 1879-’80. It is rare that they earn more than \$10 a week, and often not half that. The largest day’s work at opening oysters that I could learn of was performed several years ago by a man in Atwood & Bacon’s employ, who opened 45 gallons between 7.30 a. m. and 10.30 p. m.; but this was “liquor” measurement, and he got only 10 cents a gallon for it. Most of the openers are married and have large families.

PRICES.—The cost (total, delivered) and selling prices of the various grades of oysters in Boston, are now about as follows, in 1879:

IN SHELL (per bushel):

	Cost.	Sell for.
From Virginia, in cargo.....	\$0 30 to \$0 40	
Virginia “plants”	50 to 60	
Bags (common)	50 to 55	
Bags (selected).....	90 to 95	
Lynnhaven (Virginia fancy).....	2 00 to 3 00	
Monument River.....	1 40 to 1 60	\$2 25 to \$2 50
Other natives	95 to 1 20	
Providence rivers	50 to 60	
OPENED (per gallon):		
From Norfolk (common).....	55 to 60	60 to 65
From Norfolk (superior).....	60 to 65	75 to 90

The dealers would feel satisfied with 20 per cent. of profit, but do not get it. Six or seven cents a bushel and five cents a gallon is the usual advance.

DISPOSITION OF THE OYSTER-SHELLS.—Subsidiary to the oyster-business in Boston, is the disposal of the empty shells. These are used somewhat for filling in, particularly along the Atlantic-avenue wharves, and are largely consumed by the gaslight companies to be burned into lime for purifying their gas. In addition to this there are two pulverizing establishments in East Boston that take large quantities. The shells are gathered for them by carters and boys of every grade, at odd times, from the saloons, the proprietors of which are glad to get rid of them, and taken to the factories, a few barrels at a time. The factories pay 8 cents a barrel, and often men are thus able to profitably employ their leisure. The shells are put into a crusher and then through bolts, and are thus ground into small fragments, from which the dust is sifted. The machinery employed is precisely that used for crushing bones, etc. There is a strong prejudice against the presence of any oyster-shell in the manufactured fertilizers, strange to say, and the broken shell finds a market only as food for poultry in place of fine gravel. The price is one-quarter of a cent a pound, and a barrel will weigh about 275 pounds. About 500 barrels, valued at \$375, are sold annually by these factories to the henneries near Boston, and an occasional barrel of the finer grade is sold to the bird-stores, to be used in “sanding” the floors of cages.

STATISTICAL RECAPITULATION FOR BOSTON:

Number of wholesale dealers and shippers.....	10
Number of vessels engaged.....	8
Value of same.....	\$20,000
Number of men hired by dealers—	
Annually.....	125
Semi-annually.....	250
	375
Annual earnings of same.....	\$85,000
Semi-annual earnings of same.....	35,000
	\$120,000
Number of sailors employed (three months).....	40
Earnings of same.....	\$2,500
Number of restaurant-servants.....	1,000
Annual earnings of same *.....	\$500,000
Total number of families chiefly supported.....	1,500
Annual wholesales of—	
I. Native oysters (Cape Cod)..... bushels..	15,400
Selling value of same.....	\$15,000
II. Chesapeake "plants"..... bushels..	1457,500
Selling value of same.....	\$340,000
III. Fancy stock..... bushels..	60,000
Selling value of same.....	\$100,000
IV. Baltimore and Norfolk "opened stock"..... gallons..	350,000
Selling value of same.....	\$250,000
Total wholesale value of oysters sold annually.....	\$705,000

10. THE OYSTER-TRADE OF SALEM, MASSACHUSETTS, AND VICINITY.

PRESENT CONDITION OF THE OYSTER-TRADE.—The oyster-business here, the next place north of Boston where there is any original trade, seems quite out of proportion to the importance of the town. The reason is found in the fact, that a large surrounding region derives its supplies from this point, as well as the town itself, which appears to be highly educated in the eating of all kinds of shellfish. Two schooners, the T. A. Newcomb, 130 tons, and the Lizzie Smith, 118 tons, are engaged in the trade. They cost \$22,000, but now are worth only about \$5,000 each. In the summer they go on mackereling voyages, but in the winter devote their whole time to bringing oysters from Virginia. Ten years ago 25,000 bushels sufficed for the demand, and a portion of these came from New York bay; in 1875 three vessels were employed, and Salem called for 45,000 bushels, all from the Chesapeake. At present, however, the total annual importation by sailing craft does not exceed 40,000 bushels, with about 5,000 bushels by steamer from Norfolk, in winter, added. About 500 bushels of "fancy" stock from New York are also sold. A large portion of these oysters are sold at the wharf; another large portion goes into the storehouse; a third part are opened; and the remainder (8,000 to 9,000 bushels) are laid down in Collins bay, near Beverly bar, where they are dry at each ebb-tide. No opened oysters are taken from Norfolk or Baltimore. The result is as follows:

Oysters imported in vessels.....	40,000 bushels, costing, at 36 cents.....	\$14,400
Oysters imported via Boston steamer.....	5,000 bushels, costing, at 57 cents.....	2,850
Oysters (fancy stock).....	500 bushels, costing, at \$1 00.....	500
	Totals.....	45,500 bushels, costing..... 17,750

- Selling price of Virginia oysters, imported at wharf, 40 cents.
- Selling price of bedded oysters, in summer, 90 cents (common), \$1 20 (selected).
- Selling price of opened oysters (common), \$1 per gallon.
- Selling price of opened oysters (selected), \$1 20 per gallon.
- Selling price of opened oysters (in winter), 75 cents per gallon.
- Annual amount of business, \$40,000.

The firms engaged employ 43 men from November 1 to May 1; the rest of the year about 20 men. This represents about 100 persons supported by the business, since many of the men are unmarried. The weekly salaries will average \$12, and shuckers are paid 20 cents for each solid gallon.

The old shells are disposed of to the gas-company of the city at one-half cent a bushel, the purchaser paying for the carting. This does not take all of the 1,500 or so bushels a week accumulating, which are used by the proprietors to fill in water-lots, which they buy for the purpose of thus converting into land. To sell their shells is more profitable, however.

THE NEWCOMB METHOD OF UNLADING CARGOES.—The leading firm in Salem, Messrs. D. B. & J. Newcomb, boasts an economic method of transferring the cargo from the vessel to the shuckers' broad tables, ranged around the interior walls of their shucking-house down on the wharf. This building is two-storied, and is flush with the side of the wharf, so that the vessel moors alongside. A door in the end of the loft opens upon a railless platform or

* Somewhat mixed with other duties. † Of these, 140,000 gallons opened are sold annually under the name of "Providence stock".

balcony 6 feet square. Here two men stand to receive the loaded tubs of oysters as fast as they are hoisted (by horse-power) out of the vessel's hold. When a tub comes within reach they seize it, overturn it into a wheelbarrow, made of one-third of a strong cask, mounted on a wheelbarrow-frame, and one man sends it down while the other goes and empties the barrow, returning in time to help when the tub comes up again. The ordinary method is for two men to receive the tub upon the first floor, carry it away, lift it up, and overturn it upon the table, while two others hand back an empty tub and repeat the operation. This requires four men and much lifting. The Newcombs, however, dispense with two men and all the laborious lifting, by receiving their oysters on the upper floor and dumping them from a wheelbarrow down shutes that lead to different portions of the shucking-table, or to the "cool room", where they can store 8,000 bushels at a time, if desired.

STATISTICAL RECAPITULATION FOR SALEM AND VICINITY:

Number of wholesale-dealers	3
Number of schooners engaged	2
Value of same	\$10,000
Number of men hired by dealers	25
Semi-annual earnings of same	\$2,500
Number of restaurant-servants	20
Annual earnings of same	\$12,000
Total number of families supported	25
Annual sales of—	
II. Chesapeake "plants"	bushels.. 40,000
Southern, by steamer	bushels.. 5,000
Value of same	\$40,000
III. Fancy stock	bushels.. 500
Value of same	\$750
Total value of oysters sold annually	\$40,750

11. THE OYSTER-BUSINESS OF NEWBURYPORT.

SOUTHERN OYSTERS IN NEWBURYPORT.—The wholesale oyster-business at this port is small. About 3,000 bushels of southern oysters are sufficient for the demand. These cost from 45 to 50 cents per bushel when put down, and from an eighth to a quarter of them die during the summer. The bedding-grounds are in Parker river. About three families get their support from the business here, but the business is losing ground and is encroached upon by the opened stock from Norfolk.

Oysters sold.	bushels.. 3,500
Value	\$3,250
Families supported	3

12. THE OYSTER-BUSINESS OF THE NEW HAMPSHIRE COAST.

THE BUSINESS OF PORTSMOUTH AND DOVER.—In Portsmouth, New Hampshire, there are only two dealers who trade in oysters by wholesale and at first hand. They each send a schooner to Virginia in April, the voyage lasting about three weeks, and bring a load of 2,300 to 2,600 bushels each. Nearly the same course is pursued here as in Boston. The captain is given sufficient money to probably fill his vessel, and told to do the best he can with it; but he is not given a rate of freight per bushel, as in Portland, but hired at a given sum, which, in 1878, was \$425. This amounts, however, to about the same thing as the 18 cents a bushel paid for freight to Portland and Boston. All these 5,000 bushels of oysters are bedded down on the banks of the river in Portsmouth harbor, a mile or so below the city, where the ebb-tide leaves them nearly dry. They last through to the middle of October, with the help of a few "fancy" oysters from New York for the retail-counter. The cost per bushel of these oysters, as delivered in the establishment, varies from 40 to 50 cents, and the average selling price, at wholesale, is 75 cents.

In the winter no vessels come from Virginia, and all supplies are drawn from Norfolk by steamer to Boston, and thence by rail, or, in emergency, by buying in Boston or Portland. These are almost wholly opened oysters, in barrels and kegs. Not more than 1,000 bushels, all told, are supposed to come into Portsmouth during the winter, in the shell. The cost 50 to 60 cents. Of the others, I could get nothing better than estimates from each dealer, which, added together, give about 45 barrels, or 1,350 gallons, as the combined importation. Perhaps 150 gallons more come from Boston, in emergencies. The whole consumption of Portsmouth, then, seems to cost about as follows:

Oysters in vessels, 5,000 bushels	\$2,500
Oysters in shell, otherwise	500
Oysters opened (about)	750
Oysters, fancy and extra (about)	750
	4,500



The oyster-establishments employ 6 men, paid from \$6 to \$15 per week. In all, 25 persons are supported by the trade. No planting has ever been done at Portsmouth, and even those bedded down in the harbor show little growth of shell or body. To supply Dover, New Hampshire, a few miles above, about 2,000 bushels of Chesapeake oysters are brought up each spring and laid down in Cochecho river, near the town. A proportionate winter-supply comes by rail.

THE NATURAL BEDS OF GREAT BAY.—I was told by Mr. Washington Freeman, of Portsmouth, that this gentleman discovered an extinct bed of large oysters in the Cochecho river, some years ago, but no living ones are to be had there now.

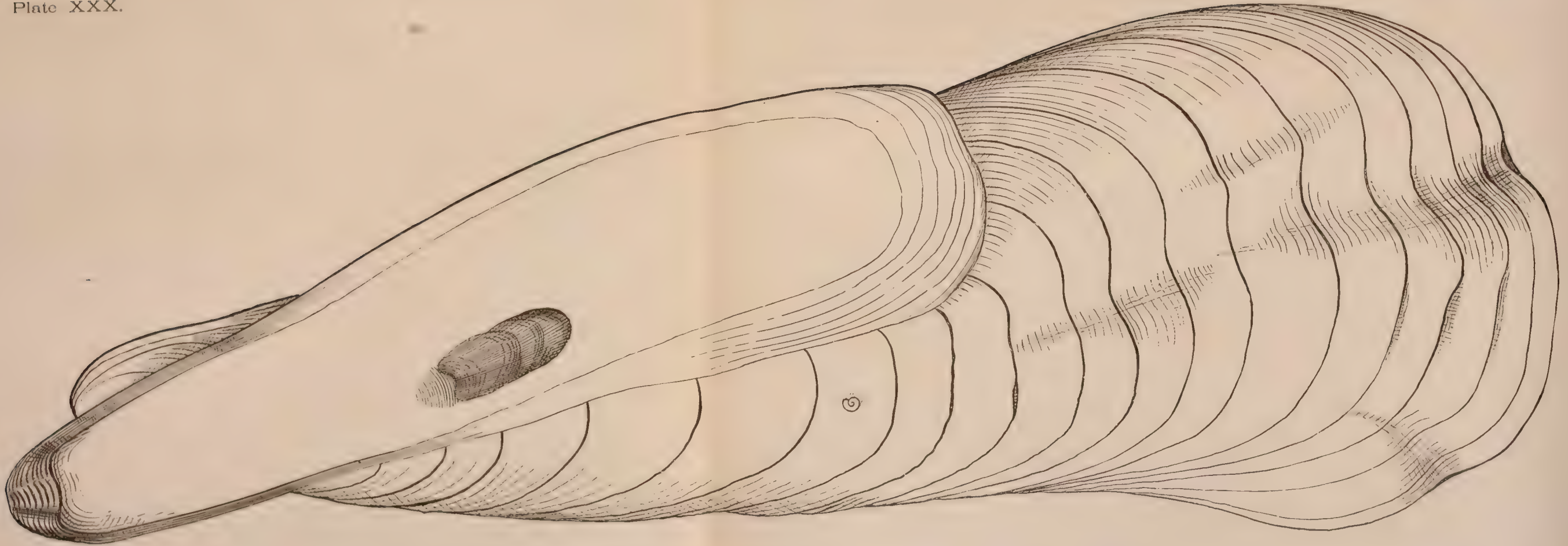
A few miles up from the mouth of the river Piscataqua, and the harbor of the city of Portsmouth, New Hampshire, an extensive bay reaches southward from the river into the lowlands. It is divided into two portions: first, Little bay, nearest the river, and second, Great bay, with which the former is connected by Furber's straits, where Durham river comes in. A portion of Great bay, on the eastern side, is also known as Greenland bay; and two rivers flow into it (the Exeter and Lamprey), besides a multitude of trout-brooks. This interior basin is perhaps ten miles long and five to seven wide, but the shores are very irregular. It is so shallow that a large portion of the shores are left as dry flats at every low-tide, yet there are channels deep enough to allow large vessels to go up to Newmarket and Exeter, when the water is favorable. This spot was renowned among the Indians for the oysters living there, and considerable shell-heaps attest the constant use made of the bivalves. Whatever might have been its resources a century or half a century ago, it is certain that within more recent times the locality was forgotten, or at least made no account of, as oyster-ground, by the large population that inhabited the shores. It was therefore looked upon almost as an original discovery when, in 1874, the explorations of the Coast Survey, which was sounding and mapping out the channels, showed that there were oyster-beds still flourishing at many points from one end of the bay to the other; that is, in Great bay, for none, to my knowledge, have ever been found in the outer Little bay. There were no tools proper for the gathering of oysters in the neighborhood, and very little was done at first to make the knowledge gained available. There lived in Newmarket, however, an old Chesapeake oysterman by the name of Albert Tibbetts, who sent to Providence for oyster-tongs, procured boats, and began raking in earnest. Others imitated his example, and the following year witnessed great activity. For several months, I was told, there were probably a dozen boats, with two or three men in each boat, raking every day, the average take being about five bushels to the man. They used not only tongs and rakes, but used also dredges. In the winter, also, they would cut long holes in the ice, and dredge the beds by horse-power, stripping them completely. It was seen that this rash and wholesale destruction would speedily exterminate the mollusks, and laws were passed by the state forbidding the use of the dredge under all circumstances; making the months of June, July, and August "close time"; and forbidding fishing through the ice at any time. The last regulation was the greatest help of all, for the ice-rakers would not throw back the *débris* of dead shells, but pile it on the ice, where the hundreds of young oysters attached to it would freeze to death. But these beneficent restrictions came too late, and the business of oystering has steadily declined, until now only two or three boats keep up a desultory search for profitable beds, and a bushel and a half a day is considered good work for each man. Only seven or eight persons were engaged during the summer of 1879, and these not all of their time. All unite in ascribing the decline of the industry to over-raking of the beds, and feel disposed to pray for a law forbidding any raking whatever during several years, in order to give the oysters a chance to recuperate their depleted ranks.

The beds, as I have said, are all in Great bay. They occupy the channels at various points, and are each of considerable extent. There are perhaps a dozen well known localities or clusters of beds. These are mainly situated in Greenland bay, near Nannie's island, along the Stratham channel, up Exeter river to some distance beyond the bridge of the Concord railroad, in the Little channel near by, and up Lamprey and Durham rivers. The chief raking now is done off Nannie's island. The average of the water on the beds is hardly more than 10 feet deep, and it is pretty fresh. The tide-way, as a rule, is strong, and the bottom tough, clayey mud. The oysters are very large. I heard of specimens 15 inches long, and those of 9 and 10 are common. One man told me of a single specimen procured in 1877 which weighed three pounds and one ounce in the shell, the fleshy part alone weighing one pound and one ounce. These large ones, however, all have the appearance of extreme age, and are heavy, rough, sponge-eaten, and generally dead, though the ligament still holds the two valves of the shell together. In taste, this oyster is flat and rather insipid, which is laid to the too great freshness of the water. It takes a large quantity of them to "open" a gallon of solid meat, a bushel not yielding more than two to two and a half quarts. As a consequence, there has not been a very great demand for them, though all that can be got now are readily disposed of. Formerly the price was \$1 a bushel in Newmarket, where they were chiefly bought; but in 1879, 80 cents was the price. No culture of these or of imported oysters has ever been tried here; and the chances are against success.

Since gathering the details given above, I have received the subjoined letter, which explains itself, but must I think, be slightly "discounted" in its figures:

NEWMARKET, N. H., October 20, 1879.

DEAR SIR: Yours of the 13th at hand. I will give you what information I can by writing, though I should have been better pleased to have talked with you on the oyster-question. I could have given you more information in that way, probably; but will answer your queries as you put them.



GIANT OYSTER, 14 INCHES LONG, FROM DAMARISCOTTA RIVER, MAINE (natural size).

I. Oysters were first found in Exeter river eight years ago by a government surveying vessel. Oysters were also known to be in Durham river and at Nannie's island. I claim to have found the beds in Great bay four years ago. It is my opinion that there are oyster-rocks all the way down to Portsmouth, but the bottom is not suitable for dredging, which is the only way they could be taken after you leave Great bay.

II. For two years they were tonged and dredged steadily through the summer-months by an average of 20 persons a day. Some days 70 to 80 men would be working. The average catch to a man that understood the business was 25 bushels. We could have caught more by working more hours, but the supply was greater than the demand. We worked about six hours per day.

III. The average catch now to a man is 3 bushels. A cause of the decline is that the marketable oysters have nearly all been caught. There are to-day more in number of young oysters than ever before, but they are not yet of marketable value, being in size from a five-cent piece to an old penny. If they are not properly protected they will die before they are suitable to use. An oyster needs cultivation and protection.

IV. Ten thousand bushels is a low estimate of what has been taken the four years I have been here.

V. The oyster does not find a ready market, not being a profitable oyster for any trade at the price asked for it. There is too much shell for the meat. They are a natural oyster, and no natural oyster this side of Sandy Hook finds a ready market, except for the purpose of planting. For meat and flavor they are but little better than Newark bays. They need transplanting.

VI. There has been no planting done here of Virginia or New York oysters. It would be no use to plant Virginia oysters here. They would be winter-killed. New York natural or hardy oysters would live. There have been a few Virginias bedded from spring to fall here, and they did better for the time they were overboard than oysters generally do in any water that I am acquainted with; and I have oystered in every state where oysters are worth catching—New Hampshire, Connecticut, Long Island, New York, New Jersey, Delaware, Maryland, and Virginia—having done nothing else for 20 years, and having worked for the largest firms in New York. Will send you information any time you write for it.

Yours, respectfully,

A. T. TIBBETTS.

As I have remarked in another place, I regard this body of water as a very promising field for testing whether, with Prince Edward island, Somerset, or some other hardy seed, artificial propagation is not possible at even this northern point.

STATISTICAL RECAPITULATION—GREAT BAY, PORTSMOUTH, AND DOVER, NEW HAMPSHIRE:

Number of wholesale dealers.....	3
Number of men fishing in summer for natives.....	6
Number of vessels and sail-boats engaged.....	5
Value of same.....	\$300
Number of restaurant servants.....	6
Annual earnings of same.....	\$2,500
Total number of persons supported.....	25
Annual sales of—	
I. Native oysters..... bushels..	1,000
Value of same.....	\$800
II. Chesapeake "plants"..... bushels..	7,000
Value of same.....	\$7,000
III. Fancy stock..... bushels..	800
Value of same.....	\$1,000
IV. Value of Norfolk "opened stock".....	\$1,000
Total value of oysters sold annually.....	\$9,800

13. THE OYSTER-BUSINESS OF PORTLAND, MAINE.

HISTORY AND METHODS.—No oysters are native at Portland, and the city is supplied directly from the Virginia producers. The real beginning of the oyster-trade in Portland was made by James Freeman, about forty years ago, and two ship-loads from the South, amounting to, say, 200 bushels a year, filled the demand of Portsmouth, New Hampshire, and Portland together. Sometimes, also, a ship-load would be brought from Staten Island to Wellfleet, on Cape Cod, and laid down, to be drawn upon during the summer. It was not until a few years ago that four merchants began to charter a vessel or vessels to run south and buy oysters, to be divided between them, each firm contributing its quota of purchase-money and expenses in proportion to its share of the cargo.

From 1869 to 1875, the following amount of oysters were thus brought in:

	Bushels.
May, 1869, to May, 1870.....	33,369
May, 1870, to May, 1871.....	49,906
May, 1871, to May, 1872.....	57,332
May, 1872, to May, 1873.....	62,786
May, 1873, to May, 1874.....	79,767
May, 1874, to May, 1875.....	71,673

From 1875 until the present, accurate statistics are not obtainable. The sum of the oysters now brought to the city is believed to be 75,000 bushels a year.

The cost of the cargo-oysters is about the same in all respects as at Boston, and the business is similarly conducted. The cost, in Portland, per bushel, of oysters delivered in the warehouse, then, sums up as follows, at an average:

1869 to 1872	50 cents.
1872 to 1875	45 cents.
1876 to 1879	35 cents.

The selling price for oysters in the shell has ranged from a dollar (ten years ago) down to 55 cents at present. This is in winter; in summer it often reaches and exceeds \$1 50 a bushel. This increase of price in summer is due to the fact that no oysters can then be got in Virginia, where the law enforces a cessation of raking, and to the extra expense entailed by "bedding".

As the weather begins to get warm in the spring, all the surplusage of each cargo which each dealer can spare, is sent about five miles down Casco bay in large, open boats, and dumped overboard upon the flats for summer-keeping. These oysters improve in quality, fatten up, and the shells add a "feather edge", often of remarkable size. It is calculated that one-fourth at least of these will perish, while the increase in value is only from 20 to 25 cents more than when they were put down. In consequence, the practice has fallen into disrepute, and only one merchant now beds extensively.

That there has been no growth in the business of importing and selling cargo-oysters commensurate with the growing population and cultivated palates of the region tributary to Portland, is acknowledged. The late depression in prosperity has made itself felt here, since the oyster ranks among luxuries. Neither so large prices, nor, proportionately, so wide profits, can now be obtained. This is ascribed by all dealers to the new fashion of buying oysters already opened in Norfolk and elsewhere in the South and bringing them here in barrels and cans.

The transactions in this branch of the trade (which must be added to the former estimates) amount to about \$1,000 a week for, say, four months. A large part of this stock is supplied at second hand from Boston. Here, as elsewhere, there are two opinions as to the real profit of dealing in this opened "barrel" stock.

The number of persons directly supported by the wholesale oyster-trade in Portland is not large, numbering between 40 and 50 families the year round, and half as much occasional help in addition in winter, to assist in opening new cargoes arriving.

The wages paid to men employed about the establishments vary from \$8 to \$18 a week, and to girls in the kitchen—for each of the wholesale houses has a lunch-room attached—about \$4 a week. They also receive their board. Those who open the oysters are here called "shuckers". They receive from 15 to 20 cents a gallon for their work, and are able to make from \$7 to \$12 a week as long as work lasts. Formerly many more shuckers were employed than at present.

The vessels employed in carrying the oysters are mackerel-schooners clearing from Cape Cod ports. They spend the summer in fishing and the winter in this trade. In 1878, the *Mary Steele*, *Nathan Cleaves*, *Mary Whorf*, and *H. E. Willard* were engaged. An average load is about 3,000 bushels, and a voyage in March has been made in ten days, but the usual time is from three to four weeks.

That in ancient times this locality was tenanted by oysters of the same race as those which lived in Damariscotta and Sheepscot waters, and have survived to the present day in the latter stream, is shown by the discovery of buried beds of shells, as has already been pointed out and commented upon.

STATISTICAL RECAPITULATION FOR PORTLAND:

Number of wholesale-dealers	4
Total number of families supported	100
Total number of families partly supported	40
Annual sales of—	
II. Chesapeakes	bushels.. 75,000
Value of same	\$50,000
III. Fancy stock	bushels.. 5,000
Value of same	\$6,000
IV. Value of Baltimore and Norfolk "opened stock"	\$15,000
Total value of oysters sold annually	\$71,000

14. THE NATURAL BEDS OF SHEEPSHOT BRIDGE, MAINE.

NATIVE OYSTERS IN SHEEPSHOT RIVER.—Four miles west of Damariscotta and Newcastle, in Lincoln county, Maine, is a small bed of living oysters and evidences of a greater number in the past. The Sheepscot river flows into the head of one of the inlets from the sea with which this rugged coast is filled. At the village of Sheepscot Bridge (one of the oldest communities in the United States, having been settled first by the Dutch in 1518) another little stream enters, known as Dyer's river. A quarter of a mile below the confluence of these streams is a cataract, and below this the widening expanse of one of the most beautiful of Maine's fiords.

From just below the falls (where there are some mills) to a point about three miles above, oysters were once

abundant. It is a tradition, that a hundred years ago smaeks used to come from Boston and load up with these oysters; but I am inclined to doubt the veracity of the tale. The most thickly inhabited portions of this region, were the basin just above the falls, the mouth of Dyer's river, and, chief of all, a point about one and a half mile above the bridge.

The bottom of the stream is rough and rocky, and the bivalves were always difficult to get. The ordinary method was by diving. Ten years ago it was possible to get a bushel or two in a day up the Sheepscot river; but now Mr. Manly Sargent, the most experienced man in the village, thinks a peck would prove a good day's work. They grow singly and of great size, shells a foot to fifteen inches in length have frequently been taken. They closely resemble in character those at Damariscotta, and are pronounced of very fine quality.

Speculation has been indulged as to whether this little colony of oysters is a natural one or not. There seems to be good evidence to show that it was planted designedly by the Indians, before the advent of white men, with mollusks brought from the Damariscotta beds. The position and condition of the colony; the fact that the banks of this river were thickly populated by Indians, who might be supposed to know enough to save themselves the trouble of going four miles every time they wanted oysters, by transplanting them to their own stream; the fact that no more distant stream has them, although no good reason can be discovered for their absence; and the fact that no shell-heaps of any account exist to attest ancient use of the bed, all seem to confirm this supposition. Dr. H. F. Hall, of Sheepscot, who has studied the matter with care, and various others, hold this opinion. As I hinted before, it is probable that the isolated oyster-colony in the George river, near Thomaston, was planted in the same way, and that Salt bay is the only really native and indigenous home of the oyster anywhere in this region. These oysters have no commercial value, of course. They are much rarer than the partridges in the neighboring woods, and there is little likelihood of their increasing. Nor are there any shell-banks to afford a fertilizer for the worn and rocky soil.

C. THE SOUTH COAST OF MASSACHUSETTS.

15. OYSTER-CULTURE IN BUZZARD'S BAY AND VINEYARD SOUND.

VERRILL ON THE OYSTER-BEDS OF SOUTHERN MASSACHUSETTS.—Buzzard's bay, indenting the southern shore of Massachusetts, and nearly separating Cape Cod from the mainland, has been noted since its discovery for its natural oysters, and is now the scene of wide cultivation and a large business. It was of this region that Professor Verrill wrote the ensuing paragraphs in his *Invertebrates of Vineyard Sound*, several years ago:

In Buzzard's bay the bottom is generally muddy, except in very shallow water about some of the islands, where patches of rocky bottom occur, and opposite some of the sandy beaches, where it is sandy over considerable areas. Tracts of harder bottom, of mud or sand, overgrown with algæ, occasionally occur. In Vineyard sound the bottom is more varied * * *; muddy bottoms are only occasionally met with.

Attached to the sides and surfaces of rocks and ledges along many parts of this coast, young oysters, *Ostrea Virginiana*, often occur in vast numbers, sometimes completely covering and concealing large surfaces of rocks. But these generally live only through one season, and are killed by the cold of winter, so that they seldom become more than an inch or an inch and a half in diameter. They come from the spawn of the oysters in the beds along our shores, which, during the breeding season, completely fill the waters with their free-swimming young. They are generally regarded as the young of "native" oysters, but I am unable to find any specific differences between the northern and southern oysters, such differences as do exist being due merely to the circumstances under which they grow, such as the character of the water, abundance or scarcity of food, kind of objects to which they are attached, age, crowded condition, etc. All the forms occur both among the northern and southern ones: for they vary from broad and round to very long and narrow; from very thick to very thin; and in the character of the surface, some being regularly ribbed and scalloped, others nearly smooth, and others very rough and irregular or scaly, etc. When young, and grown under favorable conditions, with plenty of room, the form is generally round at first, then quite regularly oval, with an undulated and scalloped edge and radiating ridges corresponding to the scallops, and often extending out into spine-like projections on the lower valve. The upper valve is flatter, smooth at first, then with regular lamellæ, or scales, scalloped at the edges, showing the stages of growth. Later in life, especially after the first winter, the growth becomes more irregular and the form less symmetrical, and the irregularity increases with age. Very old specimens, in crowded beds, usually become very much elongated, being often more than a foot long and perhaps two inches wide in the adult individuals; for nearly all the oyster-shells composing the ancient Indian shell-heaps along our coast are of this much-elongated kind. Nowadays the oysters seldom have a chance to grow to such a good old age as to take this form, though such are occasionally met with in deep water. The young specimens on the rocks are generally mottled or irregularly radiated with brown. They were not often met with on the shores of Vineyard sound, for oysters do not flourish well in that sandy region, though there are extensive beds in some parts of Buzzard's bay, and a few near Holmes' Hole, in a sheltered pond. The oysters prefer quiet waters, somewhat brackish, with a bottom of soft mud containing an abundance of minute living animal and vegetable organisms. In such places they grow rapidly, and become fat and fine-flavored, if not interfered with by their numerous enemies.

TOPOGRAPHY: EARLY ABUNDANCE OF SHELLFISH IN WAREHAM AND VICINITY.—The best starting point for inquiries, perhaps, is Wareham, an ancient town on Wareham river, which flows into the northern limit of the bay. Below the "Narrows" where the bridge is, there is a broad inlet, known as the Northwestern arm of Buzzard's bay, or sometimes as the Waukinco river. Above the bridge the Wareham river flows in, joined by the Agawam river

from the eastward. Both of these streams are influenced by the tide for a considerable distance above the village, are shallow, and are partially bordered by flats. From the bridge upward for half a mile, there anciently was one continuous oyster-bed, and, besides this, various other coves and rivers in the neighborhood were inhabited by these and other bivalves. In colonial days the present townships of Rochester, Matapoiset, Marion, and Wareham, which are ranged around the head of the bay, were known as Rochester, and tradition says that it was named after the city of Rochester, in England (which city was famous for shellfish), because of the abundance of oysters, quahaugs, clams, scallops, etc., along the shores.

LEGISLATION AND LICENSE IN WAREHAM.—That the earliest inhabitants valued oysters, is a matter of history; and even in colonial times they were made the subject of legislative protection by the town, for fear of their disappearance, as witness the following:

In town-meeting at Wareham, *voted*—

March 20, 1775, that there should be no shellfish nor shell sold nor carried out of town.

March 12, 1781, that no oyster-shells shall be catched to carry out of the town without the leave of John Fearing, Joshua Briggs, & Joshua Crocker, on the penalty of paying six shillings per bushel.

September 24, 1781, that no person shall catch any oysters or oyster-shells for to carry out of the town or carry themselves out of the town on y^e penalty of forfeiting two shillings and 8 pence per bushel.

About 1840 was argued here the famous case of *Dill vs. Town of Wareham*, involving rights to oyster-fisheries and planting privileges, which the curious in such lore will find both intricate and entertaining.

As an attempt at regulation of the oyster-fishery, a few years ago, the town divided off into grants all the shores of the numerous salt rivers and inlets embraced in the extensive and sinuous sea-coast, and offered these grants, under a twenty-years' lease, as ground for the cultivation of oysters. The expense of procuring a grant was \$2 50, and it was subject to taxation at a valuation of \$50. These grants were about 125 in number, and were situated in Wareham and Agawam rivers, above the "Narrows bridge", along the shores of the Waukinco river, as the broad inlet from the Narrows down to Buzzard's bay is called, and in Broad Marsh river, Crooked river, Mark's cove, and the Weeweaptit river, all of which are tributary to the Waukinco. On the shore other localities are: Brown's cove, Onset bay, Shell Point bay, East river, Long Neck shore, and Colhasset river. The average size of the grants is about two acres, giving from 250 to 300 acres of shore suitable to oyster-culture in this town, nearly all of which is already granted.

The seed which has been placed upon these grants, and is to be placed there, is entirely obtained from the natural beds, which are abundant in the Agawam, Wareham, and Weeweantit rivers. The incessant raking to which the beds were subjected to obtain it, added to the demand for market, threatened extermination so seriously that, in 1874, the selectmen decreed that no one should be allowed to fish for oysters at all, without paying to the town a duty of 10 cents a bushel, the proceeds to go to pay an officer for measuring, etc. Under this rule the town issued licenses and received pay, in 1875, from 36 licenses, \$303 60, giving 3,036 bushels; and in 1876, from 47 licenses, \$425 50, giving 4,255 bushels.

Since then few licenses have been issued, owing to the opposition and quarreling excited. The oyster-matter became a political issue. It is probable that multiplication by three of the results for 1875 and 1876, would give the approximate yield for those years, and there is said by all persons to have been a decrease since.

MARKETS AND PRICES.—About five years ago no oyster was better received in the Boston market than that from Wareham; it held the first place. Though it has lost this distinction by "opening" poorly of late, it is still of fine quality and in demand by the neighborhood markets. Wagon-loads are sent off to Plymouth, Middleboro, and elsewhere, frequently through the winter; and during the season of 1877-78 the Old Colony railway carried 780 bushels in shell from the Wareham station, and about 150 gallons of opened stock. From East Wareham (Agawam station) there were shipped, during the winter of 1877-78, 924 bushels in shell, while partial accounts of the next season (1879-'80) indicate a large increase. By far the larger part of the yield, however, is sold small, as "seed oysters" to be planted upon the beds along the eastern shore of Buzzard's bay and the "heel" of Cape Cod. This seed is never carried away to be sold, but the purchasers come after it in spring and fall in sloops of about 25 feet keel, locally known as "yacht-boats". This seed sells for 30 to 35 cents a bushel in spring, or 60 to 80 cents in fall, and is one and two years old, mixed. Some experiments have been made in bedding Virginia oysters through the summer, but although they lived well enough it was not found profitable. They brought only \$4, while the native oysters would fetch \$6, a barrel.

Oyster-affairs in Wareham can hardly be called a business. The title to the grants is very uncertain, the impression being that the right to operate upon them exists only through courtesy of the owners of the adjacent uplands, and a vast amount of litigation would probably arise if any one chose to object to the present status. This feeling, and the jealousy of anything smacking of monopoly, has deterred capital from being invested in any considerable degree, although efforts have been made to bring money from New York and Boston to bear upon this industry. At present the poor, ignorant, and shiftless portion of the community, for the most part, have to do with the oysters, and have found it necessary, in order to protect each other from a common thieving propensity, to decree among themselves that no man shall fish after sunset, even upon his own grant. It would be an outside estimate to say that 200 persons live upon the oyster in Wareham, at an investment of \$3,000.

SAVERY ON OYSTER-CULTURE IN WAREHAM.—Since writing the above account I have received the following instructive communication relating to this region, which I am happy to give entire :

EAST WAREHAM, MASS., *January 29, 1880.*

DEAR SIR: In order to answer understandingly your inquiries respecting the oyster-business of Wareham, I find it necessary to give you a condensed history of it.

Oysters grow naturally in the two rivers of Wareham, the Waukinco and the Weeweantit. In the former the natural beds extend from Wareham narrows, two miles above its mouth, about one mile up stream; in the latter river, the natural beds extend over a distance of about two miles. At low tide the water is about two feet deep on these beds, and the bottom is somewhat muddy. Spawn is deposited on them every year to a greater or less extent. The oysters grow in clusters, are long and thin, the meat is watery, not firm and solid, though of pretty good flavor, and on the lower part of the beds, where the water at low tide retains its saltness, they do not attain great size, even when undisturbed, but soon die, and are succeeded by a new growth. Scattering oysters are found in the channels for about one mile down stream, of fair size, firm meat, and good flavor, probably carried there when very small, by the current from the natural beds.

Prior to 1840, the privilege of taking the oysters from these beds was leased to a Wellfleet company, and several thousand bushels were carried to Wellfleet harbor, Massachusetts, and there planted for the Boston market. About 1840, fearing that the natural beds would be injured, the town annulled the contract with the Wellfleet company, and but few oysters, except for the use of the inhabitants, were taken from these beds for many years. In 1845, Peter Presho, of Wareham, got a grant from the legislature to plant oysters in a cove at the upper part of Onset bay, an arm of Buzzard's bay, in East Wareham. He there planted a few hundred bushels of Waukinco river oysters with good success, that is, they grew large, were well filled, and of excellent flavor. They did not increase in numbers, no spawn seemed to come from them, nor were any small oysters seen on the adjacent shores.

In 1855 I got a license from the selectmen of Wareham, under the general state law, to plant oysters in Onset bay, adjoining and above the Presho grant. I brought from Rappahannock river, Virginia, 2,200 bushels of large oysters in the month of May, planted them on my grant, intending to market them the next fall. They did not arrive in very good condition, and what lived did not "fill" well, so I sold but few, and let the rest remain on the grant. After the first year they "filled" well, and were of excellent quality. In a few years young oysters began to catch on the shells and on the stones of the adjacent shores, so that people made a business of catching oysters in that vicinity, and from my grant, for the home-market. I proposed planting again, but my business taking me away from Wareham, and the late war coming on, prevented my doing so. Young oysters continued to increase, and to be found on various parts of the shores of Onset bay, mostly on the sand-bars, about low-water mark. They generally lived but one year, being killed by the winter.

In 1865 I commenced gathering the young oysters early in the fall, and planting them from two to four feet deep, at low water. I found that they did well, growing rapidly, and having an excellent flavor. In 1867 I carried some to the Parker House, Boston, and the proprietors pronounced them as fine oysters as they had ever seen, and engaged all I had to sell; since which time I have furnished Wareham oysters to the Parker House whenever they have been in suitable condition for their trade. I took care to secure and preserve the spawn, placing shells and brush wherever I thought it likely to catch, and by 1869 had several thousand bushels growing finely. On the 8th of September of that year, we had a severe southeasterly gale, which washed the sand from the shores and bars, covering the oysters and destroying the greater portion of them. The water that was driven into our bay by that gale was uncommonly salt and bitter, killing nearly all vegetation, even large trees, as far as it reached, and injured many wells. The oysters were seriously hurt by it, and the next year were poor and very salt, hardly marketable. They did not fully recover from its effects until 1872. Many other persons had by this time procured licenses, and commenced planting, getting their seed mostly from the Waukinco river and the shores of Onset bay. Several cargoes of large Virginia oysters were planted in the spring, and taken up and sold in the fall, but this did not prove profitable. Spawn now began to catch in various parts of Onset bay, in water from 10 to 12 feet deep at low water; I think this came from the Virginia oysters; none has caught there since; they have all been taken up. In one year I think at least 20,000 bushels of seed, about one inch in diameter, were taken from Onset bay and planted elsewhere, some going to Providence river, and some to various parts of Cape Cod. Nearly all the available shores of Wareham were by this time granted to different persons for oyster-planting. Seed-oysters at this time, from Onset bay, sold readily at from 50 cents to 75 cents per bushel, from the boats, and large oysters brought from \$5 to \$9 per barrel, delivered at the railroad station. The business of growing oysters was profitable. The only limit seemed to be in the size of the individual grants and the amount of capital invested. The grants were too small to do a large business, and no great amount of money was invested in it.

In 1875 Wareham oysters were poor, hardly marketable, and during the winter many died; the next two years they were good, and mine brought \$7 50 per barrel; in 1878 and 1879 they were very poor, and unsalable except to peddlers, at a low price. Last winter at least one-half of our large oysters died. No seed of any consequence has been caught in Onset bay the past three years. I have tried to find out why our oysters were so poor some years and good others, and my observations lead me to the following conclusions: Onset bay has no fresh-water streams discharging into it other than small brooks, but on its shores are innumerable springs of fresh water, exuding almost everywhere between high- and low-water mark. Near where the springs flow copiously, the oysters are the best. These springs derive their supply from the rain that falls on the great wooded territory in Wareham and Plymouth, called "Plymouth woods". In 1875 the springs were very low. The previous winter had been very cold, the ground freezing to a great depth, and the woods did not thaw out until the last of May. All the water that fell, therefore, ran off the surface, and did not penetrate the ground to supply the springs. The next winter was warmer, more rain fell, the springs filled, and oysters improved. Then occurred the great fires, destroying all vegetation on thousands of acres of Plymouth woods, and leaving a sandy barren, where the rain that fell evaporated rapidly; the ponds in the woods shrank to a smaller compass than was ever known before, the swamps dried up, springs failed, many wells gave out entirely, and the streams that furnish the water-power of Wareham were, and still are, lower than ever before, and oysters are poorer. I am confident that, for the production of good oysters in this vicinity, a certain uniform supply of fresh water is required, springing directly from the ground on which they are planted. It will not do to have the water vary in saltness; if it does, though the shell may grow rapidly, the meat is watery and flavorless. Oysters are seldom of good quality in brackish water, yet when taken from salt water and placed for a short time in fresh water, they will grow plump, and improve, if not left too long.

Oysters always feed on the flood-tide. Then the water seems cloudy, while on the ebb it is clear. I have often observed, that as soon as the tide began to flow the oysters would slightly open their shells, the feathery edge of the mollusk could be seen protruding and in motion, apparently feeding. In raking oysters on the flood-tide they often catch on the teeth of the rake; I never knew this to occur on the ebb. Oysters throw off their spawn at the commencement of the flood-tide, hence it generally catches near low-water mark, and up stream from the spawning-bed, except in rivers where there is always a downward flow.

Their season for spawning here varies from the 1st of July to the 1st of September, according to the condition of the oyster and the temperature of the water; the spawn in favorable situations grows rapidly. I have known a boat, with a perfectly clean bottom, anchored over an oyster-bed, to have its bottom completely covered with oysters of over an inch in diameter in two weeks' time.

Though seed taken from the natural beds in our rivers does well when planted in other localities, the restrictions upon taking them placed by the town-authorities, and 10 cents per bushel to be paid the town, prevent their being used to any great extent. No Virginia oysters have been planted here for several years past, with the exception of a small cargo I brought from there last year, hoping to obtain spawn from them in course of time; they seem to be doing well; no oysters to any extent are opened for sale. Those sent to Boston last year brought \$5 per barrel at the railroad station. The greater quantity of oysters sold last year were to peddlers, at \$1 per bushel on the shore, who disposed of them in the adjacent towns. From the best information I can get, I think about 7,000 bushels were marketed from this town the past year, paying to the producers about \$10,000. Very little money is paid out for labor; planters do their own work, and what help is needed can be got for 15 cents per hour. The prospect for much business next year does not look encouraging. No seed, to any great extent, has been planted for the past two years. I have quite a large quantity growing, but can form no correct estimate of how many. I shall continue planting the ensuing year, if I can procure seed that will not cost over 25 cents per bushel, planted. I expect to bring some young oysters from the Great Wicomico river, Virginia, to plant here. I think they will do well if caught in shoal-water, and are young and thrifty. I have oysters planted there, but cannot yet tell how successful they will prove.

The greatest drawback to complete success of the business here, has been the lack of uniformity in quality from year to year. Much of the ground upon which our oysters are planted has too little water upon it at low tide; the oysters freeze in the winter, or are killed by the ice resting upon them. It is also impossible to catch them for market just when they bring the best prices. The most destructive enemy to our oyster-beds is a small mollusk, here called the "borer" or "white snail"; it drills a small hole through the shell directly over the "eye" of the oyster, causing its death. Some beds, particularly where the bottom is hard, are completely destroyed by them. The periwinkle also is very destructive to large oysters; one will destroy at least a bushel in a season. There are but few starfishes.

Respectfully yours,

A. SAVERY, C. E.

OYSTER-BEDS IN SIPPECAN HARBOR, WING'S COVE, AND WEEWEANTIT RIVER.—Southwesterly from Wareham the head of Buzzard's bay contains several oyster-localities of varying importance. They are: The Weeweantit river, for a mile or so in the neighborhood of the highway bridge; Wing's cove, and the Blankinship cove of Sippecan harbor, in the town of Marion.

In the Weeweantit natural beds of very good oysters have existed for a long time, and a few years ago a large yield was obtained from them every year by Mr. Robinson and others. Latterly, however, the quantity has decreased, and the beds have been raked almost wholly for the sake of seed. There are grants here, but no improvement, as yet, of any consequence.

In Sippecan harbor (the harbor of Marion) it is said that no oysters were known until about fifteen years ago (1864), when the shore of Ram island, on the eastern side of the harbor, near the entrance, was found strewn with young oysters, and the next year it was ascertained that these had lived and were growing. The whole cove rapidly filled, and at once began to be taken by the inhabitants in large quantities.

OYSTER-CULTURE IN SOMERSET.—Some gentlemen, in 1875, got permission of the town to plant oysters on the bar at the entrance of the harbor, and brought a large quantity of seed-oysters from Somerset, Massachusetts, to lay down there. Taking the hint, the town surveyed a fringe of grants around the whole harbor, which were rapidly secured by the citizens for purposes of culture. The first design was that all owning grants should seed them from abroad, leaving the natural beds in Blankinship cove and all the channels as public domain. But this was done to a very small extent, the natural beds being raked and dredged, instead, for oysters to be placed upon the grants, until it seemed likely that no mollusks at all would be left upon the beds. Legislative measures, both of state and town, were brought forward for oyster-protection, but with little avail, as restrictive measures had small support from public opinion, and now there is little attempt to restrain any one fishing to any extent. It is reported by some, as a consequence, that few oysters are left, while others say that there are as many oysters there now as ever. Meanwhile, those who had planted were not encouraged. The best grants lay in favorable spots, where the oysters had shallow water, a hard bottom, and quick tide, only lacking fresh water. One gentleman has planted about twelve thousand bushels, and has put down six to eight thousand empty shells, hoping to catch spawn; but since these were put down there has been no year in which the spawn was plenty at Marion. (The last good year for spawn in Wareham was 1877, in Somerset, 1878.) Both of these investments have proved to be losing ones. The oysters brought here from Somerset have grown pretty well in shell, but in meat are lean and watery. Last August those of marketable size produced less than two solid quarts to the bushel. This fall (1879) there has been an improvement, but a bushel does not "open" more than three quarts. These facts are true, as a rule, over the whole extent of the harbor, and in every instance the owners consider that they have lost money on their investment, and that it is probable that no great success can be looked for in raising oysters at Marion, for unexplained reasons. Even when they succeed in getting a fair quantity of oysters, they are not as hard and plump as they ought to be, and will not sell in Boston market at prices which will repay the expense of their cultivation. Among special discouragements may be mentioned the burying of two thousand bushels in one bed, on the outside of Ram island bar, by a single gale during the winter of 1878, and the sudden death of several thousand bushels up the harbor through anchor-frost. As a consequence, a large portion of the oysters which have been planted here from Somerset have been taken up and sent to Providence river, where they have been rebedded with great success. It may be that this will afford an opportunity for business, although planting will not succeed well. The seed can be bought in Somerset and laid down here for about 35 cents a bushel. Two years later it can be sold to Providence dealers for 75 cents. During these same years the natural beds near Ram island have flourished tolerably well, although the large tracts of shells about the harbor have caught no spawn. They have not opened as much nor of as good quality, however, as formerly; but there are great differences in the oysters of even this limited area.

A bed at Ram's island, on the sand, in three to five feet of water, "opened handsome," while only a few yards away oysters on a muddy bottom were of poor quality and size.

There have been about \$17,000 invested in oyster-culture in this town, but I believe the whole matter could be bought now for \$10,000. Perhaps 5,000 bushels, all told, have been disposed of annually for the last three or four years, at \$1 a bushel or gallon.

NATURAL BEDS IN SANDWICH.—Crossing over now to the eastern head of the bay (since there is nothing to be noticed south of Marion on the west, except a little later at New Bedford), I have to report an extensive industry. The Cohasset river divides the town of Wareham from the adjacent township of Sandwich, its neighbor on the south and east. Flowing into Buzzard's bay from this Sandwich side are several rivers, and the shore is indented with numerous inlets and shallow ponds. Nearly all of these inlets were found by the earliest colonists occupied by beds of natural oysters, and most of these beds are still living and supplying seed for cultivation. That the Indians used the oysters extensively is shown, not only by tradition and analogy, but by abundant traces of former feasts in the shape of shell-heaps. Some account of the oysters of this region more recently, is accessible in a letter from Dr. J. B. Forsyth, written in 1840, to Dr. A. A. Gould, and printed in the first edition of the latter's *Invertebrates of Massachusetts*. Dr. Forsyth says that the aged men of the vicinity assured him that oysters had never been brought there from abroad up to that time (1840); that they grew so abundantly everywhere along the Sandwich shores "that at low water you could at almost any point procure a bucketfull of them from the rocks". Dr. Forsyth also mentions Wareham as an oyster-locality. There was then a statute prohibiting a man from taking more than two bushels at one time for his own use, and forbidding their being carried out of town. "The oysters," says the writer, "are generally collected by a few men, who bring them to the village and dispose of them at 50 cents a bushel for their trouble; and by selling half a bushel or a bushel to an individual the spirit of the statute is not violated. This may be repeated every day, until the desired supply is laid in. When placed in the cellar and fed from time to time with a little meal and water, they will sometimes keep good for months."

CULTURE AND LEGISLATION ON MONUMENT RIVER.—Buzzard's bay is the new name for the railway station on the Old Colony line, known to all the people about there as Cohasset Narrows, because it is upon the narrowest part of the neck of the peninsula of Cape Cod. The river flowing down past Buzzard's bay station is the Monument, a clear, broad stream, up and down which the tide rushes with great force. "Wild" native oysters inhabited this stream, but had been pretty nearly exhausted by constant raking, when the attention of the town-authorities of Sandwich was called to the matter, a few years ago. They caused a survey of this and the various other oyster-waters of the township, and divided them off into "grants" of different sizes, according to the character of the bottom, but none less than about an acre and a half in extent. These grants could be taken by any citizen of the town, under certain conditions, upon the payment of \$2 50. If not improved within a year they reverted to the town. Each grant, as soon as taken, and no matter what the value of the stock upon it, was taxed at a valuation of \$50.

The special state laws passed for the benefit of this new industry, were substantially as follows:

MARCH 26, 1834. SECTION 1. If any person shall hereafter take any oysters or other shellfish from their beds, or destroy them therein, in the town of Sandwich, except as is hereinafter provided, he shall forfeit for every bushel of oysters so taken or destroyed, the sum of five dollars, and for every bushel of other shellfish so taken or destroyed, the sum of three dollars: *Provided, however*, That the selectmen of said town may give permits in writing to any inhabitant to take shellfish at such times and for such uses as they shall think reasonable and express in such permits, not exceeding two bushels for one family: *Provided, further*, That any inhabitant of said town may, without such permit, take one bushel of oysters or other shellfish per week from their beds in said town, for the use of his or her family, from September 1 to June 1, annually.

SEC. 2. If any boat, wagon, sleigh, or other vehicle, shall be found within the limits of said town with any oysters or other shellfish on board, taken in said town contrary to the provisions of this act, any inhabitant may seize and detain the same, not exceeding forty-eight hours, in order that the same, if need be, may be attached by due process of law to answer the said fines and forfeitures, with costs of suit: *Provided, however*, That as soon as the owner or master of any such vessel, boat or craft, cart, wagon, sleigh, or other vehicle, shall pay said fines and forfeitures without suit to the treasurer of said town, such vehicle shall be discharged, with the effects therein.

SEC. 3. If any person or persons, residing in Sandwich, shall assist any person belonging to any other town, in taking any of the fish aforesaid, or shall supply them therewith, he shall forfeit for every bushel of oysters so taken five dollars, and for every bushel of other shellfish three dollars, and the purchaser or purchasers, knowing them to be unlawfully taken, shall be subject to the like forfeitures.

SEC. 4. All persons not otherwise disqualified shall be competent witnesses in any prosecution upon this act.

SEC. 5. All the forfeitures mentioned in this act, not herein otherwise appropriated, shall enure, one half to said town, and the other half to the person or persons giving information, to be recovered by the treasurer of said town in an action of debt, before any justice of the peace for said county of Barnstable, or any court proper to try the same.

MAY 15, 1867. SECTION 1. Whoever takes any oysters from Monument river, Sandwich, previous to October 1, 1868, shall forfeit five dollars for each bushel so taken.

SEC. 2. The inhabitants of the town of Sandwich, at a legal meeting held for the purpose, may make regulations concerning the taking of oysters in said river after said first day of October; and whoever takes any oysters from said river contrary to the regulations so made, shall be subject to the same penalties as are provided in the preceding section.*

* On February 26, 1873, a precisely similar regulation was made for Barlow river, Sandwich, to be in effect subsequent to October 1, 1874.

VOTES OF TOWN, March 3, 1879.

Voted, That the Monument and Barlow rivers be closed for catching oysters from the first day of May next, until the first day of October following.

Voted, That the regulations concerning the taking of oysters from said first day of October until the next annual meeting, shall be the same as voted at a meeting adjourned from the annual meeting in March, 1878, to the fifth day of November in said year, which is as follows: Any inhabitant may take one bushel of oysters in each week, and no more, the same to be taken under the supervision of the fish-committee of the town, who are directed to prosecute all persons violating the regulations now voted. That Saturday in each week shall be the catching day.

Voted, That the town sustain the officers chosen in all legal action pertaining to their office.

Voted, That the town allow its inhabitants to take all the oysters they can with suitable instruments, such as drags, tongs, and rakes, wherever they can find them, except on private grants and in Monument and Barlow rivers.

Voted, That any person entitled to one bushel of oysters per week under the regulations for the Monument and Barlow rivers, may, by an order, empower another person to take said bushel of oysters for his or her family use.

The people were quick to take advantage of these legal permits, and it was not long before nearly all space of value was appropriated, and wild speculation began; but it is only within the last three or four years that much business has been done, or systematic efforts at transplanting and stocking have been introduced. There are now about 50 owners on Monument river, Cohasset river, and in Little bay, and a careful estimate of money invested gives \$30,000 as the probable value of grants, stock on hand (November, 1879), and appurtenances. Many of the grants are as yet very slightly stocked with oysters.

The Monument river oysters were famous in olden times for their superior quality and size. "They opened well," the oystermen said; that is, there was a large proportion of meat to the shell, which was thin, brittle, and much scalloped. The first idea was simply to hold, as proprietors, the seed which were caught upon the grants from the natural bed at the mouth of the river; and, to facilitate this catching, more or less dead shells have been thrown down. But the more enterprising planters have laid down great deposits of seed-oysters, purchased chiefly in Wareham, and these are just now beginning to produce their legitimate returns, having grown to a marketable size. Some fresh seed is put down every year, but in addition to this, it is expected that large accessions will be made by spawn caught from the natural bed and from the spawning of the planted oysters. Since 1874, however, very little spawn has been caught. In that year a vast quantity appeared, but arrangements were not made to avail themselves of it.

The amount of seed placed upon a grant varies with the pocket and theory of the owner, from 100 to 500 bushels on an acre; perhaps 200 bushels would be an average of actual planting. The seed from one to two years old is used and preferred. It is generally planted in the spring, when it can be bought for from 30 to 35 cents a bushel; but it is thought much better to plant it in the fall, although then from 60 to 80 cents is asked for the seed. It costs about 10 cents a bushel to throw down. The best bottom (and that which is found everywhere here) is hard sand, a little soft on top. The average depth of water on the beds is 3 feet; but some stock is planted where it is exposed or just covered at ebb-tide, the objection to this being the danger of damage from drifting ice, for the mere resting of the ice on the oysters is not usually harmful, provided they lie flat on the sand. The calculated cost of beginning business along this river now, would be about as follows:

Present cost of good ground (1 grant).....	\$40
Seeding, 300 bushels at 50 cents.....	150
Sail-boat and row-boat.....	55
Beach, shanty, and furniture.....	40
Rake, tongs, shovels, and tools.....	10
Incidentals.....	65
Total.....	360

One who is really going into the matter hopefully, must expect about this outlay before he considers his grant in condition to yield. If he puts down shells for the spawn to catch upon, as he probably will, it will cost him about 10 cents a bushel.

Formerly Virginia oysters were planted and bedded here, but did not do well. The prices received for these oysters, which are all picked over and shipped to Boston in good shape, vary from \$3 50 to \$6 a barrel. In 1878, the exports from the Buzzard's Bay station by rail were 138 barrels. Up to November 1, 1879, 240 barrels were sent, making 300 barrels a probable total for that year. Besides this, in 1879, much opening was done by the oystermen to supply the neighborhood market, and about 1,000 gallons of opened oysters were carried by express companies, in small packages.

OYSTER-CULTURE IN RED BROOK HARBOR (POCASSET).—Another oyster-locality in the town of Sandwich, is Red Brook harbor, six miles south of Monument river. The railway station is Pocasset, on the Wood's Holl branch of the Old Colony line. This harbor is an indentation of Buzzard's bay, about one and a half miles long by one-third of a mile wide, and it is separated from the outer bay by an island. A branch of the harbor, also, runs up to a landing known as Barlowtown. The name Red Brook harbor is derived from a little stream which flows into it, the bottom of which is tinged with iron rust; but this brook does not freshen the water to any considerable

extent. The bottom of the main part of the harbor is hard sand, and the water is nowhere more than 8 feet deep at low tide. In some portions rocks and eel-grass exist.

On the southern shore of this harbor, about a mile from its head, exists a living bed of natural oysters, some seven acres in extent, under protection of the town for public benefit. The oysters growing upon it are reported to be large, but not of extraordinary size, scalloped and roundish, differing in no respect from aged oysters grown after transplanting to another part of the bay. Excepting this natural bed, the whole harbor has been surveyed and divided into grants; all those good for anything have been taken up, and must now be bought at an advanced price, if any one desires to possess them. The largest owner is a Boston firm, reputed to have 75 acres, but beside it are a score of other proprietors, inhabitants of the shores. It is safe to say that \$3,500 would buy out all the home interests in the whole tract, and \$15,000 cover the total investment up to January 1, 1880. There is a spirit of progress here, however, which will lead to a great increase in the value of the property within the next few years. During 1878, for example, there were shipped from Pocasset station only 85 barrels; in 1879, 500 barrels.

I spent some hours on these grounds with Mr. Edward Robinson, who exerted himself to make my visit instructive. He thought that one-half of the whole water-area was suitable for oyster-cultivation, and all of this is now appropriated, though only a portion has yet been stocked. The seed is mainly derived from the native bed in the harbor and from the shores where the native spawn has "set", and is planted in the spring and fall. The only outside seed brought in thus far is 300 bushels from the Weeweantit river, across the bay; and 1,000 bushels from Somerset. The latter did not seem to do well. A long, sandy point runs out into the harbor here, which ebbs dry at low tide. This does not come into any grant, therefore, and hence is public ground for the gathering of seed. I saw upon the pebbly beach, in places, how abundantly this was to be had. Young oysters, at this season, from the size of a dime to that of a dollar, were strewed between tide-marks so thickly that you could hardly avoid stepping upon them, and they would survive the winter well in this exposure. These are gathered by everybody who wishes and placed upon their grants. In addition to this, many thousands of bushels of old shells have been laid down, the proper time to do this work being early in July, in order to have their surfaces clear and ready to catch the spawn which begins to appear about that time. In 1876, when there was the last good quantity of spawn emitted, the shells had been put down in May, and by July were so slimy that the spawn did not set upon them. They learned wisdom by that, but no good year for spawn has occurred since. The seed is planted in varying quantity, but Mr. Robinson said he should put it down shoulder to shoulder, so as to pave the whole bottom, if he had enough. I saw tracts where the growing oysters lay so thick as to conceal the sand, and you could gather a bushel from a square yard of bottom. The natives consider the seed here better than that at Monument river, for it is rounder and less distorted. When the oysters are three to four years old, and ready for market, Mr. Robinson takes them up and lays them upon a wooden floor near his packing-shanty, in water almost wholly fresh, which takes away the very saline flavor, fills them up in size, and makes them plump and hard. It is known as the "fattening" process, after which they are ready for shipment. Bought from the boats, a dollar a bushel is paid for these oysters, but the freight to Boston and the barreling make them cost about \$1 30 a bushel to the dealer.

Here, as at Monument river, fishing is habitually done through the ice in winter. The method is to cut a large hole and use tongs. The oystermen do not complain of it as especially cold or unpleasant work. In order to keep the oysters from freezing, they dip the bag which they intend to put them in when caught, in water, and hold it upright until it freezes stiff. It thus stands conveniently open, like a barrel, and no wind can blow through its sides to the detriment of the contents.

CATAUMET AND FALMOUTH.—Below Red Brook harbor are Cataumet harbor, Currant river, Wild harbor, and Squeateague pond. All of these are inhabited by beds of native oysters, and hence were granted in lots by the town (Sandwich) under the usual regulations. They differ in no important respect from the Red Brook region, are all of small extent, and the whole money-investment, all together, will not exceed \$500.

At East Falmouth there is a small business, the facts concerning which were kindly communicated to me in a letter from Mr. Frank C. Davis, which I take pleasure in transcribing:

EAST FALMOUTH, MASS., November 20, 1879.

DEAR SIR: There are no natural oyster-beds in our locality, nor have there been within my recollection, nor is there any trace, so far as I am aware, of their existence in the past. Oysters are cultivated on a small scale here, but there is not room for a very extensive business. We have a few acres of tide-flats, but the oyster-bottom extends chiefly along the shore, varying from six feet to one rod in width. This bottom is composed of sand and gravel. Outside of this you have dead black and blue mud, where nothing will live except eels.

I should judge there were 1,000 bushels of seed planted per annum, and about the same amount of oysters sold each year. The seed is obtained in Buzzard's bay, and costs from \$35 to \$85 per 100 bushels.

The ground is granted by the town of Falmouth to the tax-payers of said town, and all of it is taken up. The oysters grow well here, but are liable to die. Our oysters bring from \$3 to \$5 per barrel; very choice, \$6.

Respectfully,

F. C. DAVIS.

NEW BEDFORD AND VICINITY.—A few words remain to be said about New Bedford and vicinity. The Acushnet river, just above New Bedford, has been found wanting in the qualities necessary to make it good planting ground for oysters. The experiment has been tried, but has failed. No cultivation exists there, therefore.

The principal dealers in the town buy yearly a superior stock of oysters in the Chesapeake bay, bringing one

cargo of 3,500 bushels for bedding, and another cargo for winter use; the schooner Hastings, of nearly 100 tons burthen, is the vessel used at present. These oysters cost 65 cents when laid down, but grow very little on these beds, since there is no fresh water to start them. In addition to this, one firm furnishes oysters from Providence river, Wareham, and elsewhere. The rest of the town, as calculated by them, use about 200 bushels and 100 gallons a week for 5 months. This makes New Bedford's estimated consumption, annually, about 13,000 bushels.

Five men are employed six months, as openers, at 17 cents a gallon.

Just west of New Bedford is a little stream and inlet, known as Westport river. This was the locality of an ancient bed of native oysters, which has now nearly disappeared through too great raking. They are said to be very large and of good quality, but not more than 50 bushels a year can now be caught throughout the whole three miles from the "Point" up to the bridge, which sell at \$1 50 to \$2 a bushel in New Bedford. There is reputed to be good planting ground near the bridge.

A few miles west of Westport is the Dartmouth river, where, it is said, an oyster-bed has recently formed, but, as yet, is of little account. The bottom there, however, is regarded as very suitable for planting upon. Fifty bushels a year would cover the whole supply from here.

PLANTING IN COTUIT AND WAQUOIT.—At Cotuit and Waquoit are considerable planting interests, under similar regulations to those existing on the eastern shore of Buzzard's bay. From West Barnstable station, enough oysters were sent to Boston by rail, combined with what went elsewhere by water, to make the production of Cotuit amount to about 5,000 bushels annually; these oysters have a high reputation in Boston. Waquoit will produce half as much more, chiefly from Wareham seed. Both localities will give a census of 40 planters, and an investment of \$40,000. There is a considerable fleet of sail-boats here.

FORMER OCCURRENCE OF OYSTERS IN MARTHA'S VINEYARD.—In respect to Martha's Vineyard, only a paragraph remains to be said, quoted from a description of the island in the *Massachusetts Historical Collections*, second series, 1807, page 58:

The oyster is found in Newtown pond, and in two other ponds on the south shore, one of which is in Edgartown, and the other in Tisbury. It is fresh to the taste; but it is improved in its relish and rendered fatter, by digging a canal through the beach, and letting the salt water flow into the fresh-water ponds. As the southerly wind soon fills up the canal, the digging must be renewed four or five times in a year.

STATISTICAL RECAPITULATION. BUZZARD'S BAY AND VINEYARD SOUND:

Number of planters and shippers	150
Extent of ground cultivated	acres.. 500
Number of families supported	400
Number of vessels and sail-boats engaged	100
Value of same	\$20,000
Annual sales of—	
I. Native oysters	bushels.. 19,000
Value of same	\$25,000
II. Chesapeake "plants"	bushels.. 7,000
Value of same	\$6,000
Total value of oysters sold annually	\$31,000

16. THE OYSTER-LAWS OF MASSACHUSETTS.

CONDENSED VIEW OF LAWS AS AMENDED IN 1878.—The oyster-laws of Massachusetts, chapter 83, as amended in 1878, are condensed as follows:

SECTION 11. Whoever takes oysters from their beds, destroys them, or willfully obstructs their growth, etc., forfeits \$2 for every bushel, including shells. [This last phrase was made necessary by the fact that, in colonial times, when the oyster first became the subject of legal restriction, the penalty was evaded by the culprit's claiming that the shells were not to be measured against him—only the oyster meats.—E. I.]

SEC. 12. The mayor and aldermen, or the selectmen, of any city and town may give permits to any person to take a stated quantity of oysters; and every inhabitant may, without permit, take oysters, for family use, from September 1 to June.

SEC. 13. Makes the same regulation in respect to other shellfish.

SEC. 14. Any boat, not owned in the place, and found with oysters on board, not taken under a permit or license, may be seized and detained by any inhabitant for not more than 48 hours, pending process of law.

SEC. 15. Native Indians are allowed to dig for all kinds of shellfish for home use; and fishermen may take bait, not exceeding seven bushels at once.

SEC. 16. The mayor and aldermen or selectmen of any city or town may * * * grant a license, for a term not exceeding twenty years, to any inhabitant thereof, to plant, grow, and dig oysters, at all times of the year, upon and in any flats and creeks therein, at any place where there is no natural oyster-bed; not, however, impairing the private rights of any person, nor materially obstructing the navigable waters of any creek or bay. But no person shall take any oysters from any flats or creeks for which a license has been granted, * * * between sunset and sunrise, on penalty of forfeiture of license and the oysters on his beds.

SEC. 17. Such license shall describe the metes and bounds, shall be recorded, and shall cost the applicant \$2 50.

SEC. 18. The person so licensed, his heirs and assigns, shall, for the purposes aforesaid, have exclusive use of the flats and creeks described in the license during the time therein specified; and any person who, without consent of the owner, removes oysters from licensed ground incurs a fine of \$100, or less, or imprisonment from thirty days to six months, or both.

Special laws relating to Cape Cod were passed in 1870, and remain in force, to the following effect:

SECTION I. No person not an inhabitant of the town of Wellfleet shall take any clams, quahaugs, oysters, or other shellfish within the waters of said town, without first getting a permit from the selectmen, nor shall any person being an inhabitant of said town take any of said fish for bait, at any time, exceeding three bushels, including their shells, or for the purpose of selling the same, without a permit from the selectmen of said Wellfleet, who may grant the same for such sum to be paid to the use of the town as they shall deem proper; but the inhabitants of said town may take said fish for family use without such permit.

SEC. II. Whoever takes any shellfish from within the waters of said Wellfleet in violation of the provisions of this act, shall, for every offense, pay a fine of not less than five or more than ten dollars and costs of prosecution, and one dollar for every bushel of shellfish so taken; said fine and forfeiture imposed under this act to be recovered by indictment or information before a trial justice in the county of Barnstable.

D. TAUNTON RIVER AND COLE'S RIVER, MASSACHUSETTS.

17. OYSTER-CULTURE AND TRADE ON MASSACHUSETTS AFFLUENTS OF NARRAGANSET BAY.

PECULIARITIES OF THE SOMERSET NATIVE STOCK.—A discussion of this small district forms a natural division of the subject, since the Taunton river beds are isolated, and lying between Narraganset bay and the Cape Cod district, furnish seed for both. The river itself flows into Narraganset bay, and the region immediately about its mouth is included.

There lies in the Taunton river, at Dighton, a large rock, well known to archaeologists, on account of some inscriptions which it bears; these, though untranslated, are supposed to be the work of Norse voyagers who early visited these waters. The foundation for this supposition is very fully and attractively stated in Thoreau's *Cape Cod*, to which the reader is referred. These earliest comers were pleased to find shellfish abundant in the region, and the English settlers, three or four centuries later, record their thankfulness on similar grounds. From time immemorial, then, oysters have been natives of this district, and no such mistake as has been made north of Cape Cod could ever be put forward to deny that they are here indigenous.

LEGISLATION AND LICENSE.—It was long ago recognized that the Taunton river was a valuable oyster-property, and legal measures were early adopted looking toward its preservation. The present plan of operations came into effect about thirty years ago, and though differing slightly in the various towns bordering the river, consists, in general, of the leasing of the ground for raking and planting purposes, during a term of years, at a fixed rental. Most of the towns do this under the general law of the state, already explained in the chapter on the south coast of Massachusetts bay district (C); but Somerset had a special act in her favor, passed by the legislature in 1847, which reads as follows:

SECTION 1. The town of Somerset shall have the exclusive control of the oyster-fishery in that part of Taunton river within the limits of said town, and may sell at public or private sale * * * the right or privilege of taking oysters * * * for a term of not less than three nor more than ten years at any one term; and all money arising from such sale or sales shall be paid unto the treasurer of said town, for its use, etc. (Chapter 44.)

Beyond this, every householder has the right to take three bushels each month for family use.

The privilege of this town now rents for \$800 a year, and is owned for five years by the Somerset Oyster Company, composed of citizens of the town.

In Fall River, the lease is held by a firm from Wellfleet, Massachusetts, at \$600 a year.

In Freetown, the holder of the lease is a Providence man, who pays about \$1,000 annually for the privilege.

The lessee of the privileges of Dighton, also, is a citizen of Providence, at a cost of \$475 a year.

Berkeley rents its oyster-banks to a Somerset company at \$1,300 a year, for a long term.

Assonet is leased for ten years, with Providence capital, at \$1,225 a year.

The total income, therefore, derived by the towns along the bank of this small river, only a dozen miles long, is \$5,400. This is wholly for the privilege of raking the bottom for seed, besides which the towns reserve the right of each citizen to take such oysters from the river as he needs "for family use". I know no other district in the United States which is made to serve the public treasury so well.

In respect to this matter of leases, however, it may be said, that it was evidently the intention of the makers of the law to parcel out the privilege among many persons; but the shape of the business has changed, capital has overcome weak opposition, where it existed, and where there was a score of owners of the water-front twenty-five years ago, there is now only one. It is probably to the general advantage, however, in this case, that the business should be thus centralized.

SOMERSET OYSTERS: THE HISTORY OF THEIR DETERIORATION.—The oysters from all parts of Taunton river (the producing extent is about 12 miles long) are known as "Somersets". Formerly they were considered extremely good eating, and grew to a large size. Within the last twenty-five years, however, they have assumed a green appearance and lost quality. It is popularly asserted, locally, that this is owing to the influence of the impurities discharged by the copper works, by the rolling-mills, and by the print-works, which are situated some miles above the oyster beds. But this has been denied, on the ground that not enough of the mineral matter thus thrown into

the current could get down there to affect the oysters so seriously, and also on the better ground, that chemical analyses fail to show the presence of anything to account for the greenish stain, which is precisely that so highly esteemed a few years ago in the French oysters of Marennes, and other districts. I was assured that this greenness varied in different parts of the river, and with different seasons, and that if any oysters happened to have grown high up on the bridge-piers, or elsewhere off the bottom, they were not green at all. Just how deleterious to health these green Somerset oysters are, I could not learn satisfactorily. Nobody pretends that their effects are fatal, and some say they are as good as any other inferior oyster. The general opinion, however, is, that eating a dozen raw ones is certain to be followed by violent sickness at the stomach. No doubt prejudice has much to do with it, for there is no food which the imagination would more quickly influence the stomach to reject, than the soft, slippery, and somewhat insipid fresh-water oyster. The same green appearance occurs of late in the oysters of Seekonk river, to be spoken of later on; and in both cases transplanting entirely removes the stain and elevates the quality, which is said to be slowly improving. In consequence of this stain, the eating of Somerset oysters, in their natural state, has been nearly given up, and the whole trade of the river is devoted to the production and sale of seed. Of course no planting of any sort, beyond the occasional transference of "set" from one part of the river to another, has ever been undertaken.

CULTURE OF SEED-OYSTERS IN TAUNTON RIVER.—The number of young oysters born every fall in Taunton river varies, but there is never a year wholly without them. The season of 1877 was a good one, and about ten years previous, the autumn of "the great September gale", saw an extraordinary production, or "set", as the appearance of the young oysters is termed here. The rocks and gravel along both shores are covered to a greater or less extent, but in addition to this, every owner spreads down great quantities of clean shells every summer, in the hope of catching spawn. Generally, they are successful, and sometimes extremely so. Some experiments have been tried with sunken brush; but though the spawn attached itself well enough, the currents and winds are so strong and uncertain as to drift it all away and lose it to its owner. Perhaps 25,000 or 30,000 bushels of shells are spread in this river annually. The favorites are scallop shells, because they are thin and brittle, so that the young oysters anchored to them are easily broken apart or detached. Scallop shells are somewhat scarce, and 3,000 bushels put down at Assonet in 1878, cost \$300. The result, nevertheless, is often very gratifying. Mr. S. R. Higgins told me, that from 500 bushels of shells placed near Fall River, he took up the following year 3,500 bushels of young oysters. The annual product, in seed, of the different town-fronts along the river, is given approximately, as follows:

	Bushels.		Bushels.		Bushels.
Berkeley	11,000	Somerset	6,000	Assonet	13,000
Dighton	3,000	Freetown	10,000	Fall River	8,000
Total "Somerset seed"					51,000

Putting an average value of 45 cents a bushel on this (the sales of the Somerset Oyster Company in 1879 netted them 42 cents), gives the sum of \$22,950 as the value of the yearly crop of Taunton river seed. Of this, \$5,400 is paid as revenue to the towns, and the balance mainly to native assistants in dredging, tonging, and transportation. The river-towns may, therefore, be said to derive about \$20,000 as the annual value of their fisheries to them, besides the oysters needed "for family use". This money is widely distributed. While the law permits the raking of the river during nine months of the year, it is nevertheless the fact, that the main part of the work must be done in a much shorter time. As soon as the weather permits, or about April 1, the proprietors put gangs of men at work, and keep at it until the end of May. The catch is nearly all contracted for before it is caught, and every one is straining to fill their orders at the promised time. The water is from three to twenty feet deep, and the tonging not very difficult. The tongs used do not work by the twisting of the grain of an oaken pivot, but on a brass swivel-pivot, known as the "Somerset" tongs. All, however, do not approve of the invention, averring that it wears out the tongs. During the months of April and May, about 60 persons are employed in Somerset alone, and in other towns in proportion—perhaps 400 along the whole river—who, as a rule, live along the bank, and often own the boats they operate—if not owned, one is hired from their employer at 25 cents a day. The catching is all done by the bushel. Now from 10 to 15 cents a bushel is given, according to the scarcity of the mollusks, and a smart man might make \$2 a day, though the average will not exceed \$1 50. Formerly wages were higher: and perhaps the lowering has induced that constant effort on the part of the catchers to cheat the buyers, through false measures, etc., which is so freely charged against them.

The ground is cleaned up pretty thoroughly by the time the 1st of June is reached, and in the fall little raking is done, it being considered poor policy. A well known lessee on the Freetown shore, however, thinking, at the expiration of his lease a few years ago, that he would be unable to renew it, resolved selfishly to dredge his whole land in the autumn, leaving as barren a ground as possible for his successor—a proceeding quite characteristic of the locality. He did so, but succeeded in renewing his lease, and returned to his raking the ensuing spring rather ruefully, expecting to find little or nothing. To his astonishment, he picked off of an area that had usually yielded him 6,000 to 7,000 bushels, no less than 12,000! Hence, he concluded that the thorough scraping had done the bottom good, though where he got the spawn at that late day is a mystery. This small seed, less than a year old, and about the size of your thumb nail, is widely distributed, going to beds on Cape Cod, in Buzzard's bay, along the

southern shore, and in all parts of Narraganset. It is highly esteemed on account of its hardiness. Wonderful stories are told of the cold and heat, drought and exposure, water too salt and water too fresh, which it has survived and prospered under. There is no difficulty about selling to planters all that can be raised, and the present high prices are due to the rivalry which has been brought about between buyers. The vessels which come to carry it away are small sloops and schooners, of 30 or 40 tons, which carry from 300 to 1,000 bushels. None, I think, is sent anywhere by rail. Starfishes, nowadays, are few in Taunton river; but the borers, *Urosalpinx cinereus*, are growing more and more numerous and troublesome.

CULTURE AND PROTECTION IN SWANSEA, MASSACHUSETTS.—After leaving Taunton river, therefore, pointing westward, the first point at which oysters of any commercial consequence are met with, is in Coles river, which flows into Mount Hope bay, almost on the boundary between Massachusetts and Rhode Island. It was known long ago that oysters had inhabited this stream, and also Lee's river, near by, and immense dead shells are occasionally brought to light, but it had almost been forgotten, until a few years ago, when there was suddenly discovered near the mouth of the inlet a large bank of living oysters of fine quality. Everybody at once rushed to rake them up, evading or discarding the special law enacted in 1867 for the protection of the oyster-beds in these very rivers, and which I condense herewith:

SECTION 1. Defines the scope of the act—Cole's and Lee's rivers, town of Swansea.

SEC. 2. Penalties—fine of \$5 to \$50.

SEC. 3. Any householder, an inhabitant of Swansea, may take for family use two bushels a month; but selectmen may give a written permit for a larger quantity.

SEC. 4. The town of Swansea * * * shall have the exclusive right to and control of the residue of the oyster-fisheries in Cole's river and in Lee's river, within its limits, and the selectmen * * * shall have the right, from time to time, to sell to any person, at public or private sale, for any term not exceeding five years, the privilege of taking oysters from their beds therein * * *, under such regulations as they may in writing permit and designate. But at any legal meeting, called for the purpose, the town may, by vote, direct the limit and extent to which the selectmen shall thereafter exercise the powers herein conferred.

SEC. 5. The town may recover treble damages against offenders under this act.

SEC. 6. Any deputy-sheriff, constable or selectman may arrest and detain persons found offending.

SEC. 7. Any boat or vehicle containing oysters from Cole's or Lee's river in violation of this act, may be seized awaiting regular process of law (described in the context).

SEC. 8. Preserves the right to grant licenses for oyster-culture, and also Indians' rights.

The result of this onslaught was, that two or three seasons of it nearly extirpated the colony, and the few to be obtained now are only got by hard effort on the part of a few professional river-men, who peddle them in the neighborhood, or take them to Fall River.

The extensive banks and tide-flats of this river, however, have long abounded in young oysters, which were buried by the digging for clams, which is extensively carried on here, or frozen by the winter weather, so that few, if any, survived, and none to speak of were gathered. Lately a large gravel-bank has been thrown up by the changed currents against the pier of the railway-bridge, and the number of infant mollusks attached to the pebbles here became so great as to attract the attention of Providence oystermen, who have created a demand for this seed. It is therefore gathered and sold now, about 1,000 bushels, it is estimated, having been collected during 1879. This is hardy, of good shape, and produces a round and remarkably fine oyster. Some attempts have been made at Cole's river to plant and rear its own oysters, and the town granted areas for this purpose, but they have not been successful thus far. Litigation has resulted, in several cases, from a clashing of alleged rights, and anchor-frost and starfishes, or drifting sand, have done the rest. I fear it is not a favorable locality for this purpose.

Of Lee's river there is nothing to be said.

STATISTICAL RECAPITULATION FOR TAUNTON AND COLE'S RIVERS:

Number of planters (not counted elsewhere).....	10
Extent of producing area..... acres..	13
Number of men employed (a few days in spring)	400
Value of shore property and cultch.....	\$5,000
Number of boats employed	250
Value of same	\$5,000
Annual sales of native oysters	52,000 bushels..
Value of same	\$23,000

E. COASTS OF RHODE ISLAND.

18. LEGAL REGULATIONS OF RHODE ISLAND OYSTER-FISHERY.

ORIGIN AND HISTORY OF THE OYSTER-LAW.—When the people of "The Colony of Rhode Island and the Providence Plantations" felt themselves sure of future stability, they applied to the king, Charles II, to grant them a charter, which he graciously did in the year 1683. This charter was a wonderful document for those days, because of the well-nigh perfect liberty it embraced, and its hospitality to every conscientious belief, whatever the name of the religious banner it rallied under. Among the privileges and liberties it insisted upon was the right

of free-fishing in every shape. The relations of the fishermen to the owners of the shores were defined with great minuteness, and were calculated to make all the fish of the sea, and all the molluscous denizens of the muddy tide-flats, as available as possible to every citizen. Thereafter they were jealously preserved for public benefit. In 1834-35, for instance, the first session of the assembly at East Greenwich was distinguished by an act for the preservation of oysters, which the thoughtless inhabitants were burning in large quantities for lime; and, in October, 1766, an "act for the preservation of oysters" was passed, forbidding them to be taken by drags, or otherwise than by tongs, under a penalty of ten pounds. Parents and masters were held liable for the violation of this law by their children or servants, and the owners of boats engaged in evading it were subject to a double fine. When (and it was not many years ago) the state constitution was adopted, no clause was so scrupulously worded against possible evasion, as that which declared that in respect to the rights of fishing and of taking clams, etc., everything should remain precisely as decreed in the old charter.

The oyster-law, therefore, is based upon the principle, that between high-water mark and the public highway of the ship-channel, the land and water are controlled by the state as public property, to be administered for the greatest good to the greatest number. Rhode Islanders are extremely tenacious of these shore- and water-rights, and there has been no little quarreling over some actions of the legislators and decisions of the courts with respect to this subject; but, upon the whole, there has been little alteration of the original law. I condense it below, including all of the emendations up to 1880:

ABSTRACT OF THE OYSTER-LAWS AS AMENDED UP TO 1880:

GENERAL STATUTES. CHAPTER 132.—*Of the free and common fisheries.*

- SECTION 1. Prohibits taking oysters from the "free and common fisheries", or exposing for sale between May 15 and September 15; and north of Field's point, Providence river, between May 1 and November 1.
- SEC. 2. Prohibits one person taking more than 10 bushels of oysters a day; penalty, \$20.
- SEC. 3. Refers to quahaugs and clams.
- SEC. 4. Forbids dredges "or any other method more destructive to oyster-beds than the usual method of taking them by oyster-tongs"; penalty, forfeiture of boat and all apparatus, and a fine of \$300 upon every person engaged.
- SEC. 5. Exempts "under-rakes" from the force of section 4.
- SEC. 6. Fines any person willfully breaking up, dumping upon, or otherwise damaging any free oyster-bed; \$500 for each offense.
- SEC. 7. Prohibits planting on any private bed oysters taken south of a line from Hill's wharf to the commissioner's monument on the Seekonk shore (penalty, \$20 for every bushel); "provided, however, that the planting upon private beds of young oysters found above low-water mark, or found adhering to the shells of oysters fit for market or present use, shall not be deemed a violation of this section."
- SEC. 8. Enjoins culling, and the restoring to the bed of the shells and all small oysters unfit for market.
- SEC. 9. Forbids raking at night.
- SEC. 10. "No person not a citizen of this state shall be allowed to fish for oysters or other shellfish within the waters of this state."
- SEC. 11. Gives the shellfish-commissioners the right to "buoy off", *i. e.*, seclude any bed from being raked, when they think it is becoming exhausted, until it has again become sufficiently productive. They may also "buoy" any new beds discovered.
- SEC. 12. Enjoins proper publication of the placing and removal of buoys.
- SEC. 13. Prohibits the raking of "buoyed" beds or tampering with the buoys.
- SEC. 14. The penalties for violation of sections 8, 9, 10, and 13 are: fine of \$20 for each offense, and forfeiture of boat and all apparatus.
- SEC. 15. Persons convicted of a second offense against the oyster-laws forfeit their right to fish for three years thereafter.
- SEC. 16. Establishes Quicksand pond, in Little Compton, Point Judith ponds, and all the Charlestown ponds, except Powaget, as free-fisheries.
- SEC. 17. Enforces the regulation concerning close season (see section 1).
- SEC. 18. Repeals all previous laws inconsistent with these amendments.

CHAPTER 133.—*Of private and several fisheries.*

- SECTION 1. Provides for the election of three state commissioners of shellfisheries, by the legislature, who shall hold office for five years. [Previous to 1864 there had been one and sometimes two commissioners, serving without pay.]
- SEC. 2. These commissioners may lease, by public auction or otherwise, to any inhabitant of the state, any land "covered by tide-water at low tide and not within any harbor line, to be used as a private and several oyster-fishery for the planting and cultivation of oysters thereon", upon such terms and conditions as they may deem proper, but not for more than ten nor less than five years, at \$10 a year rent for every acre leased, "and not leasing more than one acre in one lot or parcel to one person or firm".
- [Strict adherence to this last clause is avoided by common consent, most of the leasing being done, when there is no opposition, in lots of several acres. The commissioners evade the technical obstacle by writing, "This land is leased in parcels of one acre each, but included in one lease for convenience".]
- SEC. 3. Gives the commissioners power to modify and cancel leases or to remit rent.
- SEC. 4. Forbids the letting of "any land north of a line extending across Providence river from the south side of Hill's wharf, to a freestone monument at Lyon's point in East Providence, or letting any of the ponds in Little Compton, South Kingston, Tiverton, Charlestown, New Shoreham, or Westerly, or letting Long bed, Rock island bed, Muscle island bed, or Long Neck flats, in Providence river."
- SEC. 5. Enjoins publication of applications for leases.
- SEC. 6. Gives the commissioners power to compel the attendance of witnesses, etc.
- SEC. 7. Persons aggrieved may appeal from the commissioners to the court of common pleas.
- SECS. 8, 9, 10. Define appeal-proceedings, proceedings and judgment in appellate court, and proper execution of leases.
- SEC. 11. Requires the commissioners, before granting a lease, to have the land surveyed and platted; to cause proper bounds to be set up on the shore in order to define the limits of the leased area; to see that such land is inclosed with stakes or buoys not more than two rods apart (when not interfering with navigation); and to have the plats of all the leases bound in a book.
- SEC. 12. The expenses incurred under section 11 must be borne by the lessee, and the commissioners shall receive from the applicant their necessary expenses in supervising, and \$1 50 a day for actual service.

SEC. 13. Penalties of \$20 fine and double damages ensuing for tampering with boundaries of oyster-grounds.

SEC. 14. "The oysters planted or growing in any private oyster-ground leased as aforesaid shall, during the continuance of the lease, be the private personal property of the lessee of such oyster-ground; and the taking and carrying away thereof * * * shall be larceny * * * and shall be punished accordingly; and, in addition to the penalty prescribed by law for larceny, the person convicted shall forfeit his boat * * * and all the implements used in the commission of said offense." In addition to this the owner of the oysters stolen has a private action for damages against the thief.

SEC. 15. Requires the commissioners to see that the terms of the leases are properly fulfilled and rents punctually paid; in case of failure they must terminate the leases.

SEC. 16. Enables them to proceed against delinquent lessees.

SEC. 17. "The commissioners may take possession of any lot leased upon which the rent or assessment shall not have been paid, and may dispose of such lot, with all of the oysters thereon, by public auction, to the highest bidder, upon giving one week's notice * * * in some newspaper printed in Providence."

SEC. 18. Prohibits fishing at night, under penalty of \$20 fine and forfeiture of boat and apparatus.

SEC. 19. "Any person who shall wrongfully take and carry away oysters from a private oyster-bed shall, for the first offense, be fined \$50, and for any subsequent offense shall be fined \$100 and be imprisoned for six months."

SEC. 20. Willful injury to any private oyster-bed or to any land leased for oyster-culture, subjects to a fine of \$500 and confiscation of all apparatus involved.

SEC. 21. Deprives of the privilege of fishing for three years, in addition to the other penalties, upon second conviction for offences under this chapter.

SEC. 22. Forbids taking more than two bushels of oysters a day from Trustan pond, South Kingston.

SEC. 23. Makes each of the commissioners a special constable to enforce the law and seize the property of those violating it, and similarly empowers all police constables.

SEC. 24. Declares that nothing is intended in the oyster-laws to "prevent any citizen of the state from digging clams or quahaugs on the shores of the public waters".

FORM OF LEASE OF GROUND FOR OYSTER-CULTURE.—The form of lease by which ground for oyster-culture is conveyed by the state of Rhode Island, to lessees, is appended herewith:

No. —.

This indenture, of two parts, made and entered into on this — day of —, in the year of our Lord one thousand eight hundred and seventy—, by and between the state of Rhode Island and Providence Plantations, on the one part, and —, in said state, of the other part, witnesseth:

That the said state doth hereby lease, demise, and let unto the said — a certain piece of land in —, lying and being and covered with tide-water, containing about — acre—, and bounded and described as follows, to wit:

To have and to hold to — the said —, executors, administrators, and assigns, to their use as a private or several oyster-fishery, for the planting and producing of oysters, for and during the term of ten years from the day of the date hereof, on the terms and conditions (among others) that the said lessee—, executors, or administrators, shall pay therefor to the general treasurer of said state, during the said term, the yearly rent per acre of — dollars, in manner hereinafter provided. And the said state doth hereby covenant with the said lessee—, executors, administrators, and assigns, that they may and shall occupy the premises hereby leased during the term aforesaid, peaceably and quietly, and free from all lawful claim and demand of all persons whomsoever, other than as hereinbefore or hereinafter set forth: the said lessee for —, — executors, administrators, and assigns (with a reservation of his right to claim remission or abatement, as by law provided), doth covenant with said state, that — will pay to the general treasurer, for the use of said state, the sum of — dollars, on the first day of January in each year during the term aforesaid.

Furthermore: This lease is made and accepted, *subject to* the provisions of existing laws relating to oyster-fisheries, and to a reserved right of the state to amend said laws as it shall deem expedient (reference to the same being here made); and also, *subject to* the further conditions following, to wit: First. That he shall at all times erect, place, or renew the bounds, stakes, or buoys, with marks thereon, for defining the premises, as and when required by the commissioners. Second. That he shall pay all expenses of surveys of lots, and renewing stakes or bounds, and rent, to the general treasurer, as aforesaid. Third. That he shall not underlet or assign the premises to any person whomsoever, without the assent, in writing, of the commissioners. Fourth. That he will not knowingly or willfully violate any provision of the laws at any time in force relating to the oyster-grounds or oyster-fisheries within the state; and Fifth. That, in the event he shall refuse or neglect to comply with or conform to these conditions, or any or either of them, the said commissioners may, on the part of said state, re-enter upon said leased premises and terminate the lease, and declare the same forfeited, and dispose of the lessee's interest in the said land, together with all the oysters thereon, at public auction, to the highest bidder, upon giving one week's notice of such sale in some newspaper printed in the city of Providence; and the lessee—, executors, administrators, or assigns, shall be holden to pay all damage that shall thereby be sustained by said state.

In witness whereof, the commissioners of shellfisheries hereunto subscribe the name of said state, and set their names and seals as commissioners, and the said lessee— hereunto sets — hand— and seal— the day and year aforesaid.

THE STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS,

By ——. [L. s.]
Commissioner of Shellfisheries.

Signed, sealed, and delivered in presence of—

———. [L. s.]

———. [L. s.]

Assistant Commissioners of Shellfisheries.

STATISTICS OF RHODE ISLAND SHELLFISHERIES IN 1860 AND 1865.—This general statute, in substantially its present shape, came into force in 1864. Previous to that time the state had let oyster-grounds at \$1 rent per acre, and not much business was done. The condition of the shellfisheries in 1865 is exhibited in the following table, extracted from the census report for that year.

In 1861 the Rhode Island Society for the Encouragement of Domestic Industry stated, that while the continental shore-line of Rhode Island is only 45 miles, it has 320 miles of shore washed by the tides. Five out of

the 32 towns that compose the state are situated on islands. The bays embraced within the state, and the extensive salt ponds near the southern coast, abound with shellfish.

To ascertain the extent and value of these fisheries, the society made great exertions, but without success, at the time of the general census of 1860. A statement, nevertheless, exists in the report of 1860, that the oysters of Rhode Island were valued at \$382,170, out of a total of about \$6,000,000 for all the fisheries, excluding whales. In 1865, this point was made a special feature, and much fuller information was gathered. "These statistics," says the report of the general assembly's committee, "must, from the nature of the case, depend to some extent upon estimates. For example, the clams on the shores are free to all the inhabitants of the state who choose to dig them. Persons come to the shores from all quarters, and often from distances of several miles, and dig as many clams as they choose to eat or carry home. Nothing is exactly known of the quantities thus removed. The only estimates which could be made were from the opinions of the owners of shore-farms."

I give below the table of the product of the shellfisheries, by towns, presented by the committee in 1865:

Towns.	Bushels of clams.	Bushels of quahangs.	Bushels of scallops.	Bushels of oysters.	Total value of all shellfish.
Barrington	962	457			\$2, 313
Bristol	200				200
Warren	1, 215	10			1, 225
East Greenwich.....	1, 415	339	6, 635	13	6, 313
Warwick.....	9, 127	2, 953	1, 627	242	13, 949
Jamestown.....	162	6			98
Little Compton.....					
Middletown.....	119				932
Newport.....	(Lobsters.)				2, 200
New Shoreham.....				4, 200	1, 680
Portsmouth.....	7, 715	145	500		4, 331
Tiverton.....	576	55			468
Cranston.....	200				200
East Providence.....	3, 405	820		12, 100	19, 662
Providence city.....	404	2, 966	3	50, 450	54, 122
Charlestown.....	200			1, 812	1, 515
North Kingston.....	5, 740	1, 480	870		6, 791
South Kingston.....	257		18	3, 070	3, 345
Westerly.....				7	11
Total.....	31, 697	9, 241	9, 653	71, 894	118, 655

OPPOSITION TO EXISTING LEGISLATION.—Although the amounts in the above table ought to have been doubled to represent the truth in each case, on the average, yet they show that when the new law, putting a rent of \$10 an acre and organizing the oyster-interest under careful control by the state, went into operation, the whole value of the industry was very small, compared with the present. Since the passage of this statute the oyster-interest has steadily grown in importance.

Nevertheless, there has always been more or less grumbling on the part of the owners of leases, who pleaded that they are paying an exorbitant rent. The general financial depression of 1873-76 heightened this discontent, and in the winter of 1878-79 it came to the surface in a contest before the legislature, which brought up several mooted points. The great bone of contention was the construction put by the commissioners upon who were suitable persons to receive leases. It was notorious that many Boston dealers planted oysters and operated business generally in Narraganset bay, upon ground leased in the name of some "inhabitant of the state", who might or might not act as their agent at the scene of operations. This practice was deemed by many native fishermen an infringement of law, and an injury to them. They, therefore, endeavored to procure the passage of a bill through the legislature, making it a misdemeanor for any lessee of oyster-beds to be interested with any person not a resident in the state, with a penalty of \$100 and a cancellation of the lease, for such "interested" connection.

The supporters of this bill averred that its object was to secure to the citizens of Rhode Island the right to supply the demand for oysters grown and cultivated in waters of this state, and to induce the capital invested in that business to be located here, where it and the profits accruing might be subject to taxation, and thus made to help pay the revenues of the state* beyond the mere rent money of the ground. It was claimed that it was not intended as a restraint upon trade; did not imply that no lessee might borrow capital from outside the state, or might not contract to sell his oysters outside; and, also, that it was not with the intent to create a monopoly.

The opposition to this bill was strong, and was put in tangible shape by the application of Mr. George N. Bliss, an ex-commissioner of shellfisheries, for lease of ground in Providence river, in his name, as a partner in a Boston firm. A hard fight before the general assembly and before the commissioners resulted. Those opposing him

* I am of the opinion that the capital from other states invested in oysters in Rhode Island is between \$200,000 and \$250,000.

stated that the superior capital of outsiders was securing all the ground that was good for anything, and was thus keeping away citizens who wanted to plant on a small scale in their home-waters; moreover, that the great firms could afford to undersell individual planters because of their large facilities and production, and worse than that, that they brought oysters of poor grade, already opened, from Norfolk, mixed them with Providence river oysters, and so lowered the price and hurt the reputation of the honest native dealers.

In reply, Mr. Bliss said that the law which was then before the legislature was unconstitutional, and if passed it would be impossible to enforce it. The state could not dictate whose money, or where obtained, a man should use in his business. The oysters within the state were taxable, and therefore Boston owners paid their proportionate revenue. Nor could the state say what a licensee shall do with his oysters, to whom or where he shall or shall not sell them. As to the scarcity of land, that had been the cry for ten years, yet the state was leasing from one to two hundred additional acres of ground every year, and there would be more and more leased for years to come. Instead of harm, there was a positive benefit arising from the introduction of foreign capital, since there was not money and enterprise enough within the state to successfully keep it out by fair pre-occupation of all opportunities. The more beds leased, the larger the number of oysters produced and the cheaper. The Rhode Island market, he stated, takes only one-tenth of the oysters grown in the state. The remaining nine-tenths are sold outside. The price of oysters in the Providence market has decreased each year since 1866, when the price was \$1 75 per solid gallon, to 1878, when it was from \$1 15 to \$1 20, and to 1879, when it was only 90 to 95 cents. It appeared, therefore, that year by year oysters were increasing in quantity and lessening in price. This was the result of good legislation; and so long as it continued, the state was bound to consider the present regulations proper and foster them. If the effects had been as terrible upon the resident oystermen as had been predicted, they would have been driven from the field long ago; but there is not one of them who is not still in business and annually enlarging his planting area. The state could not legislate for the aggrandizement of these few owners, but must study the general benefit of the whole commonwealth.

The result of the fight was that the bill failed to become a law, and Mr. Bliss secured his new leases.

A DEFENSE OF EXISTING LEGISLATION.—The above sketch partly answers the question, whether the law is equally wise in charging \$10 an acre. From a careful study of the case, I, myself, believe that it is. The report of the commissioners of shellfisheries for 1878, reviewing the previous twenty years, proves this quite satisfactorily. It is admitted that at \$5 an acre, for instance, the state would not have received so much money.

In 1857 the revenue from oyster-rents was only \$30. In 1858, when there was a commissioner to look after it, \$685 22. From 1859 to 1861, there appears no mention of oyster-rents in the state treasurer's reports. I believe all dues were remitted on account of the universal destruction of oysters by starfishes at this time. In 1862, there were collected \$82; 1863, \$60; 1864, \$61. Then came the present law charging \$10 an acre, and the net proceeds of oyster-rents to the state at once advanced, as follows:

1865	\$ 737 72	1872	\$2,772 95
1866	661 27	1873	4,443 88
1867	1,568 50	1874	4,997 05
1868	1,814 40	1875	5,276 00
1869	1,949 15	1876	5,300 00
1870	1,527 05	1877	6,045 25
1871	2,186 63	1878	6,582 90

This shows that, in spite of a rent of \$10 an acre, in spite of the fact of lively competition with Boston capital, in spite of the fact of the general financial depression just passed, and in spite of the steady decrease in the selling prices of all grades of oysters, the revenue to the state has steadily grown, and new leases are continually applied for. It is, moreover, an admitted fact, that assignments of oyster-ground are continually taking place, at a bonus of from \$75 to \$200 an acre. If the state is to make any alteration in this state of affairs, she would do better to advance than to reduce the rent upon productive ground.

“But,” say the dissatisfied ones, “we can never be sure that a piece of ground will be suitable for oyster-growth until we have tried it. If we take out, say ten acres, as an experiment, and perhaps are not able to plant it that year, or try it for two or three years, and then find that it won't do, we suffer a heavy loss, paying several hundred dollars upon useless ground.”

The reply is, that men constantly do find it worth while to take the risk, even at \$10. One person I know of, has applied for 100 acres, beyond any territory heretofore thought suitable; and that in case they fail, or show that they have not been able to begin to use certain land as soon as they expected, the commissioners may, and often do, remit a part or the whole of the rent. This very year rent was remitted upon 47 acres belonging to one person. However, in their report for 1878, the commissioners referred to this alleged grievance as follows:

At the present time nearly all the oysters grown on private beds are imported from Massachusetts, Connecticut, New York, and Virginia, and although oysters spawn here freely, it is only at rare intervals that there is what the oystermen call a set, when the spawn attaches itself abundantly to sticks, stones, shells, and other substances, and grows to mature oysters. If, in some way, we could stop this great waste of spawn, so that it might produce oysters, an incalculable increase in our oyster-business would naturally follow. In Connecticut the oystermen throw into the water immense quantities of oyster-shells at the exact time of oyster-spawning, and are thus very successful, as the spawn readily attaches itself to clean, bright shells. The holders of oyster-beds here say that they would try

similar experiments, but they cannot afford to pay \$10 an acre annual rent for such a purpose, especially as several years must elapse before they would get returns, even if successful, and that the Connecticut men have the advantage of paying only \$1 annual rent for each acre.

Under the present law the commissioners are not allowed to lease land for less than \$10 annual rent for each acre, and we respectfully suggest that the general assembly inquire into the expediency of granting more favorable terms to persons who may wish to experiment, with a view of making productive our annual crop of oyster-spawn.

It is probably unnecessary to say anything further with respect to the law, unless it be to state, that although not required by any express provisions of the statutes, the commissioners have always held themselves ready to attend to the prosecution of offenders against the oyster-laws, whenever reasonable evidence has been presented to them, and have prosecuted many offenders, without charge for legal services. "It is evident," they reported, "that there have been combinations for the purpose of stealing from these beds, which is done in the night-time by men in row-boats, with watchmen ready to give alarm at the approach of danger, and thus, in many instances, they are able to escape detection." The arrest and conviction of several put a strong check upon these thieves, who stole the oysters and then inflicted additional injury upon the bed-holders, by underselling them in the markets.

19. THE PLANTING-GROUNDS OF NARRAGANSET BAY.

THE EAST SIDE OF NARRAGANSET BAY.—Tradition says that oysters used to grow in Mount Hope bay proper, below the mouth of the Taunton river; but I could get little trustworthy testimony on this point. Beyond that, on the eastern side, I could not learn of any oyster-beds, ancient or modern, until I reached Newport, where now none are growing or planted (the city deriving all its supplies from Providence), but where, in some of the larger salt water ponds, they formerly existed in considerable quantities. They were described to me as a large, round, scalloped oyster, quite different from those anciently found in the pond on Block island, which were said to be long, slender, and very good. It is probable that a careful survey of ponds and inlets along the eastern bank of the Scoonet river, and around Scoonet point, would disclose the remains of many extinct beds, and perhaps some living colonies of oysters. The same may be said of Newport neck and Conanicut island.

The Kickamuit river is an inlet of Narraganset bay, at the extreme eastern boundary of the state, which has an entrance only a stone's throw in width, but expands interiorly into a bay about three miles long and one wide, the narrow upper portion of which is called Palmer's river. The water is shallow, of course, and the bottom of a very varied character. Forty-one acres have been leased, distributed among eight planters. Native oysters grew there of good size and quality, and some are got yet, but the chief value of the ground is for planting; and as yet the experiment is too slight to afford much judgment. There seems good reason to expect success, since it used to be a famous place for "set". The bottom is also said to be full of fresh springs, which is highly in its advantage.

Westward of the Kickamuit river are Warren, Barrington, and Palmer rivers, joining in an inlet of Providence river. In these three streams is leased a total of 173 acres, distributed among thirteen proprietors, some duplicating Kickamuit, Drownville, Providence, and Boston names. The shell-heaps strewn upon the knolls along all four of these rivers, show that the succulent bivalves have lived in their waters since time immemorial. Occasionally the natural oysters are still to be found; and that twenty years ago many remained, is shown by the fact that in 1860 an extraordinarily large number of infant oysters "set" on the shores. These native oysters were very large and long and slender. Their shells were not usually very heavy, and they were held in high esteem. At present there are none to be had of marketable size, and there are not enough young ones to be found in these rivers to amount to anything. Nevertheless the Warren and the Barrington are among the best places in Rhode Island, apparently, for oyster-culture. The water is wonderfully pure, sparkling, and salt, and flows in and out with a swift tide. The bottom is very hard, as a rule, and in places rocky. This fact makes the oysters there come to have a round outline, and a firmer, better substance within, though they do not grow so fast as they would lying upon mud.

A score of years ago planting was begun above the road and railway bridges, in Barrington river, and among the first leases taken out was one for the acre or two of "quick-water" between the bridges; but it is only within two or three years that operations have been extended below this part into the main river, where the water is salt, and ranges in depth from 9 to 18 feet, over a hard bottom.

The Virginia oysters bedded here do very well, indeed. They are handled mainly by one planter. His plan is to lay 75 bushels on an area 50 feet square, distributing them by shoveling overboard from the large crafts known as "planting-boats". Ten men, the usual number engaged on a single cargo, will thus unload and put upon the beds from 2,000 to 2,500 bushels a day. The Virginia oysters cost, put down, about 35 cents a bushel. On good ground the growth is gratifying, although about one-fourth of the original number put down are expected to perish. The large amount of cultch spread upon this gentleman's territory, had thus far yielded him no return of consequence, since he had planted with it only a few natives. On the contrary, another prominent lessee in Warren river, gave his whole attention to rearing native oysters, and paid no attention at all to "Chesapeakes". He procures his seed, like all the rest of the dealers, from Somerset, Wareham, Pocasset, etc., but mainly from the Connecticut shore. Formerly he got it much cheaper, but now it costs him from 50 to 70 cents a bushel. The several hundred bushels he put down three years ago lived well, and he now considers them trebled in value. He has adopted the

plan of not planting until June. "When the weather gets warm," he says, "the slime rises from the sand and rocks on the bottom of the river and floats away. There remains a clean bottom, and I wait to take advantage of this most favorable condition of things for my young oysters, who will have a hard enough time, under any circumstances, to live through it." Being fortunate enough to have a tract where the swift tide never permits serious freezing, he is able to wait until all his competitors are frozen up, when he can sell his easily accessible stock at a large advance upon the ordinary price, which averages about a dollar a bushel.

Rumstick point juts out from the southern end of Rumstick neck, a peninsula dividing the Warren river from the waters of Providence river. It is the site of a dangerous shoal, and the bottom is hard and in places rocky. There is only one owner of ground there, who leases 12 acres, but it is probable that a hundred acres more will be let there during 1880.

PROVIDENCE RIVER AND THE WEST SIDE OF THE BAY.—Proceeding now up the eastern shore of Providence river, at Nayat point (which stands opposite Canimicut, and marks the real mouth of the river on this side), 46 acres are now planted by a Providence firm. The beds are north of the point, on the sandy bottom around Allen's ledge.

The next point above this is Drownville, where the oyster-bottom is owned by three men, who divide 25 acres. Many other dealers, however, make Drownville their opening and shipping point, among them, several Boston firms having large opening-houses and shipping extensively. So many citizens, not less than 125, are given employment, therefore, in the winter, that the remark of one was justified: "Drownville would evaporate if it were not for the oysters." The starfishes and periwinkles have been troubling the Drownville planters of late more than elsewhere.

Reaching back into the country north of Drownville, and protected from the outer bay by Bullock's point, is Bullock's cove, a shallow estuary, by many regarded as the very best place to plant oysters in the whole state. It is certain that, uniformly, the best oysters now put into the market come from this immediate neighborhood. The only reason I have heard assigned is, that the bottom has many springs in it, supplying constant fresh water. In Bullock's cove 13 acres are taken up by two men; but the ground at Bullock's point (239 acres) is held by 12 lessees.

At Sabine's point, just above, there is only one owner, whose tract of 64 acres lies in a crescent between the light-house and the point. Just north, a single acre is let at Pomham rocks; and beyond, at Fuller's rocks, 9 acres are divided among four persons. This brings us to Field's point, on the western side, the northern limit of oyster-culture, and a scene of considerable operations, 23 acres being under lease to 9 persons. South of Field's point the river widens suddenly, but the channel hugs the opposite (eastern) shore, leaving extensive shallows all along the western shore. Southward from Field's point to Starvegoat island (familarly condensed into Stargut island) runs a reef which is pretty nearly dry everywhere at lowest tide. This reef was among the earliest tracts taken up by the veteran oysterman, Robert Pettis. When, about 1861, the starfishes were depopulating the beds all over the bay, he alone was so situated that he could get at them at low tide and destroy them, and his good luck was the occasion of great profit to him. At Starvegoat island the beds now operated are 27 acres in extent.

There were formerly natural oysters growing abundantly all over this part of the river; but the main deposit was just south of Starvegoat island, in the center of the tract of 160 acres, now known to oystermen as Great Bed. This in old times was the great scene of oyster-raking, and it is more than thirty years since these beds were wholly exhausted. Once in a while, then, they used to get a few enormous specimens from there, and peddle them about town at 10, 15, and 20 cents each; but even these disappeared long ago. The owners on this bed are no less than 21 in number, and at Patuxent 63 acres more are taken up by five men.

At Gaspé point, 10 acres, and at Canimicut point, 60 acres, both being in a little saltier and deeper water than any of the rest, complete the list of plantations, except one acre in Wickford harbor and another at Westerly.

In former years beds grew naturally clear up to the city of Providence, and oysters were even found in the "Cove", that pretty circle of water near the railway station, the banks of which have been converted into a park. Now, however, any leasing of ground north of Field's and Kettle points is impracticable and prohibited, because of the large amount of impurities thrown into the water by the city's drainage. The few beds up there—Long bed, West bed, Diamond bed, etc.—have, therefore, now been abandoned, and are not counted, though a few leases have not quite yet expired.

At its January session, in 1878, the Rhode Island general assembly passed a resolution enjoining the commissioners to visit the Great Salt pond (also known as Powaget pond), in Charlestown. It lies on the southern border of the state, and communicates with the open ocean by a narrow inlet, which frequently becomes closed by the shifting of the sand in the autumnal storms. In this pond the spawn of the oyster sets abundantly each year, and grows rapidly until the closing of the breach connecting the pond with the ocean cuts off the daily supply of salt water, which causes the oysters to die in immense quantities. If a permanent connection of this pond with the ocean could be secured, the natural oysters, which are of excellent quality, could be grown with great success, and large quantities of seed-oysters could be obtained for stocking the oyster-beds of Narraganset bay.

Such was the report of the examining committee, and such is the opinion of the people generally. Accordingly, the legislature appropriated \$1,500 to defray the expense of constructing a sort of riprap wall, in such a way that the currents and waves should help to keep the breach open, instead of closing it, and so maintain a constant influx

and efflux of sea-water. This work is not yet completed and tested. If it should succeed, a large, new territory will be added to the oyster-grounds of the state.

PAWCATUCK RIVER.—The Pawcatuck river divides the state of Connecticut from Rhode Island, and is subject to tides as far up as Westerly, at least. From a mile below Westerly to its mouth it is inhabited by oysters, though of poor quality, and hence of small commercial importance. These are of two sorts: one kind, the "rock-oyster", attaches itself to the rocks along the shores and in the bottom of the stream, and grows singly to a good size; the other, called the "bed-oyster", grows in dense clusters, in crowded beds, and is of very small size; it is rarely brought to market, and is considered by the fishermen worthless to transplant, on account of the clustered condition. Sufficient painstaking in the matter would, of course, overcome this objection. For some years the oysters of all kinds in this river have been affected by a disease which interferes with their sale, because, whether for good reason or not, they are supposed to be unwholesome. The disease was described to me as producing little "boils" on the body, inside the mantle, as near as I could understand. It appeared first as a greenish spot, then became yellow, and finally turned into a black, rotten pustule. Various causes are assigned, but none are satisfactory. Dry seasons, like the present, seem to augment the disease, which is perhaps a fungoid growth that finally "eats out a hole", as the fishermen say, and it is not essentially different from the "greenness" of Somerset and Seekonk oysters.

A large set occurs regularly in this river, but in some years to a greater extent than in others. Three years ago was said to be an exceedingly productive year. Young oysters were found upon everything all through the river, and upon some rocky points down toward the mouth, they were said to have been seen lying on the shore "in windrows a foot deep"; this is an exaggeration, no doubt, but gives evidence that there was a vast quantity. This was immediately following a dredging-out of the channel. Nothing of any account was done toward saving them to stock beds anywhere. Pawcatuck river is not considered suitable for oyster-bedding to any extent, unless the ground should first be prepared by paving the mud and killing out the eel-grass. There are many impurities in the water, also, arising from drainage and the waste of many mills, print-works, and other manufactories. In Ward's pond, on the contrary, a sheet of water affected by the tides, which lies four miles east of Westerly, is found a most excellent place for oysters, wild and cultivated, but the people who inhabit the shores do little themselves, and object to attempts on the part of outsiders. This pond contains between one and two hundred acres, and is nearly everywhere gravelly or sandy on the bottom, with considerable fresh water flowing in. I was told that nowhere in this whole region did oysters grow so fast, and acquire so fine a relish, as here, but not having inspected the pond myself, I cannot corroborate these glowing reports by personal observations.

AREA OF PRE-EMPTED OYSTER-GROUNDS IN RHODE ISLAND.—To recapitulate, I append a list of localities where oyster-ground is let in Rhode Island, and the areas in 1879:

Locality.	Acres.	Locality.	Acres.	Locality.	Acres.
Kriekamuit river	35	Sabine point	64	Canimicut point	60
Palmer's river	5	Pomham rock	1	Wickford harbor	1
Warren river	141	Fuller's rocks	9	Ward's pond, Westerly.....	1
Barrington river	27	Field's point	23		
Rumstick point	12	Starvegoat island	27	Total number of acres	962
Nayat point	46	Great Bed	160		
Drownville	25	Pawtuxet	63	Number of lessees	56
Bullock's cove	13	Gaspé point	10	Average tract	17.2
Bullock's point	239				

FUTURE OF THE SHELLFISH-INDUSTRY IN RHODE ISLAND.—To the question: "Is all the suitable ground in Narraganset bay taken up?" the oystermen almost always reply: "Yes". But they have been doing so for years and years, yet from 100 to 300 acres have been added to the leased area every year, and applications for more are now in. Below Canimicut point is an extensive basin, with plenty of hard bottom, entirely unoccupied, owing to the depth of the water, which, however, over large tracts, is no deeper than is planted in Connecticut. The same is true of Greenwich bay, where one man assured me a thousand acres would some day come under oyster-cultivation. Not much experimenting has been done in either of these districts as yet, however, the cost of leases and the active opposition of the scallop-interest deterring. It may be said, in general, that land enough unoccupied remains in Rhode Island to give scope to all the capital likely to be invested there for many years to come. It has been asserted more than once by the commissioners, that the revenue from her shellfisheries ought to, and in time will, pay all the expenses of the state.

20. SOUTHERN OYSTERS: TRANSPLANTING AND TRADE.

BEDDING VIRGINIA OYSTERS.—Thus far the bedding and fattening of Virginia oysters, mainly to be sold opened, has been the most profitable branch of the business. Of these oysters about 500,000 bushels are laid down annually, at present. The vessels employed in bringing them are mainly owned on Cape Cod, and have already been named. None, so far as I could learn, hail from Rhode Island ports. The freight is about 15 cents a bushel, in the fall and winter, falling to 12 and 10 cents in the spring, when quicker voyages for planting purposes can be made. What part of the Chesapeake bay furnishes the best oyster for these waters is a question that has received much attention. One gentleman told me that he had lost the whole of two years' labor, by trying to put down

cargoes from the Rappahannock. Another planter, equally experienced, said these succeeded well enough if brought here and planted before the weather became at all warm. Oysters from the St. Mary and Potomac rivers are troublesome, because mixed with many obnoxious mussels, and, besides, they do not grow well, as a rule. Those from Tangier sound are pretty good, and are largely bought. The general verdict, however, is, that the best Virginia oyster for this bay is to be had in the James river. These show the largest growth at the end of the season, developing a hard, flinty shell and white meats; on the contrary, I was told that at New Haven, Connecticut, the James river oysters cannot be used at all. But many cargoes are planted here, the exact southern home of which is never known.

The laying down of southern oysters must all be done early in the spring. If they would only survive the voyage as late as June, Mr. Bourne thought that month would be the best time to plant them. When I suggested the use of steamers to expedite the transfer, he said it would not help matters, for the jarring of the cargo, caused by the throb of the engine, would kill the mollusks; he did not even allow any wood to be split on his oyster-vessels, for fear of this species of damage. Of the half a million bushels bedded in Rhode Island yearly, about half are owned in Boston.

TRADE IN NORFOLK OPENED OYSTERS.—During the winter of 1878-'79, the Norfolk opened oysters were brought to Providence in large quantities, by several dealers. The following is a statement of shipments, furnished by the steamship company:

Oysters shipped from Norfolk to Providence, Rhode Island, via Merchants' and Miners' Transportation Company, during 1878 and 1879.

Month.	1878.		1879.	
	Bushels.	Gallons.	Bushels.	Gallons.
January.....	261	1,727	1,983	930
February.....		103	3,210	53
March.....			2,262	
April.....			3	1,742
May.....				36
September.....		10		37
October.....		347	153	1,930
November.....		802	1,737	3,923
December.....	1,362	353		
	1,623	3,342	9,348	8,651

The result of this experiment was so unsatisfactory, however, that the importation of this opened "barrel-stock" has been almost wholly abandoned. What now comes (so it is darkly hinted) is chiefly used to adulterate genuine "Providence rivers".

21. NATIVE AND SEED-OYSTERS.

DEARTH OF YOUNG OYSTERS IN RHODE ISLAND.—The fattening of Virginia oysters is only half the business, though, perhaps, the most profitable part, in Rhode Island. A vast number of "native" oysters are raised in Narraganset bay, though but a portion of them are born there. There are only a few places in the bay where a "set", as it is called, occurs with any regularity or of any consequence. In the Warren and Barrington rivers it has not happened for twenty years, and the same is true of the whole eastern shore, except Cole's, Kickamuit, and Seekonk rivers. Providence river itself never produces young oysters now, nor does any part of the western shore, except Greenwich bay and the ponds in the extreme southern part of the state, deriving their salt water directly from the Atlantic. The cause of this dearth of spawn and seed, where once every shore was populous with it, can only be ascribed, I think, to the antecedent disappearance, through persistent raking, of all the old native oysters. In Cole's river a heavy "set" occurred three years ago, and from 500 to 1,000 bushels are obtained every year. In the Kickamuit, the shores are dotted with infant ostreae annually, and supply the planted beds there, while old oysters of very good quality are not infrequent. In dredging back and forth throughout the whole extent of Greenwich bay, the scallop-fishers frequently take up large oysters, evidently "to the manor born", and they are now and then seen on the shore-rocks. About 1872 there was a very large "set" here and in Potowomut river, just below. Boats came down from Providence and elsewhere and were filled again and again. But all of the crop left was swept away by starfishes, which were then very abundant, or was buried beneath drifting sand and wrack, and so no establishment of a natural bed there was possible. If these young oysters were not all picked out of Greenwich bay in the fall, they would live through the winter, even where the ice rested fully upon them at low tide, and would soon repopulate the bay. But now their annual value to any one is insignificant and constantly decreasing.

THE SEED-OYSTERS OF SEEKONK RIVER.—There remains one river, nevertheless, where, under protection, the oysters are able to reproduce regularly every year. This is the Seekonk, which flows down past Pawtucket and Providence, with East Providence on its left, and numerous bridges and small shipping to worry its swift tides. The Seekonk has always been a favorite home of the oyster, and year by year the river contributes its quota to the tongers, through a space from the Wicksbury pier to nearly five miles above. This is due largely to the fact

that the oysters of the Seekonk, like those of the Taunton river, are vividly green. No better reason can be assigned than in the former case, and, like the others, this seed, when transplanted for a few months, entirely loses its verdant tint. Seekonk oysters, therefore, never go to market, but are all caught for the seed. This catching begins November 1, according to law, and must close on May 1. These dates are arranged with the purpose to prevent successful planting, and so protect the fishery; but the planters buy as long as the weather remains "open" and warm. Very little raking is done in this river in the spring. The men who catch it are rivermen, who work at this a few weeks in November and December, and the rest of the year do other water-work. The law forbids taking more than 10 bushels in one day to each boat, but if the seed is plentiful, this law is very often violated, since there is no officer to watch. Perhaps it is a direct good effect of these regulations, that 1878 and 1879 have witnessed the largest yield of Seekonk seed known in a dozen years. The main buyers are Wilcox, Browne, Wall, and Adams, of India point; but everybody buys a few bushels who can. The catchers have to take what pay is offered them, but competition sometimes produces a good rate, the usual price being 25 cents a bushel. This being public ground, and everybody having a chance at it (many of the heavy owners send spare boats and crews up this river to rake at odd times), it is impossible to come at any close estimate of the amount of seed oysters taken from the Seekonk during the last year. The truth I believe to be somewhere between five and ten thousand bushels. It is a shapely, hardy seed, opening well, and is in general demand, some planters putting it at the head of the list for its good qualities. One year on its new bed suffices to remove totally the green tinge, and two years to make it marketable.

SEED-OYSTERS FROM ADJOINING STATES.—The remainder of the seed-oysters planted in Narraganset bay come from the Connecticut shore, East river, Fire island and the Great South bay, Somerset (planted chiefly by those owning privileges in Taunton river), and from various parts of Buzzard's bay. I often asked which was best, but could never get evidence of much superiority in any one kind. The success of a planting does not depend on the kind of seed put down, so much as it does upon a thousand circumstances of weather, water, and bottom. The seed which would do excellently in one cove would behave badly in the next, and *vice versa*, individual preferences being founded upon these varying and unexplained experiences. The seed from the south shore of Long Island used to be cheapest of all, and good; but a Boston demand ran up the price beyond the pockets of Rhode Island planters. In general, it may be said that any seed transplanted to Narraganset bay develops into a better oyster than it would have come to be if left in its native waters.

UNDECIDED QUESTIONS IN OYSTER-PLANTING.—Similarly, it is hard to tell what has been the outcome of a particular planting—that is, how much profit is made—because it is inextricably mixed with various other work. Native seed put down and ready to grow, has cost on an average about 60 cents a bushel. To estimate profits on it is out of the question, until the oysters are all sold, nor even then. If all does well, treble value is calculated upon in three years' growth.

It is not even decided whether it pays best to grow "natives" or fatten "Chesapeake". The first year you plant a piece of ground the oysters do the best; the next year poorer; the third year they fail. Consequently, the oystermen try not to plant the same area continually, but shift their oysters around to allow the old ground to be revived by free contact with the rejuvenating sea. If left down in one place more than three years, it is said that many of the oysters die, from no reason but exhaustion. It is the universal opinion, that the character of the bottom has quite as much to do with their nourishment and good growth as has the water. On sand they grow slower than in mud, but are of better shape and flavor. Similarly, they need to be far enough apart not to crowd one another into deformity.

Much ground that is not now suitable might be made so, but needs to be carefully prepared, if the planter has any hopes of catching spawn,* and the more intelligent say that carelessness in this respect, and a lack of any source of spat, is the reason why in the Warren river and at other points no "set" has occurred for many years, and the depositing of cultch, in the shape of old oyster-shells, has been in vain. It is found on the seed-grounds, that the more a spot is raked (not denuded by a dredge, but often raked), the more it produces. Cat point, Seekonk river, is one example of this; Somerset, after the fall-dredging, is another instance. To prepare a muddy tract, you need to pave it with shells. This is done early in the spring, 10,000 bushels of shells, say, being thrown on, at an expense of from \$250 to \$300. Then in June, when the shells have settled well into the mud and formed a strong surface, throw down more clean shells, and scatter a quantity of large living oysters just ready to spawn—100 bushels of "mothers" to three or four thousand bushels of shells. Scallop-shells make the best stools or cultch, because they are thin and brittle, and can easily be broken away from the seed when it is to be taken up and transplanted. You thus have the source of spawn, and its most suitable resting place, side by side.

Great success in several instances has followed this plan, particularly in Greenwich bay and Apponaug cove, so far as the catching of spawn is concerned. One planter told me that he put down, in 1877, about \$125 worth of cultch and mother-oysters at the latter place, and calculated that he obtained, in a few weeks, \$10,000 worth of seed; but a little later it all died—why, he is unable to guess. Another gentleman, at the same place, last year, put down 1,600 bushels of shells and 60 bushels of spawning or mother-oysters. In the immediate vicinity of these he got a

* The very meager account given of this form of true oyster-culture is supplemented in the chapters G and H on Connecticut and the East river, where the process is carried to a much greater degree of perfection.

good set; but on a closely adjacent bed, where there were no "mothers", not a young oyster was to be seen. He had had the same experience in the Kickamuit. On the other hand, the simple tumbling over of shells in the hope of catching drifting spawn, has proved almost universally a failure here. One man told me he had planted shells steadily for thirteen years in Providence river, and had got only one set worth mentioning.

NATIVE OYSTERS AT BLOCK ISLAND.—On Block island, many years ago, there was an abundance of small oysters living in the pond that occupies so much of the interior of the island. For some reason, however, they were rarely found in a fit condition for food, but would serve to transplant. The oystermen at Clinton, Connecticut, and elsewhere, used to buy them, the price being 25 cents a bushel, delivered at their destination. The shells of these Block island oysters were so delicate, one planter told me, that it was easy to pinch your thumb and finger through them, and often there would be so much air and fresh water held within their half-vacant shells, that they would float when thrown overboard in planting, and drift away. All these oysters long ago disappeared, and no cultivation has been tried to replace them.

Returning northward, I find that, at Bristol, several attempts to raise oysters have failed, and that the markets of this ancient and beautiful village are now supplied by Providence.

22. ENEMIES OF THE OYSTER IN NARRAGANSET BAY.

MEN AND STARFISHES.—The active enemies of the oyster in these waters are five: human thieves, popularly known as "ten-fingers"; starfishes, or "five-fingers"; winkles, drills, and annelid worms. I will not dwell upon these here, because the subject is fully discussed in another chapter devoted especially to these pests. Stricter measures of both guarding and punishing have, of late, put a stop to the stealing to a great extent. The starfishes have not been seriously troublesome, except in limited spots, since their memorable visit in 1860 and 1861, when they all but extirpated the business, and compelled it to move up to West and Diamond beds, now abandoned, where the water was too fresh to permit the starfishes to follow, and where a heavy fall of snow came to the aid of the oystermen, and finally killed the five-fingers, by freshening and chilling the water beyond their endurance. During the last two or three years, however, starfishes have become more numerous, particularly in the Bullock's Point region, and have done much damage.

MOLLUSKS AND WORMS.—The winkles, or "wrinkles", *Sycotypus canaliculatus*, seem also to be on the increase, and commit considerable damage. In many parts of the bay drills, *Urosalpinx cinerea*, occur abundantly, and rapidly destroy the seed and younger oysters, not attacking the old ones so readily. In Taunton river, a few years ago, this little mollusk made clean work, eating nine-tenths of all the seed between Somerset and Assonet. In Pawtuxet, this year, the oystermen have been greatly troubled by multitudes of annelid worms, *Serpula*, whose tortuous, cylindrical cases are formed thickly upon every shell, and serve to collect a coating of cases, sand, mud, etc., which is often half an inch or more thick. This is known locally as "sanding-up" or "loading", and under its infliction the mollusks suffer greatly in quality, probably through the fact that the parasitic worms, which feed upon the same organisms as the oysters, extract much of the nourishment from the water, which otherwise would go to make them fatter. One or two other minor animal agencies inimical to the oyster are at work all the time.

23. STATISTICS OF THE OYSTER-TRADE OF RHODE ISLAND.

CAPITAL INVESTED.—The amount of capital invested in this district it is almost impossible to come at. It probably approaches \$1,000,000, including perhaps \$300,000 or \$350,000 worth of seed-oysters growing on the beds. One-third or more of this property is owned in Boston, and the necessary money for carrying on operations comes thence, but is represented by men who also do more or less private planting on their own account. Of course this is chiefly in the hands of a dozen or more planters on the list; the forty or fifty others will not average a greater sum than \$1,000 each invested in this business, which is chiefly conducted personally, close to their bay-side homes, and without hired help, by selling to home-shippers. The expensive warehouses required by some of the wholesale dealers and shippers in the city of Providence count largely in the estimate of capital involved; and the boats used are of a good class.

YIELD AND VALUE OF THE OYSTER-BEDS.—The yield of the beds and its value, appears in the following table:

	Bushels.
1879. Native oysters produced on beds owned in Rhode Island	103,200
Southern oysters, ditto	274,300
Native oysters produced on beds owned out of the state	40,000
Southern oysters, ditto	233,000
Total Narraganset production	660,500

The total value of this, and some additional annual business, will amount to at least \$600,000, at the original wholesale price paid the producer.

PRICES AND WAGES.—The prices at which oysters were sold by wholesale dealers in the city of Providence, during 1879, were the following: Virginias, in shell, selected, \$1 to \$1 25 per bushel; Virginia plants, common, 90

cents per gallon; Virginia plants, selected, \$1 25 per gallon; natives, in shell, \$1 25 to \$1 50 per bushel; at retail, 25 to 35 cents a quart, of all kinds. Some "fancy" lots, of course, brought higher rates than these prevailing market prices. In "Arnold's" and other restaurants the most palatable oysters possible are laid upon the counter to tempt the appetite. Those from Gaspé point, purely native-grown, are recognized as the very best of all, and sell for five cents a piece. They are delicious. So great an industry, of course, gives support to a numerous body of citizens in this district, at least during part of the year. In the summer so little is done that comparatively few are employed, this number including only the proprietors of beds, the dealers and assistants who are obliged to keep their shops open, and the few men required for catching oysters for the feeble market, for spreading shells and planting seed, and for watching the safety of the beds. Reckoning the proprietors as perhaps 100 in all, the addition of the rest employed the year round would bring the total up to about 250; but this varies considerably from year to year. They are paid by the week, as a rule, wages running from \$7 to \$14, and averaging about \$10. For the colder half of the year, "the season," as it is called, large additional help is needed, both on the water and in the opening-houses that are placed close to the shore at various points, or on the wharves in the southern part of Providence city. Taking all the oyster-houses together at the head of Narraganset bay, I find about 350 openers employed. Add this to the 250 counted up as otherwise employed, and I have 600 men as the total. A very large proportion of these men are married; and I believe it would not be unfair, all things considered, to multiply this 600 by 4, which would give us 2,400 persons of all sexes and ages supported chiefly by the oyster-industry in the Rhode Island district. I believe this is short of the truth. The sum of the wages paid is somewhere about \$125,000 annually.

OYSTER OPENERS AND THEIR METHODS.—Separating the meat from the shell is known in Providence as "cutting out" an oyster. The "cutters" or openers are taken from a low grade of society, as a rule, and are about one-half foreigners, mostly natives of Ireland. During the summer many of them go "bony-fishing", *i. e.*, in chase of the menhaden, *Brevoortia tyrannus*, others get a living in various capacities along the shore and on the water, and a large portion of them are common laborers. No women are employed here in the opening houses. I was told that an experiment made in employing them some years ago was regarded as a failure. Very few boys are to be seen, also. Here the only method followed is that known as "side-opening". The opener holds the oyster in the palm of his unsupported left hand, which is protected by a sort of gauntlet of leather, while he pries the shells apart with his knife. This is a quicker method than any other, but it is very laborious, causing a hard strain upon the muscles of the hand and wrist, and upon those of the left side. It has an advantage, however, of producing less breaking and refuse than any other style of cutting out. The oyster-meats, nevertheless, are carefully washed by being stirred about in large collenders, through which clean water is running. This gets rid, at the same time, of course, of all the natural moisture or liquor of the oyster, and the result is known as "solid" measurement.

The payment for opening oysters is made at the rate of so much per gallon "solid" or "in liquor", as agreed upon; if the former, 12 cents is the usual price the present season; if the latter, 17 and 20 cents is demanded. From \$1 to \$2 a day is earned while work lasts. The amount of difference between a gallon of oysters measured "solid" and one measured "in the liquor", depends on the condition of the stock. It is the universal complaint this year, that all Rhode Island mollusks are "opening poor"; that is, there is too much liquor and too little meat in the shells. This is universally attributed to the fact that the present autumn (1879) has been very dry; more rain would have made the oysters "fatter". At present it takes three liquor-gallons to make two solid ones, at their best; but in some years the difference is almost nothing, and then the oystermen will say: "You couldn't press the meat back into its own shell, after opening," so rich and elastic are the juicy bodies.

STATISTICAL RECAPITULATION FOR RHODE ISLAND:

Number of planters	100
Number of lessees in 1879	56
Extent of ground cultivated	acres.. 962
Value of same (about)	\$15,000
Value of shore-property (about)	\$75,000
Number of boats engaged	100
Value of same, with outfit	\$20,000
Number of men hired by planters or dealers through the whole year	150
Annual earnings of same	\$75,000
Number of men hired half the year	350
Semi-annual earnings of same	\$50,000
Number of families supported, exclusive of retail-trade, about	500
Annual sales (1879) of—	
I. Native oysters	bushels.. 148,200
Value of same	\$205,500
II. Chesapeake "plants"	bushels.. 274,300
Value of same	\$200,000
III. Fancy stock	bushels.. 15,000
Value of same	\$20,000
IV. Baltimore and Norfolk "opened stock"	gallons.. 8,650
Value of same	\$5,000
Value of oysters raised in Rhode Island, but owned elsewhere	\$250,000
Total first value of all oysters produced in Narragansett bay, annually	\$680,500

F. COAST OF CONNECTICUT.

24. OYSTER-INDUSTRIES EAST OF NEW HAVEN.

NATURAL AND ARTIFICIAL BEDS NEAR NEW LONDON.—The extreme eastern point on the Connecticut shore where any oysters occur, is in the neighborhood of New London. A few miles east of the mouth of the Thames, in the township of Groton, is an inlet and river known as Pequonock. In 1877 several gentlemen leased about 35 acres of ponds on the east side of this river. In one of these ponds, containing about 15 acres, native oysters grew upon the rocks and around the edges. A portion of the bottom of this pond they prepared for oyster-raising, by spreading scallop-shells over six acres, and gravel and beach-sand over two acres. Here they planted some 2,500 bushels of seed from Stony Creek, Clinton, and Fair Haven, Connecticut, at a total expense of between \$4,000 and \$5,000. These oysters have grown finely, but as yet few have been taken to market. This year (1879-'80) has been a comparatively poor one for them.

The oysters in Pequonock river are deep and cup-shaped, not of large size, and with a thin, white, flinty shell. Locally, they are very highly esteemed. Another locality where this firm has undertaken oyster-cultivation, is in the Niantic river, an inlet just west of the Thames, where they have had 20 acres set off for the purpose, and have already planted some seed. In Alewife cove, between Niantic bay and the Thames, they have also several acres of ground which they purpose preparing in the near future. A few oysters are now being put upon the market from these ponds, and have met with a good reception, at high prices. These planters believe that a grand success awaits them: others assert that the waters are unsuitable, and that little of importance will result. Three persons are employed.

In the river Thames, years ago, were great numbers of indigenous oysters. Thousands of bushels were annually obtained for the markets of the neighboring towns. These oysters were of good quality, and generally of immense size. Planting, however, was never a success, owing to the great freshets which often sweep down the river, and also owing to the impurities that are cast so plentifully into the stream from the drainage of the towns and from multitudinous factories along the tributary streams. Nevertheless, a few native "Norwich river" oysters are annually caught, except in the close season, between March 1 and November 1, and there are half a dozen persons in Norwich who deal in them and in other oysters, but the whole city's trade, probably, does not amount to 10,000 bushels a year of "natives" and "Chesapeakes" combined, and is decreasing.

At New London, the oystermen own ground at Bullock's point and Drownville, in Providence river, Rhode Island. Upon those tracts, in 1879, they bedded about 15,000 bushels of Virginia oysters, in addition to receiving a winter's supply of 35,000 bushels. New London and its neighborhood also consumes about 700 bushels of fancy oysters annually, mainly brought from Providence, Rhode Island. The prices at this point, in 1879, were, for southern oysters, 80 cents to \$1 a gallon; for native stock, 50 cents a quart, or \$1 60 a gallon, wholesale. Twenty cents a solid quart is paid for opening.

There are employed here in the winter months 12 men on oyster-vessels and 25 men on shore, besides the principals. These are mostly heads of families, who engage in menhaden-fishing in summer.

OYSTERS IN SAYBROOK.—Moving westward from New London, the first village of consequence is Saybrook. There is a small stream here called Oyster river, that produces a variety of the bivalves after which it is named, which are said to be of superior quality. Mr. John N. Clark kindly made inquiries for me, and reports that the production is trifling. Fifteen or twenty persons engage in these native fisheries at odd hours, getting so few bushels each, that the total gathered in the whole season will probably amount to no more than a hundred. Five years ago the town appointed a committee on the subject, and several persons received grants of land for the purpose of cultivating oysters, but the obstacles (chiefly thieving) were so many that no one has persisted in the attempt, either to bed southern oysters or to raise native stock.

OYSTERS IN CLINTON.—At Clinton, a little village settled under the name of Kenilworth (afterwards corrupted into Killingworth), at the mouth of the Hammonaset river, the oyster-business is of long growth, and is somewhat peculiar. The harbor, in old times, contained an abundance of large, succulent oysters, but these have been all-but exhausted in one way or another. About twenty-five years ago the planting began in the harbor, the seed then used being caught mainly at home or brought from Block island. The harbor, at present, contains about 200 acres suitable for oyster-growth. Formerly there was much more, but a few years ago the sea made a breach through the peninsula which incloses the harbor, by which the southerly storms are given so fierce an entrance into the bay, that any attempt at oyster-work, or even at navigation, over much of the water-space, is rendered utterly futile. If this breach, locally known as the Dardanelles, could be filled up—and the cost, I was informed, would not exceed \$1,000—a thousand acres, or more, would be added to the oyster-bottom. The bottom is hard, the water nowhere too deep for tonging, and of about the right degree of freshness. Mud and sand drift so badly in winter, however, that no oysters can be left down during that season. The practice, therefore, is to put down not only Virginias, but natives of so large a growth that they shall be marketable the next winter. Years ago a much larger number

of Virginia oysters were planted than at present—often 20,000 bushels—but the business has changed, until now only 8,000 bushels a year are demanded. The freight from the Chesapeake is 12 cents a bushel, and the following four schooners find employment: J. H. Chaffee, 130 tons; Mary Stow, 160 tons; G. A. Hayden, 108 tons; Helen P., 146 tons.

A fair “set” occurs in Clinton harbor every year, and in 1877 there happened a very heavy one. A certain quantity of this survives, and about 1,000 bushels are utilized annually. The majority of the “native” oysters, however, are raised from seed bought along the shore to the westward, that from Norwalk being preferred. This costs from 75 cents to \$1 a bushel, and is planted in April. It is ready to take up late in the following autumn, and has grown rapidly, and into handsome shape. The quality, also, is most excellent, such oysters selling for from \$1 to \$1.50 a bushel, at wholesale. The annual production of this stock amounts to 2,000 bushels. The only enemy of the oyster here is the drill; but this is sadly abundant.

To recapitulate, Clinton produces annually—

	Bushels.
Of southern plants, about	8,000
Of Connecticut plants, about	2,000
Of native oysters, about	1,000
Total.....	11,000

The total investment here, which at present will not exceed \$10,000, is divided among about fifteen planters, and affords a partial livelihood for perhaps a score of families.

The bottom of the margin of the sound off the villages of Madison and East River has been staked off to a considerable extent, but is utilized by only one firm of oyster-producers. Mr. Elihu Kelsey has kindly reported to me, by letter, upon the extent of their operations. Their beds consist of six acres or more, and are near a small island called Overshore. This area is protected on its southern side by high reefs of rocks. They have a second bed of about 12 acres extent, a mile and a half eastward near Tufas island, in 20 feet of water, with hard, sandy bottom, where they are experimenting. They also own a third bed near Guilford harbor of 24 acres, on which they have spread “2,000 bushels of shells and a good many small stones, on which the oysters ‘set’ and grew for four years, and were the best in the world; but the water is too shoal without artificial protection, and the storms and thieves have ruined the bed”. As not enough “set” is caught upon the stools, a thousand bushels or so of seed-oysters are annually raked from the natural beds in the vicinity of East River, or bought from dealers in Stony Creek and New Haven and planted upon the beds. These various beds yielded, during 1879, about 1,200 bushels, the most of which were sold in the shell at \$1 to \$1.50 per bushel. For opened oysters \$1.60 a gallon was received. No southern oysters were handled in any shape. In respect to the drawbacks and general condition of the business at East River, Mr. Kelsey writes: “The first drawback to success is the lack of good protection from storms which might be remedied by the construction of a breakwater. The second is the constant alteration of the state laws designed to protect the industry. The third drawback is thieving. The present condition of our producing beds is good; and the prospect is, that with plenty of hard labor our venture will be remunerative. We find the character of the soil to be of the greatest importance. On our producing-bed the mineral ingredient of the soil is iron. This renders the oysters healthy and of the finest flavor, so that our customers say they cannot be excelled.”

OSTER-CULTURE IN GUILFORD.—At Guilford some inshore ground is cultivated, but this is not of great capacity. Outside, west of Goose island, they have improved about 160 acres in water from seven to ten fathoms deep, upon a hard, sandy bottom. This outer tract has not as yet had time to yield much. The spreading of shells in the hope of catching spawn, appears futile, for the sufficient reason that there are no living oysters in the vicinity to produce the spat. A large quantity of seed has therefore been placed on this area. This seed was procured partly in the Guilford river, although there is great opposition to its being taken, and has largely been bought in the western part of the state. Besides this, several hundred bushels of large-sized oysters have been scattered among the planted shells, to produce the spawn which it is desired to catch. A small set has already been obtained, and next year some harvest will begin.

The oysters heretofore and at present obtained at Guilford, from the artificial inshore beds which have been in existence for thirty years, are of large size and fine shape. Their flavor is excellent. Formerly they were sold regularly to Hartford buyers at \$8 and \$9 a barrel; now, however, they are worth only \$4 to \$5. About 800 bushels a year comprise the total yield at present. No Virginia oysters are planted at Guilford. Experiments showed that the practice was not successful. The great drawback upon the inshore ground is the drifting of sand and mud, which is likely to occur in storms; the drills, also, are troublesome, but I did not hear that starfishes had caused much damage thus far.

The native river-oysters at Guilford formerly lined the whole river, opposite the town, for three or four miles. A town-regulation early prohibited the taking of more than two bushels a day by one person, but this has been more or less evaded, and now the fishery is of little value, all the oysters taken being very small; yet there is so strong a popular prejudice against utilizing any of this product in seeding the artificial beds, or against allotting

the suitable ground in the exhausted river for cultivation, that the town voted to not avail itself of the privileges granted by the state, in general statutes, which are as follows:

SEC. 12. "The selectmen of Guilford may lease, for not exceeding ten years, all ground of the town in East and West rivers, suitable for planting or cultivating oysters, to the highest bidder," at public auction; but no lease shall be made to any person of more than five acres, nor to a minor. "The leases shall be executed by the selectmen, as deeds of real estate, reserving to said town the rents for such grounds, * * * and any lessee shall, during the term of his lease, be the owner of all the oysters thereon, but shall not take any oysters therefrom in the night season."

This ratification, as I have stated, was refused, and a two-bushel protective regulation was made instead.

About 600 acres of land have been set apart for oyster-cultivation in the waters of the sound, outside of this harbor, besides that already mentioned near shore. No improvement, however, has yet been made upon this area.

OYSTER-CULTURE IN STONY CREEK.—The next point of oyster-culture is Stony Creek, where the large collection of islets known as The Thimbles affords excellent opportunity for planting and raising. Organized business here is of comparatively recent date, but native oysters of extra quality were always to be had for the raking in the harbor. The largest dealer is the Stony Creek Oyster Company, N. P. Miner, president, which was established in 1868, and now owns 400 acres of ground devoted to the growing of oysters, and has a capital stock of \$42,000.

The Stony Creek Oyster Company raises annually about 15,500 bushels of natives, and employs six men. All the stock is sold in shell, shipping in barrels, and opening little or nothing. The other persons engaged in planting have spent a good deal of money here in getting the foundation of a business laid, but with small actual results as yet. There is also a large class of citizens who cultivate for personal use, or sell to a trifling extent, and so get a partial support out of the industry. It was very difficult to gather any exact or approximate figures, therefore, outside of the oyster company's report; but I judge that all the other producers together, added to the 15,500 bushels reported by President Miner, will not bring the total production of Stony Creek, in 1879, above 20,000 bushels.

The prospects at this point seem very good. Some large sloops are employed in dredging, and it is proposed to employ steam very soon. An air of unusual thrift is observable about the oyster-houses on the shore, which do not, as is too often the case, disfigure the pleasant scene. Stony Creek is a favorite source of seed-supply to the planters of Rhode Island, and probably one-fourth of the year's yield is sold in the spring for this purpose, the purchasers sending sloops to be loaded. Stony Creek beds had a good set in 1879, very little in 1878, but a massive collection of spawn in 1877. The great obstacle to success along this part of the coast, is the lack of smooth, hard bottom, and the liability of the ever-present mud, to be moved about and settle upon the oyster-beds in such quantities as to kill the young and stunt the old ones. The oysters grow in clusters, and are likely to be of large size, long and slender, forming "coon-heels" and "razor-blades". They are so clogged with mud when brought ashore, that a stream from a hose must be turned upon the heap before the clusters can be broken apart, preparatory to the culling for size.

OYSTER-CULTURE IN BRANFORD AND EAST HAVEN.—At Branford, a few miles westward, about the same state of things exists, and there are some additional discouragements, making the prospect less bright than at Stony Creek. Some who have tried it assert, that Branford is good for nothing as an oyster-nursery, but others have a brighter faith. It formerly had more prosperity than at present, in this line. The river was a great natural oyster-bed, but has now become nearly depopulated, and it is hard to get any seed for the outer beds. The starfishes are reported to have damaged the beds very greatly in 1878, and the drill is an ever present enemy. Southerly storms often bury the oyster-beds here wholly out of sight. This misfortune happened to one planter, after an expenditure of over \$1,200 on artificial beds inside of Stony island. The whole product of the locality last year, was about 3,500 bushels, and half a dozen families are supported. Off Branford and East Haven's coast, in the deeper water of the sound, more or less ground has been granted to strangers, but the results are nothing, as yet.

At the village of East Haven about 80 acres are under cultivation in the off-shore waters of the sound, devoted wholly to native oysters, for which seed is procured from neighboring beds, or spawn is caught on planted shells. In 1879 the catch was 3,000 bushels, all of which were sold in the shell at an average price of \$1 per bushel. It is supposed there remain 20,000 bushels of oysters on the ground, subject to risks from heavy storms and creeping enemies. The mode of catching is by dredges at all seasons, and three men find employment at \$2 wages per day.

STATISTICAL SUMMARY FOR EASTERN CONNECTICUT.—Recapitulating the statistics of this eastern district of Connecticut, we find the following result for 1879:

Number of acres improved, about	900
Number of families supported, about	109
Number of bushels of "natural growth" oysters marketed, about	8,700
Number of bushels of southern oysters used	65,000
Number of bushels northern planted oysters sold, about	34,000
Number of vessels engaged: schooners, 6; sloops, 20	26
Amount invested in fixtures, etc., about	\$75,000

25. EARLY OYSTER-TRADE AT NEW HAVEN.

ABUNDANCE OF OYSTERS IN FORMER DAYS.—New Haven is one of the principal depots of the oyster-trade in Connecticut, and in the United States. With New Haven, however, I include Fair Haven, South Haven, West Haven, and Milford, since the business all around and off the mouth of the harbor is substantially united.

From the earliest times the borders of the Quinepiac river, on the eastern boundary of the city of New Haven, have been the scene of oyster-operations. Shell-heaps along its banks show how the aborigines sought in its waters, season after season, the best of bivalves, and the earliest settlers followed their example. Natural beds of oysters were scattered over the bottom of the whole river for three miles, clear up to the North Haven salt meadows, and at intervals along the eastern shore of the harbor, where favorable coves existed. At all points these mollusks were convenient of access. The result was that the raking of oysters in this river, and along the eastern shore of the harbor at its mouth, which was a free privilege, was early adopted as a business by many persons who lived near the banks, and a considerable retail peddling-trade was thus kept up throughout the neighborhood, in addition to the home-supply. Wagon-loads of opened oysters in kegs, traveled in winter to the interior towns, even as far as Albany, and thence westward by canal.

26. ORIGIN AND DEVELOPMENT OF THE SOUTHERN TRADE.

IMPORTATION FROM NEW JERSEY AND THE CHESAPEAKE.—It came about, that among the first places in New England to import oysters from New Jersey, and then from Virginia, to be transplanted for additional growth, was Fair Haven; and it is probable that far more oysters were brought there from the Chesapeake twenty years, or even ten years ago, than now are. At that time a large fleet of Connecticut vessels was employed in this traffic every winter, and some stirring traditions remain of perilous voyages during that icy season. They were better oysters that came in those days, also, than now. While a large majority of these cargoes were at once sent into the current of winter-trade, and distributed to customers all over the state (for no other harbor fattened "Chesapeake" to any extent), a quarter or so of the whole season's importation was regularly bedded down, in April and May, to supply the summer and fall demand. The favorite bedding-ground then, as now, was "The Beach", a sand-spit running off into the harbor for more than a mile from the Orange (western) shore. This is bare to a great extent at low tide, but covered everywhere at high tide, and is the best possible place for its purpose. The ground on this beach rents at from two to five cents a bushel, according to location. Those occupying the Beach each year—in 1879 they were 23 in number—form themselves into a mutual protective association, and provide watchmen who never leave the ground. Formerly these watchmen lived in boats housed in, but now, upon opposite extremities of the Beach, piles have been driven and two houses have been built, where these men live, and whence they walk or row about day and night to guard the property. They go on duty at the time of the first planting, and remain until the last oyster is gathered, a period usually about nine months long. Their wages are only \$40 a month, and it would seem to be an extremely tedious duty; yet there is no lack of volunteers for the places. But I have shot ahead of my subject, in following out this matter to its present status; let me return to a past period.

The Virginia trade began about forty or fifty years ago, Captain Merritt Farran having been the first man to bring them. His cargo was a sloop-load of about 600 bushels, profitably sold. The trade rapidly grew into immense proportions. Just when it was at its zenith it is hard to say—probably about thirty years ago—and it was then very profitable. The Fair Haven establishments had branch-houses in all the inland cities, as far as Chicago and St. Louis, and it was reported that the profits of a single house, from 1852 to 1856, amounted to \$25,000 a year. Levi Rowe & Co., alone, in 1856, are said to have employed 20 vessels, and 100 openers, and to have sold 150,000 gallons of oysters, while companion-houses shipped from 1,000 to 1,500 bushels per day throughout the season. In 1857-'58, according to De Broca, from 200 to 250 schooners were employed in supplying the establishments of Connecticut from the Chesapeake and Fair Haven, which alone, he says, made use of 2,000,000 bushels, but this undoubtedly was a large exaggeration; one-half of that would certainly more than cover the facts. Half a dozen years later, when De Broca wrote, the decline was very perceptible.

DE BROCA'S DESCRIPTION OF NEW HAVEN IN 1862.—Some extracts from Lieutenant De Broca's report, made in 1862, to the French government, upon the oyster-industries of the United States, and reprinted in the first report of the United States Fish Commission, will present interesting, if not wholly trustworthy, reminiscences of New Haven at that time, where Lieut. De Broca is well remembered. This writer says:

New Haven, the capital of Connecticut, ranks next to Boston in importance, in the oyster-trade. The business is divided into two distinct branches, the culture of oysters and the various occupations connected with their transportation to the towns of the interior.

The principal plantations are situated in the bay. Commencing at a short distance from the head of the great pier, they extend over a distance of about three miles, almost without interruption; on the one hand to the southern part of the sandy point, and on the other to Morris creek, always leaving free the channels of navigation leading to the harbor.

The maritime ground on which they are established is partially exposed at low tide. In some cases, however, the plantations are constantly submerged, and are at a depth varying from 1 to 6 feet, when the water is lowest. The soil is formed of sand and mud, mingled with sea-weed, and the stratum of mud, upon which the oysters rest, is about three inches thick.

The spectacle presented on entering the harbor is most curious. As far as the eye can see, the bay is covered with myriads of branches, waving in the wind, or swayed by the force of the currents. It looks as if a forest were submerged, the tops of the trees only rising above the surface of the water.

At certain distances on the plantations, large boats are anchored or moored to posts, having a small house built upon them for the accommodation of the men appointed to watch the grounds. They are four in number. The wages of these guardians of the property amount to about \$30 a month, and are paid by the association of planters. This system of surveillance is indispensable, since most of the plantations are at a distance from the harbor, and might be invaded with impunity, especially at night.

About five hundred men are employed in planting oysters in the spring, and in gathering them in the proper season to supply the necessities of commerce.

The New Haven banks have a very high reputation, and the number of bushels planted annually is estimated at 250,000.

The establishments engaged in the transportation-business are mostly at Fair Haven, a charming village, beautifully situated. Some are at Oyster Point, on the western part of the bay. At Fair Haven the Quinepiac is about a mile and a half wide,* and is protected from the winds on the south and east by a chain of wooded hills, lying parallel with its course. It forms a beautiful smooth sheet of water, until its entrance into the bay, where the currents are very strong, but not sufficiently so to disturb the plantations established in the bed of the river. Some of the dealers, before using the oysters, deposit them for two or three days in the Quinepiac, the saltish water giving the flesh a better appearance.

The establishments of the dealers are on both sides of the river, and many of them are built partly in the water, in order that the fishermen may discharge their cargoes with greater ease.

The dealers send raw oysters away in small wooden barrels, called kegs, or in tin cans, containing about a quarter of a gallon. During the winter, wooden barrels are considered a sufficient protection; but in warm weather, and when the mollusks are to be sent to a distance, tin boxes are used exclusively. The work of packing is accomplished in the same building where the oysters are shelled, or in one near at hand; and whatever may be the receptacle used, it must contain only a quarter of its capacity of juice. A tinner is employed in each establishment to close the cases, by soldering a small round piece of tin over the opening. The cases are then placed in a refrigerator, where they remain until sent to the railroad. When dispatched to distant cities, those of the West for instance, the cases are inclosed in a box of pine wood containing about a dozen. These are tightly packed, and a space is left in the middle of the box for the reception of a piece of ice, which preserves the oysters until they reach their destination.

The number of barrels and boxes or cases required annually, at Fair Haven, is so great that two large manufactories have been established for the manufacture of these articles, and they employ about one hundred and fifty persons. That for the making of kegs uses steam as a motive power. Everything in the establishment is done by machinery. One machine cuts out the staves, a second the bottom; others pierce the holes, and form the plugs. The kegs, at wholesale, bring the following prices: Kegs containing a gallon, \$1 08 a dozen; kegs containing a half-gallon, 94 cents a dozen. Tin cases are worth \$5 50 a hundred.

Oysters without the shell are divided into two classes—those of large size selling for twenty cents a gallon more than the others. They sell at the rate of \$3 for half a dozen cases, each of which contains from seventy to one hundred mollusks.

THE FAIR HAVEN OYSTER-TRADE IN 1857.—A very careful account of the business, as it seems to me, was printed in the *New York Tribune* of January 9, 1857, access to which I owe to the liberality of Mr. Thomas F. DeVoe, of New York. It says that 80 vessels were then bringing oysters to Fair Haven. They were mainly schooners of 2,000 to 4,500 bushels capacity, and were generally owned in Fair Haven, but many additional ones were occasionally chartered. The capital invested there was considered little short of \$1,000,000.

Describing the village and its methods during the busy season, this article continues:

There are the openers, the washers, the measurers, the fillers, the packers, etc., each of which performs only the duties pertaining to its own division. At this season of the year (January) few of the oysters are "planted", but are generally taken directly from the vessel to the places occupied by the openers, who form a large number of operatives, and are composed of females and boys, who earn from \$5 to \$9 per week. An expert at this branch will open 100 quarts per day, but the average is not perhaps over 65 quarts. The standard price is, I think, 2½ cents per quart. This work gives employment to many hundreds, and much of the work is performed at private dwellings, thus affording opportunity for labor to many who cannot go into a general workshop. The oysters, as they come from the vessel, are heaped upon the center of the room, the operators occupying the wall-sides. Each person has before him a small desk or platform, some 3 feet in height, on which is placed, as occasion requires, about half a bushel of oysters, from which the opener takes his supply. On the stand is a small anvil, on which, with a small hammer, the edge of the shell is broken. The operative is provided with a knife and hammer, both of which are held in the right hand at the time the shell is broken, when the latter is dropped and the knife does its work. Two tubs or pails, of about three gallons capacity each, are placed within about 3 feet of the workman, into which he throws, with great dexterity and rapidity, the luscious morsel which is to tickle the palate and gratify the taste of some dweller in the far West. The object of placing these vessels of reception so far from the operator is to prevent, as much as possible, the deposit of the original liquor with the oyster. * * * From the opening-room the oysters are taken to the filling-room, and thence to the packing department. In the filling-room, on a platform, are placed a dozen or more kegs or cans, with the bungs out. The oysters are first poured into a large hopper pierced with holes, in which they are thoroughly washed and drained, when they are ready to be deposited in packages. This is done by placing a funnel in the aperture of the keg, by one person, while another "measures and pours". This operation is performed with great rapidity, two or three men being able to fill some 2,000 kegs in a day. After depositing the requisite number of "solid oysters", as they are termed, in each package, a pipe conveying fresh water is applied, and the vacant space filled with nature's beverage—the bungs placed and driven home—when it is ready to be shipped.

In hot weather, the article adds, kegs are placed in boxes surrounded with broken ice. One firm, Rowe & Co., used 150,000 kegs a year, costing about \$15,000.

THE OYSTER-TRADE OF FAIR HAVEN IN 1879.—Except that the use of the little wooden kegs has been abandoned for the most part, and that opening is no longer done at the homes of the workmen, but wholly at the planter's warehouse, the foregoing report presents a good picture of the Fair Haven of to-day.

* The Fair Haven iron bridge is just 150 paces in length.—E. I.

With the growth of so extensive a business, in so confined a space, came the attendant evil of too severe competition. About 1850, therefore, one or two Fair Haven men of energy conceived the idea of taking their warehouses to the oysters, instead of bringing the mollusks so far to the salesroom. They therefore opened branch houses in Baltimore. Others followed, and the names of Maltby, Mallory, Hemingway, Rowe, and their confrères, long familiar in Connecticut, and identified then as now with the oyster-business on the Quinepiac, became equally well known along the Chesapeake, and, through wide advertisements, over the whole country. All the great Baltimore firms of old standing originated in Fair Haven, just as Wellfleet, an obscure village on Cape Cod, supplied Portland, Boston, and Providence, with its oystermen. The result was the same in both cases; the home interests retrograded when metropolitan advantages began to be used in competition, and at Fair Haven considerable and rapid changes in methods, as well as the results of trade, have come about.

All of the foregoing remarks have applied to the imported Chesapeake oysters, which were brought in the spring, fattened on the sand-bars in the harbor, and taken up in the autumn. Then, as now, New Haven harbor had no competition in this branch of trade worth speaking of anywhere else in the state; and it may be dismissed, so far as the whole of Long Island sound is concerned, with the remark, that many or all of the old dealers continue to bring and plant southern oysters, which they open in the fall and winter, but a good proportion confine themselves wholly to raising and disposing of natives.

The Chesapeake oysters brought into this locality in 1879 amounted to about 450,000 bushels. Those from the Rappahannock are the favorites for winter use, and are imported almost exclusively; for planting purposes, however, Rappahannock oysters are undesirable, and those from Fishing Bay, Saint Mary's, and Chrisfield, are preferred. But this may be wholly changed in a year or two. The names of the principal dealers appear in the appended table.

THE NEW HAVEN OYSTER-FLEET.—The vessels employed in this trade are rarely owned in New Haven, as used to be the case, but mainly hail from New York. The following is the list, so far as I have been able to complete it—all schooners:

Name.	Tons.	Name.	Tons.	Name.	Tons.
William Farren	75	J. F. H. Langrel	—	Garry P. Wright	—
Ellie F. Long	98	Morning Star	55	Stephen Wood	12
Mary C. Decker	91	Minnie Griffin	—	David Carll	125
James Phelps	112	Ella H. Barnes	190	Mary Ellen	—
John Mosser	93	R. Mason	51	John A. Chaffee	130
Orvetta	128	Wm. H. Van Name	97	Harvest Home	—

The smaller of these schooners are preferred, as they make quicker passages, but the larger will carry for less money. Freights, therefore, vary with the vessel and the season, from 10 to 18 cents. It is estimated that 3 cents will plant the oysters, which makes their cost from 22 to 28 cents a bushel. The selling price will average at least 75 cents, and probably more.

27. NATIVE OYSTERS AND OYSTER-PLANTING IN THE VICINITY OF NEW HAVEN.

EARLY OYSTER-CAMPAIGNS ON THE QUINEPIAC.—The remainder of my history will apply to the gathering, transplanting, and propagating of native oysters in the waters of Long Island sound, opposite New Haven.

It has already been mentioned, that native beds existed within recent years, if they do not now flourish, in every harbor westward of the Thames river, and that many of these old localities, as Stony Creek, Branford, and so forth, still furnish large quantities of small oysters for the plantations. None of these localities ever equaled, however, the importance of the Quinepiac and its tributaries at New Haven as a natural field of oyster-production, while this harbor was equaled, if not surpassed, by several inlets still further west.

Until lately, however, all this wealth was used up in private consumption, sold in the shore-towns as "fancy", or mixed in with the southern stock, without being taken into account. The fishing was done mainly for each man's winter-supply, and nobody paid much attention to any regulation of it beyond the close-time in summer. Gradually, however, these public river oysters became more rare and coveted. The law was "off" on the 1st day of November, and all the natural beds in the state became open to any person who wished to rake them. In anticipation of this date, great preparations were made in the towns along the shore, and even for twenty miles back from the seaside. Boats and rakes, and baskets and bags, were put in order. The day before, large numbers of wagons came toward the shore from the back country, bringing hundreds of men, with their utensils. Among these were not unfrequently seen boats, borne on the rigging of a hay-cart, ready to be launched on the expected morning. It was a time of great excitement, and nowhere greater than along the Quinepiac. On the day preceding, farmers flocked into Fair Haven from all the surrounding country, and brought with them boats and canoes of antique pattern and ruinous aspect. These rustics always met with a riotous welcome from the town-boys, who hated rural competition. They were very likely to find their boats, if not carefully watched, stolen and hidden before they had a chance to launch them, or even temporarily disabled. These things diversified the day and enlivened a community usually very peaceful, if not dull. As midnight approached, men dressed in oilskin, and carrying oars, paddles, rakes, and

tongs, collected all along the shore, where a crowd of women and children assembled to see the fun. Every sort of craft was prepared for action. There were sharpies, square-enders, skiffs, and canoes, and they lined the whole margin of the river and harbor on each side in thick array. As the "witching hour" drew near, the men took their seats with much hilarity, and nerved their arms for a few moments' vigorous work. No eye could see the great face of the church-clock on the hill, but lanterns glimmered upon a hundred watch-dials, and then were set down, as only a coveted minute remained. There was a hush in the merriment along the shore, an instant's calm, and then the great bell struck a deep-toned peal. It was like an electric shock. Backs bent to oars, and paddles churned the water. From opposite banks navies of boats leaped out and advanced toward one another through the darkness, as though bent upon mutual annihilation. "The race was to the swift," and every stroke was the mightiest. Before the twelve blows upon the loud bell had ceased their reverberations, the oyster-beds had been reached, tongs were scraping the long-rested bottom, and the season's campaign upon the Quinepiac had begun. In a few hours the crowd upon some beds would be such that the boats were pressed close together. They were all compelled to move along as one, for none could resist the pressure of the multitude. The more thickly covered beds were quickly cleaned of their bivalves. The boats were full, the wagons were full, and many had secured what they called their "winter's stock" before the day was done, and thousands of bushels were packed away under blankets of sea-weed in scores of cellars. Those living on the shore, and regularly engaged in the trade, usually secured the cream of the crop. They knew just where to go first; they were better practiced in handling boats, rakes, etc.; they formed combinations to help one another. That first day was the great day, and often crowds of spectators gathered to witness the fun and the frequent quarrels or fights that occurred in the pushing and crowding. By the next day the rustic crowd had departed, but the oysters continued to be sought. A week of this sort of attack, however, usually sufficed so thoroughly to clean the bottom, that subsequent raking was of small account. Enough oysters always remained, however, to furnish spawn for another year, and the hard scraping prepared a favorable bottom, so that there was usually a fair supply the next season. It was not long, however, before the old-fashioned large oysters, "as big as a shoe-horn," were all gone, and most of those caught were too small for market. Attention was therefore turned to the cultivation of oysters, and as the Chesapeake trade declined, this subject began to receive more and more earnest attention, and to arouse an unexpected opposition upon all sides.

LEGAL ALLOTMENT OF PLANTING-GROUNDS.—The laws of the state provided for the setting apart of tracts of land under water for the planting or cultivating of oysters. The position and amount of these tracts that were to be set apart were left to the judgment of the people of each town, who chose a committee of three to five electors, termed the oyster-ground committee, to act in such matters. Two restrictions, however, were always jealously insisted upon: first, that no "natural oyster-beds" should be set apart or "designated" (the legal term) for purposes of planting or cultivation; second, that no more than two acres should be allotted to each applicant. All the early designations made in New Haven harbor, therefore, were in the shallow districts near and below the mouth of the Quinepiac, where no natural beds existed, and the allotments were of various sizes. They were owned by women and minors as well as by voters, and thus it was possible for a citizen who cared to do so, to acquire for his use several acres, being those taken out in the name of his wife, his sons, and even of his relatives of remote degrees. Moreover, it was permitted to assign these rights and privileges; but any one who applied for grants of land "for the purpose of speculation", was guilty of a misdemeanor. It was thus an easy matter for a man who desired to cultivate native oysters extensively, to get under his control a large amount of land, through assignments from family and friends; nor, in the great majority of cases, was any money consideration given for such assignments. It soon became common, indeed, for an application to be made by "A, B, and others", a score or more, perhaps, everybody understanding that while the "others" were actual inhabitants of the town, they had no intention of making any personal use whatever of the privileges. This, of course, was an evasion of the law, which practically amounted to its annulment, yet no one objected, for the spirit of the statute was not considered to have been broken; perhaps it ought to be said, no one objected at first, for within the last few years there has been loud murmuring against the largest dealers, who have obtained the control of hundreds of acres, and who have found it necessary to secure amendments and additions to the laws in order to make their titles sure and strong.

ORIGIN OF OYSTER-PLANTING IN LONG ISLAND SOUND.—It will be understood by this, that the business of catching and cultivating native, home-bred oysters at New Haven had grown, out of the old haphazard condition, into a definite and profitable organization by the time the last decade began. It was not long before all the available inshore bottom was occupied, and the lower river and harbor looked like a submerged forest, so thickly were planted the boundary stakes of the various beds. Encroachments naturally followed into deeper water, and this proceeded, until finally some adventurous spirits went below the light-house and invaded Long Island sound.

Who was the originator and pioneer in this bold move is undecided; the honor is claimed by several with about equal right. At any rate Mr. H. C. Rowe first showed the courage of his opinions enough to take up some hundreds of acres outside, in water from 25 to 40 feet in depth, and to begin there the cultivation of native oysters.

Incessantly swept by the steady and rapid outflow of the Quinepiac and Housatonic (whose current flows eastward), the hard sandy bottom of Long Island sound, off New Haven and Milford, is kept clean throughout a considerable area, beyond which is soft, thick mud. There are reefs and rocks scattered about, to be sure, and

now and then patches of mud; but over large areas extends only a smooth, unencumbered bottom of sand or gravel. This makes this region peculiarly adapted to oyster-culture.

CONFLICTING CLAIMS OF PROPRIETORSHIP IN OYSTER-GROUND.—This new departure, or unlooked-for expansion of the business, caused considerable excitement as it rapidly developed. It was soon seen, in the first place, that the existing statutes, which never had contemplated this sort of thing, would not fit all the exigencies, and after the codification of 1866, alterations and amendments rapidly followed one another, in which the conflicting interests of the deep-water cultivators and the small inshore-owners were sought to be harmonized or guarded against opposition. Although recognized by law and acknowledged by clear heads since the earliest times, the rights of proprietorship under the water, and the notion of property in the growth and improvement ensuing upon ground granted and worked for oyster-culture, have hardly yet permeated the public mind and become generally accepted facts. Cultivators of all grades found many and many instances in which their staked-out ground was reappropriated, or the oysters, upon which they had spent a great deal of time and money, were taken by their neighbors even, who angrily resented any imputation of stealing. Not uncommonly the proceeding was much after the manner of mining in a new gold or silver region, such as the Leadville district of Colorado, for instance, where prospectors "located claims" on top of one another, and all went to digging side by side, the first one to strike "mineral" having a right to any or all of his rivals' territory, within stipulated limits.

Having put some oysters on a piece of ground and found them to do well, a man would put in a claim for a grant of that piece, and feel greatly abused because it had previously been designated to some man who knew that the only proper or safe way was to get legal possession of the ground first, and make a trial afterwards.* Then number one would claim the right to remove his oysters, and in doing so would be sure to be charged by number two with taking more than belonged to him. It was easy, too, for unscrupulous persons to dump seed or large oysters upon ground that they pretended not to know was already granted, and then, in taking their stuff away, to rake up a large addition.

If a man neglected to take out a title to his ground, or omitted any technicality, somebody stood always ready to rob him of all the results of his work in open daylight, with the calmest effrontery. "All that is under water is public property," was the maxim of the million, "unless every form of law is observed;" and unless it is watched with a shot-gun besides, they might have added. An authentic incident that happened many years ago, will illustrate this temper; and I should not devote so much attention to this matter, were it not that this false philosophy has been almost universal; has proved the greatest stumbling-block to the prosperity of efforts at oyster-culture along this whole coast, and is almost ineradicable from the 'longshore mind.

Two of the veterans of the native oyster-business at this point, were born and spent their boyhood on the shore, and early became accustomed to the habits and haunts of all the fishes and mollusks. When they were lads of seventeen they sought out a suitable place near the western shore, and gradually accumulated there an artificial bed of native oysters, which soon attained a merchantable size. There were several hundreds of bushels, and the young men were congratulating themselves as fall approached, that upon the early completion of the engagements, which then occupied their time, they would reap a rich harvest from their labor and patience. The time when they intended to take them up was only a few days distant, and no harm by storm or otherwise had come to the bed, when one morning they went out only to find that every oyster had disappeared! It was a cruel disappointment, but inquiry soon solved the riddle. In the darkness of the preceding night several teams, fully prepared for the work, came down from miles and miles back in the country, from away up about Westville and Woodbridge and North Orange, and their owners had raked up the whole bed, and carted it away to hide in their cellars. No robbery could be plainer, and there was little attempt to secrete it; but there was no redress, and the perpetrators chuckled over it as a good joke, without a scruple about the propriety of the thing. Nothing in the sea was private property.

LEGAL PROTECTION FOR OYSTER-PLANTERS.—A vast amount of this sort of stealing and interference with proprietary rights granted by the state, was perpetrated and sanctioned by the great majority of the watermen, under the plea that the locality in question was "natural ground". Any definition or restriction of this ground was impracticable and resisted. The only resource for the man who had invested money in oyster-culture, and wanted the opportunity to develop his investment, was to declare that no "natural oyster-ground" existed in New Haven harbor, and that designations past and to come were valid, even though the areas so designated might once have been natural oyster-beds. This checkmated the men who "jumped claims", yet refused to be considered thieves; but it caused a tremendous howl against the movers, in which a large number of persons, having small information of the facts, joined, on the general principle of "death to the capitalist". It may have worked discomfort in a few individual cases, as all sweeping changes must, but on the whole, considering how nearly exhausted and worthless the Quinepiac fisheries had become, I think it must be regarded as not unjust. At any rate, the legislature of 1875 passed an amendment exempting Orange, New Haven, and East Haven from the enactment prohibiting the setting apart or "designation" of "natural oyster-beds" for purposes of planting or cultivation, leaving, however, the law intact for the rest of the state. Had this measure not been passed, systematic cultiva-

* Perhaps some excuse or explanation of this sore feeling is found in the fact, that the town of Branford allowed a man to apply for and try a quantity of land a year; at the expiration he could pay for it or "heave it up", as he thought best. This was a purely local regulation, however.

tion would have been vastly hindered, if not altogether killed, by thieves and malcontents, so far as New Haven harbor is concerned. Elsewhere, under different conditions, no such necessity exists as yet, in order to be able to prosecute the artificial raising. Instantly upon the passage of this act, there was a rush by everybody for the possession of lots in all parts of the Quinepiac and West rivers. The oyster-committee of the towns decided that each owner of land abutting on the river should possess the right to the bottom opposite his land for 100 feet from high-water mark. This was a concession to popular feeling, though that opinion had no foundation in law whatever, since the title to riparian real estate in this state terminates at the high-water tide limit. Between these boundaries, or "wharf lines", tracts equal in width to each man's water front, and extending to the channel, were allotted to the land owners at \$10 to \$15 an acre; but the majority of them were not more than half an acre in extent. Lucky receivers of these river-grants at once found themselves able to sell for from \$25 to \$50, and before long there was brisk demand and little sale, at prices ranging from \$100 to \$150. The deep-water men found this river property of great use as a nursery for seed, and as a place to make temporary deposits of surplus stock, etc. The Quinepiac thus began to bristle with boundary stakes, much as the harbor had done for many years previous, and many of these river-lots are now valued at more than \$500.

In 1877 a very full set was obtained everywhere in the river and harbor; in 1878, however, there was almost a total dearth; but 1879 again saw a partial set.

28. PRESENT CONDITION OF OYSTER-CULTURE IN THE VICINITY OF NEW HAVEN.

ORANGE OR WEST HAVEN.—Situating on the western shore, the township of Orange (West Haven) owns the western half of the harbor of New Haven. These shores have always been populous with oysters, which were raked as public property. If any attempts at cultivation were made until within a few years, they were desultory and of small account. When the general oyster-statutes were passed, Orange at once acted under them, but delegated to its selectmen the powers of an oyster-committee instead of erecting a second board, as was done in all the other towns. This arrangement has been found to work very well. The first designation was made in April, 1864, and all the suitable ground in West river and in the harbor was soon set apart, amounting to about 45 acres. Mr. Samuel Smith, chairman of the selectmen, tells me that nothing was charged for this ground, but that it was put under taxation, and now pays on valuations running from \$50 to \$500. When, four years ago, the experiment of deep-water cultivation was begun, Orange issued designations, almost wholly to citizens of other towns, for about 2,450 acres, at \$1 an acre. It is impossible to come nearer than this to the town's revenue from its oyster-lots, since no separate account is published by the treasurer. The deep-water area is taxed at a merely nominal rate at present.

Only two producers of any consequence now reside in West Haven. The small allotments in West river which they possess, are nearly ruined by the drifting of sediment, and the total product of the river last year would hardly exceed 500 bushels. One planter told me he had had 12 acres in one lot in the harbor spoiled by becoming covered with mud.

NEW HAVEN.—Between Orange and East Haven lies New Haven, priding herself upon her harbor. She had begun to set apart oyster-planting ground for the use of her citizens. Before long, however, it was claimed that she was allotting spaces of bottom over which she had no jurisdiction. This brought on suits at law and aroused inquiry. The forgotten fact was then brought to light, that in 1803 a joint commission (of which Noah Webster, the lexicographer, was a member) determined the boundary between New Haven and East Haven to be, in general terms, the ship-channel down the Quinepiac and down the harbor. This was ratified by the general assembly. A few years later some disputes caused the appointment of a commission to settle upon the boundary between New Haven and Orange. This was reported to be the middle of West river, and thence eastward to the ship-channel in the harbor. It seems to have been the intention of this commission that this line should intersect and terminate at the East Haven line, but by some error this was not quite done. The recommendations of this commission were adopted by the legislature and decreed to be the boundary between the two towns. This left to New Haven only the waters just about her wharves and a very narrow, wedge-shaped strip down the channel. When, by later laws, it was decided what of the deeper ground of the sound should be "designated" by East Haven and Orange, respectively, New Haven was allowed a strip 1,500 feet wide, running southward into the sound from a line drawn from the old light-house to Savin rock.

Although these boundaries were settled nearly a century ago, the New Haven oyster-committee not long ago designated ground in Orange waters, where they had no right to. Unscrupulous persons at once took possession, and in some cases refused to yield to the legal owners deriving their designations properly. Hence expensive suits and much personal animosity has arisen. Many lessees, however, learning their mistake in time, took out new deeds from the rightful authorities, and so saved themselves. But this was done at additional expense, for New Haven had never charged anything for her privileges.

29. LAWS OF CONNECTICUT RELATING TO OYSTERS.

LAWS RELATING TO THE FISHERIES FOR SHELLFISH.—Having thus briefly reviewed the circumstances and growth of the oyster-business of New Haven and its vicinities; touched upon the decline of the Virginia trade and the beginning of organized cultivation of the native stock; noted the drawbacks and opposition with which this had to contend, and the extraordinary jealousy which shows itself among the river-men and producers, it is a proper time in which to introduce a careful digest of the state-laws pertaining to the oyster-business, an examination of which will reveal the many reasons why specific acts for the protection of this interest were deemed needful from time to time.

The oyster-statutes of Connecticut, in force in 1880, were as follows:

CHAPTER IV. FISHERIES.—PART I. FISHERIES IN TIDE-WATER AND RIVERS.—ART. I. *Fisheries for shellfish.*

SECTION 1. Describes the particular territory within which the selectmen of East Haven may "designate" or grant ground for the planting and cultivation of oysters; describes within what other waters the oyster-committee of the same town may designate; and gives to the selectmen of Orange all the powers of an oyster-committee.

SEC. 2. Provides that any other town except East Haven and Orange may appoint a committee of not more than five electors, which shall designate to applicants suitable places in the navigable waters of the town for planting or cultivating oysters, clams, or mussels.

SEC. 3. Any person desiring to plant or cultivate oysters, clams, or mussels may apply in writing for a suitable place, and such committee or selectmen may make such designation, not exceeding two acres in extent, after the applicant has proved that the ground has not previously been set off for this purpose; that the ground is within town limits; and that fees due to the town for this designation have been deposited. Town clerks may grant the required certificates, and town treasurers receipt for payments of fees. Violations of this act by members of town committees are punishable. Having received his designation, the applicant must mark the boundaries of his ground by buoys or stakes, set at suitable distances, and labeled with the name or initials of the owner; and until then he shall not be permitted to catch oysters upon the ground. Designations may be made to several in common.

SEC. 4. Every person who shall plant or cultivate oysters, clams, or mussels in any such place shall own them, and also all other oysters, clams, or mussels in such place, and have the exclusive right of taking up and disposing of them, and of using such place for the purpose of planting or cultivating oysters, clams, or mussels therein, which shall be transferrable by written assignment, but nothing herein contained shall affect the rights of any owner of lands in which there may be salt-water creeks or inlets, or which may be opposite or contiguous to such navigable waters; nor the existing by-laws of any city, town, or borough; nor authorize any committee or selectmen to designate, or any person to mark, stake out, or inclose any natural oyster-bed (except in New Haven harbor and its tributaries, and for a distance not exceeding two miles from the mouth of said harbor), or infringe the free navigation of said waters, or interfere with the drawing of seines in any place established and customarily used for seine-fishing.

SEC. 5. Any person procuring oyster-ground "for the purpose of assigning rights which he may acquire for profit or speculation", shall be fined \$50.

SEC. 6. Amended and replaced by subsequent legislation, adds to the powers of the New Haven committee the power to designate ground for oyster-planting and cultivation in the waters of Long Island sound, which lie between East Haven and a line parallel to its boundary and 500 yards to the westward; and the selectmen of Orange may designate between this tract and a line due south from Savin rock, even though such ground "may have been natural oyster-beds". And the committee's previous designations in this territory are hereby confirmed.

SEC. 7. Enjoins that all designations of oyster-ground, when made, shall be exactly recorded in the office of the town clerk, together with all descriptions and assignments; "and all attested copies of such applications, designations, and assignments, with a certificate that they have been recorded, shall be conclusive evidence of the fact of such record, and *prima facie* evidence of the validity of such application, designation, and assignment."

SEC. 8. Any owner who has lost the evidences of title to oyster-ground, after having filed them with the town clerk, may apply to the town committee, and if he satisfies them of his claim, he may receive from them a new title; but there are heavy penalties for fraud under this provision. In case of boundaries being lost, or when the committee authorized to stake out oyster-grounds have described the boundaries incorrectly, the superior court, as a court of equity, may, upon petition, order such uncertain boundaries to be re-established, according to prescribed methods, except in cases where a map of the ground has been filed with the town clerk, in which case uncertain bounds are to be established by a surveyor appointed by a judge of the superior court.

SEC. 9. When there are more than thirty designations in any one town the selectmen shall procure a map of the district.

SEC. 10. An owner desiring to dam or lock an inlet or salt-water creek for the purpose of cultivating oysters therein, the selectmen shall visit the spot and report upon the propriety of the request at a meeting of the town; if the meeting approves, the owner may build a dam, etc., as indicated by the selectmen, and maintain it during the pleasure of the general assembly.

SEC. 11. When any natural oyster-bed is set apart, contrary to law, the superior court in the same county has power to revoke the designation, if it deems it best; but must give the owner time to remove any oysters and improvements on the property.

SECS. 12 and 13. Conferred privileges upon Guilford which that town declined to ratify.

SEC. 14. No person, except the authorized committee or selectmen, shall stake out or inclose any oyster-grounds in navigable waters, unless such person shall own this ground under the provisions of this chapter; penalty, fine not to exceed \$50.

SEC. 15. Any member of a committee who shall designate ground for oyster-cultivation upon natural oyster-beds, or in any other place where it is prohibited by law, shall forfeit from \$25 to \$200, excepting in Orange, New Haven, and East Haven.

SEC. 16. Any other person than the owner, who shall unlawfully remove any shells or shellfish from a place designated for oyster-planting, shall be fined not exceeding \$300, or imprisoned not more than one year; but if the offense be committed at night, heavier penalties are decreed.

SEC. 17. Forbids taking any oysters or oyster-shells from the Thames river between March 1 and November 1.

SEC. 18. Every person who shall willfully injure any inclosure legally designated for oyster-planting, remove any buoys or stakes, injure any oysters, remove any shells from such inclosure, or willfully deposit mud there, shall be subject to heavy penalties, after trial before a justice of the peace, with right of appeal to the superior court.

SEC. 19. Provides penalties for injury to dams or locks of any oyster-pond.

SEC. 20. Prohibits taking "shells or shellfish" between sunset and sunrise, from any navigable waters of the state (except clams in Branford harbor from April to October), under fine of \$50 to \$100, or imprisonment, or both.

SEC. 21. Prohibits the taking of shellfish, or the use of spears for taking fish, within any area designated for oyster-planting, within two miles of the shores of Branford or East Haven; penalty, fine of from \$7 to \$100, or imprisonment.

SEC. 22. Prohibits the use of dredges in New Haven harbor west of a line from Farm river to Scotch cap, and north of a line from Scotch cap to Southwest ledge, and then westerly to Hines' place in Orange; prohibits taking shellfish in Morris creek, except on or adjacent to one's own land; and prohibits dredging *by steam* anywhere away from upon one's own ground, more than two days in the week, under heavy penalties, which may be imposed by a justice of the peace, subject to an appeal to the superior court. Dredging on one's own ground is allowed, however, in East Haven waters to the owners of ground southerly of a line drawn from The Chimneys, through Quix's ledge and Adam's fall, until it intersects a line drawn from the old light-house to Savin rock.

SEC. 23. All sheriffs and constables shall, and any other person may, seize any boat or vessel illegally used in dredging, with its tackle, apparel, and furniture, wherever found, within one year thereafter; and, if condemned, the boat, etc., shall be sold after the prescribed form.

SEC. 24. When there shall be found in any waters of this state, on board any boat or vessel, illegally used under the provisions of this chapter, any dredge or shells and shellfish, it shall be *prima facie* evidence that said boat or vessel was used contrary to the provisions of said chapter.

SEC. 25. No person shall gather shells or shellfish in any waters of this state for himself or his employer, unless he and his employer are at that time, and have been for six months previous, actual inhabitants of the state.

SEC. 26. Refers to lobsters.

LAWs OF 1875.—Since the revision of the statutes in 1875, the following additional laws have been enacted :

MARCH 16, 1878.—When oysters have been planted on any ground legally designated, and doubt arises as to the jurisdiction of neighboring towns over it, prosecutions against the owner may be made in either of the three towns nearest.

MARCH 27, 1878.—No committee or selectmen of any town shall designate, and no person shall mark, stake out, or inclose for the cultivation of oysters, clams, or mussels, any natural clam-bed.

MARCH 27, 1878.—No person shall take or carry away from Branford or Farm rivers any oyster-shells or seed-oysters, for the purpose of planting them on private beds; or more than two bushels of oysters in a single day; or shall use tongs for taking oysters there between May 1 and October 1; under penalty of forfeiting \$14 before a justice of the peace in Branford or East Haven, with a right of appeal to the superior court.

NAVIGATION LAWS.—There are two clauses in the state's navigation laws (chap. viii) which concern oysters, as follows :

SEC. 19. Every person who shall deposit any substance except oyster-shells in the harbors of New Haven, Bridgeport, and Stamford, shall be fined from \$50 to \$500, or imprisoned, or both.

SEC. 20. Gives the city court or a justice of the peace jurisdiction in such cases.

REMEDYING WEAK TITLES.—By a series of amendments and resolutions the legislature has "healed" many weak titles to oyster-ground, by enacting that designations of ground for planting and cultivating oysters, clams, or mussels shall be valid and confirmed, including :

I. All granted informally under the provisions of chap. 3, sec. viii, although the owners may have lost their evidences of title after having filed the same with the town clerk (July 17, 1875).

II. All in which the applicant may be a married woman or a minor (March 16, 1878).

III. All in which the application was made for the purpose of transferring the privileges; and all such transfers are confirmed (March 27, 1878).

IV. All designations for "planting", where "cultivation" is not mentioned.

V. All designations of ground described as containing not over two acres to each applicant, exclusive of muddy or rocky bottom, although the total quantity of ground embraced in the designation may be more than two acres to each applicant (March 27, 1878).

VI. All designations previous to March, 1879, by the town of East Haven, between its westerly boundary and a line drawn due south from the center of the mouth of East Haven river.

ESTABLISHMENT OF A STATE COMMISSION FOR LOCATING OYSTER-GROUNDS.—Finally, some months subsequent to the compilation of the previous legal information, the legislature of 1881 passed an act, which is given herewith in full, which reconstructs the methods hitherto in vogue, and reads as follows :

AN ACT establishing a state commission for the designation of oyster-grounds.

GENERAL ASSEMBLY, JANUARY SESSION, A. D. 1881.

Be it enacted by the Senate and House of Representatives, in General Assembly convened :

SECTION 1. The state shall exercise exclusive jurisdiction and control over all shellfisheries which are located in that area of the state which is within that part of Long Island sound and its tributaries, bounded westerly and southerly by the state of New York, easterly by the state of Rhode Island, and northerly by a line following the coasts of the state at high water, which shall cross all its bays, rivers, creeks, and inlets at such places nearest Long Island sound as are within and between points on opposite shores, from one of which objects and what is done can be discerned by the naked eye upon the other. And all shellfisheries not within said area shall be and remain within the jurisdiction and control of the towns in which they are located, under the same laws and regulations and through the same selectmen and oyster-committees as heretofore, except that such selectmen and committees shall hereafter only act as the agents of their respective towns. If a difference shall arise between any town and the commissioners as hereinafter provided for, as to the boundary line between said town and the area so to be mapped, said town, by its selectmen, may bring its petition to the superior court for the county within which said town is situated, to determine said boundary line, and said court, upon reasonable notice to the parties, shall hear said petition and appoint a committee to ascertain the facts in such case and report the same to said court, and said court shall thereupon make such order as may be proper in the premises.

SEC. 2. The three fish-commissioners of the state now in office, and their successors, shall also be and constitute a board of commissioners of shellfisheries, and be empowered to make or cause to be made a survey and map of all the grounds within the said area in Long Island sound, which have been or may be designated for the planting or cultivation of shellfish; shall ascertain the ownership thereof, and how much of the same is actually in use for said purposes; they shall also cause a survey of all the natural oyster-beds in said area, and shall locate and delineate the same on said map, not to exceed \$2,500 in cost, and shall report to the next session of the legislature a plan for an equitable taxation of the property in said fisheries, and make an annual report of the state and condition of said fisheries to the legislature, and the said commissioners shall be empowered to appoint and employ a clerk of and for said board, and they shall each give a bond for the faithful performance of their duties, and for the payment to the state treasurer of all money that may come into their hands under this act, in the sum of two thousand dollars.

SEC. 3. The said commissioners shall also be empowered, in the name and in behalf of the state, to grant by written instruments, for the purpose of planting and cultivating shellfish, perpetual franchises in such undesignated grounds within said area as are not, and for ten years have not been, natural clam or oyster-beds, whenever application in writing is made to them through their clerk, by any person or persons who have resided in the state not less than one year next preceding the date of said application. The said application and the said grant shall be in manner and form as shall be approved by the chief justice of the state, and all such grants may be assigned to any person or persons who are or have been residents of the state for not less than one year next preceding such assignment, by a written assignment, in manner and form approved by said chief justice; and the said commissioners shall keep books of record and record all such grants and assignments therein, and the same shall also be recorded in the town clerk's office in the town bounded on Long Island sound, within the meridian boundary lines of which said grounds are located, if lines were run due south from present termini of town lines.

SEC. 4. When any such application is filed with the clerk of said commissioners, he shall note on the same the date of its reception, and shall cause a written notice, stating the name and residence of the applicant, the date of filing the application, the location, area, and description of the ground applied for, to be posted in the office of the town clerk of the town bounded on the said Long Island sound, within the meridian boundary lines of which said grounds are located, where such notice shall remain posted for twenty days. Any person or persons objecting to the granting of the grounds applied for, as aforesaid, may file a written notice with the town clerk, stating the grounds of his or their objections, upon the payment to said town clerk of the sum of twenty-five cents, and at the end of said twenty days the town clerk shall forward all such written objections to the clerk of said commissioners; and in case such objections are so filed and forwarded, the said commissioners, or a majority, shall, upon ten days' notice in writing, mailed or personally delivered to all the parties in interest, hear and pass upon such objections at the town in which such grounds are located as aforesaid, and if such objections are not sustained and the area of ground is not, in the opinion of the commissioners, of unreasonable extent, they may, for the actual cost of surveying and mapping of such grounds, and the further consideration of one dollar per acre paid to the said commissioners, to be by them paid over to the treasurer of the state, grant a perpetual franchise for the planting and cultivating shellfish in such grounds, or in any part of the same, in the manner aforesaid, and when no objections are made such grants may be made for the considerations hereinbefore named. At all hearings authorized by this act the said commissioners may, by themselves or their clerks, subpoena witnesses and administer oaths as in courts of law.

SEC. 5. The said commissioners shall, previous to the delivery of any instrument conveying the right to plant and cultivate shellfish on any of said grounds, make or cause to be made a survey of the same, and shall locate and delineate the same, or cause it be located and delineated upon the map aforesaid, and upon receipt of said instrument of conveyance the grantee shall at once cause the grounds therein conveyed to be plainly marked out by stakes, buoys, ranges, or monuments, which stakes and buoys shall be continued by the said grantee and his legal representatives, and the right to use and occupy said ground for said purposes shall be and remain in said grantee and his legal representatives: *Provided*, That if the grantee or holder of said grounds does not actually use and occupy the same for the purposes named, in good faith, within five years after the time of receiving such grant, the said commissioners shall petition the superior court of the county having jurisdiction over the said grounds, to appoint a committee to inquire and report to said court as to the use and occupancy of said grounds, in good faith, and said court shall in such case appoint such committee, who, after twelve days' notice to petitioners and respondents, shall hear such petition and report the facts thereon to said court, and if it shall appear that said grounds are not used and occupied in good faith for the purpose of planting or cultivating shellfish, the said court may order that said grounds revert to the state, and that all stakes and buoys marking the same be removed, the costs in said petition to be paid at the discretion of the court.

SEC. 6. When, after the occupancy and cultivation of any grounds designated as aforesaid, by the grantee or his legal representatives, it shall appear to said commissioners that said grounds are not suited for the planting or cultivation of oysters, said grantee, upon receiving a certificate to that effect from said commissioners, may surrender the same, or any part thereof. Not less than one hundred acres to the state, by an instrument of release of all his right and title thereto, and shall, on delivery of such instrument to the said commissioners, receive their certificate of said release of said grounds, the location and number of acres described therein, which shall be filed with the state treasurer, who shall pay to the holder the sum of one dollar for every acre of ground described in said release, where said sum has been paid therefor to the state. And the said release shall be recorded by the said commissioners in their record-books, and in the town clerks' office in the town adjacent to and within the meridian boundary lines of which said grounds are located.

SEC. 7. Said commissioners shall provide, in addition to the general map of said grounds, sectional maps, comprising all grounds located within the meridian boundary lines of the several towns on the shores of the state, which maps shall be lodged in the town clerk's office of the said respective towns; and said commissioners shall also provide and lodge with said town clerks blank applications for such grounds and record-books for recording conveyances of the same, and all conveyances of such grounds and assignments, reversion, and releases of the same shall be recorded in the books of said commissioners, and in the town clerks' offices in the towns adjacent to and within the meridian boundary lines of which said grounds are located, in such books as are provided by said commissioners, subject to legal fees for such recording, and the cost of all such maps, blank-books, surveys, and all other expenses necessary for the carrying out the provisions of this act, shall be audited by the comptroller and paid for by the treasurer of the state, and the said commissioners shall each receive for their services five dollars per day for the time they are actually employed, as provided for in this act; their accounts for such service to be audited by the comptroller and paid by the treasurer of the state.

SEC. 8. All designations, assignments, and transfers of ground in Long Island sound heretofore made for the purpose of planting or cultivating oysters, clams, or mussels, excepting natural oyster-, clam-, or mussel-beds, are hereby validated and confirmed.

SEC. 9. All the provisions of the statutes of this state relating to the planting, cultivating, working, and protecting shellfisheries, upon grounds heretofore designated under said laws, except as provided for in section eight of this act, and as are not inconsistent with this act, are hereby continued and made applicable to such designations as may be made under the provisions of this act.

SEC. 10. When it shall be shown to the satisfaction of the said commissioners that any natural oyster- or clam-bed has been designated by them to any person or persons, the said commissioners shall petition the superior court of the county having jurisdiction over the said grounds, to appoint a committee to inquire and report to the said court the facts as to such grounds, and said court shall, in such case,

appoint such committee, who, after twelve days' notice to the petitioners and respondents, shall hear such petition, and report the facts thereon to said court; and if it shall appear that any natural oyster- or clam-beds, or any part thereof, have been so designated, the said court may order that said grounds may revert to the state, after a reasonable time for the claimant of the same to remove any shellfish he may have planted or cultivated thereon in good faith, and said court may further order that all stakes and buoys marking the same be removed, the costs in said petition to be taxed at the discretion of the court.

SEC. 11. Any commissioner who shall knowingly grant to any person or persons a franchise, as hereinbefore provided, in any natural oyster-bed, or clam-bed, shall be subject to a fine of not less than one hundred dollars, nor more than five hundred dollars, and if such franchise is granted the grant shall be void, and all moneys paid thereon shall be forfeited to the state; and said commissioners shall in no case grant to any person or persons a right to plant or cultivate shellfish which shall interfere with any established right of fishing, and if any such grant is made the same shall be void.

SEC. 12. All acts and parts of acts inconsistent herewith are hereby repealed, but this act shall affect no suit now pending.

TOWN LAWS OF EAST HAVEN: TAXATION.—It will be observed that the first section of the old law gave the right to grant land in East Haven to both the selectmen and the oyster-committee. The former had long been accustomed to set apart oyster-ground, and retained this privilege for the river and upper shores, while the committee designated in deep water. In a special meeting of the town of East Haven, held in September, 1865, to ratify the late legislature's enactments, an oyster-committee of five was appointed; and it was

Voted, That the committee aforesaid shall stake out the grounds aforesaid in squares of one acre each (where the nature and extent of the said grounds will permit), and employ a surveyor to survey and make a map of the same, and lodge it with the town clerk of said town.

Voted, That each person who makes application to the committee aforesaid * * * and receives from them a written description of ground set apart to them, shall * * * pay to the said town clerk at the rate of \$10 per acre, which money is to be used in paying the expenses incurred in making out the aforesaid survey.

Voted, That the town clerk pay the surplus, if any, into the treasury of the town.

The succeeding spring, in order to give the young oysters in the river a chance to get some growth, all raking was prohibited "from April 9, 1866, to March 9, 1867".

The reason why this area was restricted to one acre, was in order that there might be enough to go around; applicants were so numerous, at first, that designations were *allotted* literally by drawing the number of the designation from a dark box. The favorite locality was Morris cove. For all the land set apart by the selectmen, \$10 or more an acre was received; when application was made for grants outside, the oyster-committee thought the experiment so foolish that they were ashamed to ask more than \$1. In addition to this, there was a charge of 90 cents for making and recording each deed, besides (until late years) a 50-cent revenue stamp on each document, and a second one in case of a transfer. About 750 acres were designated at \$10 an acre, and about 1,500 acres at \$1. In all, East Haven had granted 2,523 acres of oyster-ground up to January 20, 1880. My authority is the Hon. C. A. Bray, who has had official charge of these matters for many years in that town. To this may be added 650 acres set apart but not yet paid for. Since 1877 East Haven has taxed these grants, under the head of "personal property", at valuations of \$5, \$10, and occasionally more, per acre, the rate last year being 12 mills on the dollar. The reports of the treasurer show that East Haven has derived the following satisfactory revenue from the sale of her oyster-culture privileges:

Previous to 1867	\$3,325 00	In 1874.....	\$220 00
In 1867	222 00	In 1875.....	430 00
In 1868	300 00	In 1876.....	883 95
In 1869	197 50	In 1877.....	479 85
In 1871	97 50	In 1878.....	79 90
In 1872	1,554 00	In 1879.....	569 75
In 1873	68 00	Total.....	8,427 45

The expenses of surveys, etc., used up about one-half of this; the other half went to the treasury. All the \$1 designations have been "net" to the town.

RESOLUTIONS OF THE LEGISLATURE IN 1879.—These and other provisions and alterations of the oyster-laws have caused much discussion, and showed satisfactorily the existence of much discontent, though no one seems able to propose a better arrangement. The best opinion, I believe, is that few changes are desirable. In compliance with the wishes of the oyster-interest of the state, the legislature of 1879 passed the following resolutions:

Whereas, the raising of oysters from the spawn in the deep waters of this state, in Long Island sound, has proved by experience to be a success;

Whereas, there is an immense tract of available oyster-ground between the town boundaries and the southerly boundaries of the state, which cannot at present be used, because the state has granted no authority to designate it;

Whereas, these grounds can be disposed of so as to bring a large sum into the treasury of the state: Therefore,

Resolved by this assembly, That a commission, consisting of three persons, be appointed by the governor to prepare a plan, and report to the next session of the general assembly, for the gradual disposal of the grounds in the waters of this state which are suitable for the cultivation of oysters. Said commission shall examine all existing statutes relating to oyster-grounds and town lines in the sound, all customs and by-laws in different parts of the state, and such other matters as pertain to oyster-fisheries, so that the system devised shall be of general application, and enable the state to dispose of the franchise of the grounds to the best advantage.

The commissioners appointed were: the Hon. Robert Coit of New London (chairman), the Hon. H. B. Graves of Litchfield, and the Hon. Charles W. Bell of Norwalk. They held meetings during the autumn of 1879, in various shore-towns, which were well attended by the oyster-growers, and to their report is probably due the new law passed in January, 1881, and already quoted, in respect to the designation of grounds by the state.

Such are the circumstances under which the oystermen in New Haven harbor and the contiguous sound are able to do business.

30. LIMITATIONS OF OYSTER-CULTURE IN THE NEW HAVEN REGION.

SELECTION OF OYSTER-GROUND.—As I have already remarked, the cultivation of native oysters has grown up within comparatively recent years, to supply the altered conditions of the business and fill the demand for the home-bred stock. It soon expanded beyond the limits of shallow water, until now the hopes of all cultivators of any consequence are centered upon the deep-water ground, to which the inshore tracts are held as subsidiary, being largely used only as nurseries wherein to grow seed for the outside beds.

The process by which a man secures a large quantity of land outside has been described. It is thought hardly worth trying unless at least 50 acres are obtained, and many of the oyster-farmers have more than 100. These large tracts, however, are not always in one piece, though the effort is to get as much together as possible. He obtains the position of his ground, as near as he can, by ranges on the neighboring shores, as described in his leases, and places buoys to mark his boundaries. Then he places other buoys within, so as to divide his property up into squares an acre or so in size. In this way he knows where he is as he proceeds in his labors. Having done this, he is ready to begin his active preparations to found an oyster-colony.

The bottom of the sound opposite New Haven, as I have said, is much of it smooth, hard sand, with occasional little patches of mud, but with few rocks. The depth varies from 25 to 40 feet. This area is almost totally void of life, and no oysters whatever were ever found there, except after some "dumps" were made outside the light-house, by the dredging boats which had been cleaning out the channel and deposited many living oysters along with the other dredgings in the offing. These dumps very soon became, in this way, oyster-beds, supplying a considerable quantity of seed, which was public property, to be had for the dredging and taking their share in the incessant controversies as bones of contention.

PREPARATION OF A DEEP-WATER OYSTER-FARM.—When a cultivator begins the preparation of a deep-water farm, his first act is to scatter over it, in the spring (about May), a quantity of full-sized, healthy native oysters, which he calls "spawners". The amount of these that he scatters depends on his circumstances; from 30 to 50 bushels to the acre is considered a fair allowance here, I believe. The rule is, 1 bushel of spawners to 10 bushels of culch. He now waits until early in July (from the 5th to the 15th is considered the most favorable time), when he thinks his spawners must be ready to emit their spat. He then employs all his sloops, and hires extra vessels and men, to take down to the harbor the tons of shells he has been saving up all winter, and distribute them broadcast over the whole tract of land he proposes to improve that year. These shells are clean, and fall right alongside of the mother-oysters previously deposited. The chances are fair for catching of spawn. Sometimes the same plan is pursued with seed that has grown sparingly upon a piece of ground; or young oysters are scattered as spawners, and the owner waits until the next season before he shells the tract. Sometimes there must be a preparation of the ground, before any operations can be begun upon it, by elaborate dredging or otherwise. Within the harbor, for instance, considerable muddy bottom has been utilized by first paving it with coarse beach-sand. No spot where there is not a swift current, is considered worth this trouble. The proper amount is 200 tons of sand to the acre, which can be spread at the rate of five sharpie-loads a day, at no great expense. The sand forms a crust upon the mud firm enough to keep the oyster from sinking, and it need not be renewed more than once in five years.

EXPENSE OF AN OYSTER-FARM.—In either case, therefore, the planter's expense has not been enormous. I present herewith two statements of the outlay under the operations outlined above, which are as follows:

No. 1.—Fifty acres.

2,000 bushels spawners, at 30 cents.....	\$600 00
15,000 bushels shells, at 3 cents.....	450 00
Planting 15,000 bushels shells, at 4 cents.....	600 00
	<hr/>
	1,650 00

No. 2.—Sixty acres.

2,000 bushels of spawners, at 56½ cents.....	\$1,130 00
17,000 bushels of shells, at 4 cents.....	680 00
4,453 bushels Bridgeport seed, at 10 cents.....	445 30
	<hr/>
	2,255 30

In a third case Captain George H. Townsend gave me a statement of the expenses of starting a farm of 25 acres off the mouth of East Haven river. This was a more elaborate arrangement, but on the other hand was accomplished, through a variety of favorable conditions, cheaper than would have been possible with ground otherwise situated:

2,000 bushels small river oysters, at 25 cents.....	\$500 00
Spreading same and staking, at 5 cents.....	100 00
600 bushels dredged seed, at 40 cents.....	240 00
10,000 bushels of shells, put down at 4 cents	400 00
	1,240 00

I think it would not be unfair to average the cost of securing, surveying, and preparing the deep-water beds at about \$40 an acre, or about \$4,000 for 100 acres. To this must be added about \$2 an acre for ground-surveys, buoys, anchors, etc. But now that he has got his set everywhere upon this 50 acres of shells, the planter's anxieties have just begun. The infant mollusk, when first it takes hold upon the stool, the merest speck upon the surface of the white shell, is exceedingly tender. The chances in its favor in the race against its numberless adversaries are extremely few, almost as few as befriended the egg when first it left the protection of the mother-mantle. The longer it lives the better are its chances, but the tender age lasts all through the autumn and until it has attained the size of a quarter-dollar piece; after that it will withstand ordinary discouragements. It often happens, therefore, that the "splendid set" proves a delusion, and Christmas sees the boasted bed a barren waste. The cultivator finds his work as risky as mining. "You can't see into the water," he says; and the miner quotes back his proverb: "You can't see into the ground." A sufficient cause may usually be assigned for the death of large districts of infant oysters which appeared to get a good start. Starvation is probably the true explanation. Some evil current bore away from them the necessary food. In other cases specific causes, the most potent of which are storms, can be pointed out.

VICISSITUDES AND LOSSES OF OYSTER-PLANTING.—In the fall, just when the young oyster-beds are in their most delicate condition, occur the most destructive gales that afflict the Connecticut coast. They blow from the southwest, and if, as occasionally happens, they follow a stiff southeaster, producing a cross-sea of the worst character. The water is thrown into a turmoil to a depth, in some cases, of four or five fathoms, and everywhere between that and the beach the oyster-beds are torn to pieces, all boundaries are dissolved, and windrows of oysters, containing thousands of bushels, are cast up along the whole extent of the beach. Although so great a disaster as this is rare, it does occasionally happen, and hardly a winter passes without more or less shifting of beds or other damage by tempest. The burying of beds under drifted sand is more uncommon off New Haven than easterly; but in the harbor, where the bottom is soft, mud is often carried upon the beds to such an extent as to smother, if not wholly to hide, the oyster. All that part of the harbor near the mouth of West river is so liable to this accident that oystermen have abandoned that district altogether. It is believed by many that the beds in the sound, in water more than twenty-five feet deep, are safe from disturbance from gales; but others decline to put their faith in any depth thus far planted. Frequently oysters cast up by storms, if attended to immediately, can be saved and replanted with profit.

MANAGEMENT OF THE OYSTER-FARM.—Having secured a colony of young oysters upon the stools which have been laid down for them, they are left alone until they attain the age of three, four, or five years, according to their thrift and the trade for which they are designed, by the end of which time they have reached a large size and degree of fatness, if the season has been favorable. If, as is largely done by those planters who live at Oyster point, the oysters are to be sold as seed to Providence river or other planters, they are taken up when only one or two years old. Not a great quantity of this seed was so disposed of last year—not over 20,000 bushels, I should say. It is not considered, as a rule, so profitable as to wait for the maturity of the stock.

EXPERIENCES OF CAPTAIN TOWNSEND IN OYSTER-PLANTING.—In no way, probably, could I better illustrate the series of slow experiments and expensive trials by which the more intelligent of the New Haven planters have succeeded so far as they have done, than by giving an abstract of a diary kept for several years by one of the most energetic of these experimenters, Capt. Chas. H. Townsend. I am able to avail myself of it through his consent, and the kindness of Prof. A. E. Verrill, of Yale College, to whom it had been intrusted for scientific use. Captain Townsend lived at South Haven, where his brother, Mr. George H. Townsend, still continues the business on a large scale. Captain Townsend was in command of ocean steamers for many years, and took special pains, when in Europe, to study the methods of oyster-culture in vogue on the French coast, and was able to apply many hints there obtained to his plantations on this side, though he found so great a difference of circumstances and natural history between French and American oysters, that his transatlantic experience was of less use here than he had expected it to be. The "fort", to which he often refers, is old Fort Hale, on the rocky eastern shore of the harbor, near the mouth. It was a picturesque brick structure in 1812, but had become dilapidated at the time when the civil war of 1861 broke out, and so was razed and transferred into a series of earthworks and bomb-proofs. The moat and its tide-sluice became the scene of Captain Townsend's experiments, detailed in the account condensed herewith.

The first memorandum in this interesting book informs us, under the date "1867", that the author "commenced stocking the ditch at Fort Hale with native oysters, of two years' growth, in September and October of 1867, for the purpose of experiment". Only 51 bushels were laid down. To 1868 is devoted only one page, as follows: "In September and October, 1868, we notice a thrifty set of young oysters along the edge of the ditch and on the stones near the sluice; also, on the piles of the bridge and in the brook that leads into the ditch. We are also sorry to note that about one-half of the oysters laid down as an experiment, for spawners, have been killed by becoming buried in the mud." Subsequently (June 10, 1870), the author records that "one of our neighbors took from the ditch, one night last fall, 23 bushels of the oysters planted by us and sold them in New Haven". Betwixt mud and thieves, experimental knowledge appears to have been a dear acquisition.

The next record is under 1869:

From the last two years' experience we have decided to stock the ditch with native oysters, of three years' growth, this fall, for the purpose of having them in thriving condition during the spawning-season of 1870. We have now down the following quantities:

	Bushels.
Remaining, four years old, say	25
Remaining, of spawn	100
Selected natives, planted November 3 to 29.....	150
This year's growth, taken from the edge of the ditch.....	25
<hr/>	
Total.....	300

The next entry is a list of the names of the 48 original proprietors to whom the oyster-lots, subsequently transferred to the Townsend Brothers, were first granted by the town of East Haven. The lots run from No. 389 to No. 482; each lot consisted of two acres.

In July, 1868, Mr. Townsend began spreading shells upon seven of his lots, and between the 16th and 29th threw overboard 4,487 bushels, estimating that each lot required from 700 to 750 bushels. The expense of this he sets down at 8 cents a bushel; 2½ cents cost of shells; 5 cents for boating and spreading; ½ cent for staking, etc.

Following this comes a "memorandum of sound and cove seed-oysters, planted August and September, 1868". This states, very particularly, the date of planting, who did the labor, the exact location of the work, and the number of bushels put down each time, with occasional additional note, regarding quality, etc. A large number of the Fair Haven oystermen appear to have been furnished with steady employment at this season. Succeeding this entry, are similar memoranda of Fair Haven river seed-oysters planted at the same time upon different ground. In all, 834 bushels of cove and sound seed and 2,595 bushels of river seed were planted, both kinds a year old. This seed, says a subsequent entry, was laid down at the rate of 25 bushels to 30 feet square, or 1,000 bushels to the acre; eighteen months afterward it was decided to be too thick to thrive well.

At this time he began taking up some Virginia oysters. One cargo, planted April 24, 1869, on lot 455, consisted of 765 bushels from Fishing bay. They cost, to bed down, 31½ cents a bushel, and sold, December 1, at 48 cents a bushel. Another cargo, planted on lots 406 and 407, April 25, 1869, consisted of 2,280 bushels from Great Anamassie. They cost, to bed down, 34½ cents, and sold, on the ground, for 50 cents per bushel. The oysters remained down, on the average, six months, and increased in growth one-third.

Between July 14 and 26 he shelled the east side of lots 428, 429, 430 with 900 bushels of "stools", in a strip about 100 feet wide, and put 200 bushels on Black Rock bar.

This completes the diary for 1869. I continue to quote:

January 1, 1870.—Paid W—— F——, for service as watchman, 10 days, at \$2 50, \$25.

F—— was relieved to-day by A. Moulthrop, whom I have employed, for the Townsend Brothers, to cultivate oysters, and otherwise, for one year, at the rate of \$75 per month.

January 26, 1870.—Spent several hours to-day with Moulthrop on the oyster-beds in the harbor. I also told him of my plans for developing the ditch at Fort Hale. We walked around it and I gave him an idea how much of the ditch we had stocked; I also showed him the mussel-patch in the sluice, and gave him directions to get brush ready to lay over the mussels for the purpose of catching their spawn, similar to the French plan. I also told him to prepare stakes, boats, etc., for work in the spring.

March 26, 1870.—I find the cold weather had killed many of our finest oysters near the sluice at the fort. We were employed scraping and trimming up the ditch, etc.

March 28, 1870.—Moulthrop and myself busy on the oyster-grounds getting ready to transplant seed from spawn of 1868.

On the following day the transplanting was begun. Lot 409 had been "shelled" in July, 1868, at the rate of 1,000 bushels to the acre. These shells had caught a large amount of spat, which had lived and was now ready to be transferred. Between March 29 and May 26 there were taken from this lot, as follows:

	Bushels.
Transplanted to lot No. 425.....	650
Transplanted to lot No. 403.....	645
Transplanted to lot No. 403.....	630
Transplanted to lot No. 402.....	540

Before transplanting, the lot which was to receive this seed was divided off into "squares", 30 feet in breadth, and about 15 bushels was placed on each square. Mr. Townsend made a plat of each lot, so planted, in his note-book. I will transcribe one, as a sample of the many that occur all through, since it may be suggestive. On each square is noted the date of planting and the number of bushels, thus: "April 14—15."

		NORTH.						
		28	30	30	30	30	30	feet.
WEST.	30	This strip, 30 ft. wide, planted July and August, 1868, with 210 bushels F. II. seed. Replanted June 5, 1871.						
	30	April 18—15.	April 18—15.	April 18—15.	April 11—15.	April 7—15.	April 12—20.	April 11—15.
	30	April 18—15.	April 15—15.	April 14—15.	April 11—15.	April 7—15.	April 5—15.	Mar. 31—17.
	30	April 16—15.	April 15—15.	April 14—15.	April 13—15.	April 7—15.	April 5—15.	Mar. 31—18.
	30	April 16—15.	April 15—15.	April 14—15.	April 13—15.	April 7—15.	April 5—20.	Mar. 30—17.
	30	April 16—15.	April 14—15.	April 14—15.	April 13—15.	April 6—15.	April 6—15.	Mar. 30—18.
	28	April 15—15.	April 14—15.	April 14—15.	April 13—15.	April 6—15.	April 6—15.	Mar. 29—15.
		90	90	90	90	100	100	bush.
		SOUTH.						

Turning the pages still further, it appears that other spat had been caught on stools and was now transplanted, over 8,000 bushels being gathered from ten or twelve acres. Meanwhile, seed was being imported from outside sources. Cove seed, for instance, was caught up from lot No. 415 and laid down on lot No. 444, on Black Rock bar, to the amount of 750 bushels; while on June 15, 30 bushels of Long Island seed was put on lot 417, at a cost of 25 cents a bushel; and on July 25, 110 bushels of Morris Cove seed, at 20 cents, was planted on lot 415.

Meanwhile, in May, the schooner Albert Field brought Mr. Townsend a cargo of Wyeomico river oysters from Virginia, which he bedded on Crane bar and on Black Rock bar, under the following expense:

3,000 bushels, first cost, at 15 cents	\$450 00
3,000 bushels, at 14 cents freight.....	420 00
2,940 bushels, bedded, at 3 cents.....	88 20
<hr/>	
Total.....	958 20
Add cost of 4 tubs.....	4 00
Add branding 12 tubs, at 50 cents.....	6 00
<hr/>	
Grand total	968 20

DIARY OF CAPTAIN TOWNSEND.—Going back a little, now that this subject of transplanting has been followed to the end, the diary shows that Mr. Townsend conducted many experiments in propagating oysters during the summer. I copy the record of this practical study:

May 25, 1870.—I have carefully watched the growth of oysters planted in the ditch. A large proportion of the first laid down have died, having been badly mudded; but the young ones, from the spat or spawn of the oysters, laid down in 1867 and 1868, have grown very rapidly. The shells are thin and generally thrifty.

June 18.—I have this day been employed * * * running east and west lines, as per map No. 1 of oyster-grounds, in New Haven harbor within the limits of East Haven. [Here follows technical description of boundaries and ranges corrected from the survey of 1866.] * * * I have taken great pains to have this survey made, and spared no expense, as it is very important that some landmark should be made, as the ice carries away all stakes in winter, and it is remarkable that the one stake we have used has remained so long; but it is sure to go next winter, for the sea-worms have eaten it badly.

June 23.—Laid down near the bridge 15 bushels very large and fine single oysters taken from lot 422.

June 29.—Employed all day. Employed all day with two carts, three men, and Sergeant Maxwell, at the fort, carting oyster-shells preparatory to shelling the ditch. We have dumped 27 loads, of 25 bushels each, in piles 60 feet apart. Will spread the shells at the rate of 12½ bushels to a space 30 feet square. We call the ditch 30 feet wide at the bottom.

July 2.—Maxwell finished spreading shells in the ditch for the present. For the past week I have kept the ditch with about 4 feet of water in it in order to let the sun heat the water and make the oysters all spawn about the same time. I have also shut out the tide and let flow in as much fresh water as possible, as an abundant supply is supposed to benefit the oysters while spawning.

July 10.—Examined shells and oysters in the fort ditch this morning. The native oysters of the ditch seem to be about half-done spawning, while those taken from lot No. 422—very large, fine, single oysters, say four years old—seem just ready to spawn. The shells put in July 1 are coated with slime, fine sea-grasses, and now and then a speck which looks as if it might be spat.

At the end of July the author sums up his summer's labors, and counts over 10,000 bushels of stools planted, at a cost of from 5 to 7 cents laid down, or a total of \$688 50.

July 28.—I have also laid down, as an experiment, what is equal to 50 bushels an acre of smooth stones on lot 179, to keep the shells from shifting, and also to see if the spawn will set on the stones.

We are offered any quantities of shells for 2 cents per bushel in the heap, or laid down for 5 cents. We have paid as high as 5 cents a bushel for shells brought from Fair Haven river, but can now get the same work done for 4 cents, and 3½. H—— G—— has planted 177 bushels of shells taken from the saltpeter works for 2½ cents; William E. B—— furnishes shells, laid down, for 5 cents per bushel; and William G—— will let us have 5,000 bushels for 2 cents, or have them laid down for 5 cents.

On August 1, Mr. Townsend tabulated his estimated wealth in oysters—the season being now over—as follows:

	Bushels.
Young seed, from shells	8, 150
Old seed, river and cove	6, 000
Fort ditch	1, 500
Scattering sources	1, 500
Virginia plants	3, 000
Total	20, 150

August 2.—This day examined two oyster-lots in Morris cove, the first a triangular lot near Morris' wharf. * * * We find it well stocked, and also affording good clamming, but the growth of oysters there is very slow. This is one of the oldest beds in the cove, and there are oysters on it seven or eight years old. The second, off Nettleton's, ranges as follows: * * * This lot was seeded in 1866-'67, and the oysters have not grown since the first year. Clams in abundance.

I notice that the oysters at Morris' and in the harbor are out of spawn, but we see no signs of young oysters yet.

September 1.—Have examined carefully the shells laid down to catch spawn, and have not as yet found one young oyster, either in the fort ditch or in the harbor lots. We hear of a slight set in the cove and off the light-house. Moulthrop has been employed in the cove, and has brought up and laid down on lot No. 413, about 150 bushels of oysters, which were very fat, but had not grown enough to pay for planting, in three years; and I am convinced from actual observation that Morris cove, inside of the base-line, is not a productive spot for seed-oysters. Off-shore, and between Morris' wharf and the light-house, they may do better, as they get more current and fresh water. If the brook running east of Thompson's house could be let into the cove about at Parker's house, I think it would improve oyster-culture between the fort and the light-house, \$100 per annum.

Moulthrop has taken several bushels of clams from lots 250 and 267, and reports good clamming, something we will pay attention to next year.

The Virginia oysters planted on Black Rock bar have "sanded" somewhat, and, with the exception of a small spot in the sluice, the ground north of a line running to Hugh Waters' is not fit to plant on again, as I notice that some sand-ridges have shifted two rods since spring. These oysters (a lot of 1,050 bushels, from schooner Albert Field, planted May 14, being all that lived out of a cargo in bad condition when put down) have grown about 50 per cent. in three and a half months. If allowed to remain until December 1, they ought to be double their size when put overboard. Some of them are still in spawn, but are fit to open now, and their flavor is the same as that of the fort oysters.

We also planted 1,920 bushels, from the same vessel, on Crane's bar, in 2 and 3 feet of water (low tide) and on softer bottom, and in less current; they have not done as well.

Oystermen report native oysters fat, but cannot account for it, as we have not had rain for three months. They say the reason the spawn has not matured this year is because the water has been so salt that it has killed the spawn. * Moulthrop has also caught up 500 bushels of natives planted on lot No. 401, and has laid them down for fall use on the flats off the mouth of the creek.

October 1.—During the last two weeks we have sold about 175 bushels of oysters, and bought about 400 bushels of cove seed, and laid it down for next year. We have also begun to open a few oysters to try the market, but the weather is so warm dealers do not care to buy. The seed planted in the spring looks thrifty and clean. The drills have made some havoc, and we hear of starfish off the Pardee buoy.

October 23.—Returned from Boston last night, and this afternoon went out with Moulthrop to examine the oysters laid down as an experiment, on Black Rock bar. We find that the tidal wave occasioned by the shock of an earthquake last Thursday, has done considerable havoc among the oyster-beds. For the last two summers the growth of sea-weed on the flats has been very abundant, and as there was no ice last winter to clean it off, this year's growth, with the old growth, made the quantity double; the hot sun this summer having killed it all, and left it to decay. When the tidal wave came up the harbor from south-southwest to north-northeast, it is reported to have combed up 2 feet, by captains of vessels lying at anchor, and it swept before it all the mass of loose decayed sea-weed, and piled in windrows all the way from the Townsend creek to Crane's bar, completely smothering 500 bushels of oysters laid down at the mouth of the creek. It also altered the whole south and west side of Black Rock bar, and has destroyed hundreds of bushels of fine Virginia oysters, the sand in some places being 2 feet high. It has also tossed the oysters about in every direction, and our loss cannot be counted up at present, but we found oysters half a mile from their beds, which shows the strength of the tidal wave to have been great.

I find the oysters laid down as an experiment have all done well, except those laid down just north of the breakwater, off King's island. They are poor, which I attribute to not having fresh water, and I will in the spring open a creek through the meadow, which will give a good supply; as I believe the salt meadows are full of fine springs of fresh water, and if drained will not only benefit the

* This and the previous sentence refer to popular traditions which no evidence supports as true.—E. I.

meadow, but the fresh water will furnish a large supply of food necessary for the oysters to thrive well. The seed laid on the flats in May last has increased 100 per cent., and on Black Rock bar about 50 per cent. The young cove- or lighthouse-seed, bought of Captain Luddington in August, has at this moment increased 100 per cent., and astonishes us all. It is my opinion, that if we lay down any more, in order to thrive well they should be put down at the rate of 10 bushels to the square of 30 feet. By so doing, the seed will be large and sound in about one year's time.

I have not examined the oysters in the ditch at Fort Hale for two months, but when looked at they were in a thrifty condition, and will be ready for market this fall, if required. The two beds opposite ship-yard in Fair Haven river, are being taken up, and Mr. George Baldwin, the ship-builder, who has charge of them, says they are fat and looking well. The oysters in the cove are small, as they lie out of the current; but the clams are very abundant. Next year we shall clean up the cove. I write this in haste, as I leave for New York to take command of steamer Ontario to-night, and expect to make a voyage to Europe. Will commence next March to cultivate in earnest.

After his return from this voyage, Captain Townsend resumes his diary:

January 1, 1871.—Having closed the oyster-season last month, and being away at sea, my brother, George H. Townsend, decided to keep Anson Moulthrop watching oysters until I returned.

Having arrived at Boston, January 12, and home, January 15, I find the oyster-interest has been well looked out for, and as ice has closed up the harbor, we will wait until spring, before making farther beyond watching, etc.

March 1.—The ice has now broken up and left the shore and salt meadows in a very bad condition, having had several south-south-west gales, which reached their height about high water, piling the cakes of ice, some of which were 2 feet thick, one on the other, and the heavy surf kept them in constant motion, so that the whole length of the beach has been stirred up from Fort Hale to the creek, and thousands of tons of sand have been driven upon the meadows north of the creek. On the whole, the north part of the farm has been improved, but my point (the south water-front) badly injured. I also notice the ice has plowed deep furrows along the flats, and large rocks have been taken from the beach and left on the flats; and that oysters left in holes on Black Rock bay, have been washed out, and more than one-half carried out to sea by the ice. Those that remain, however, are of good quality, and in the sluice where the water was deep enough to keep them from coming in contact with the ice, I find them very fat and sweet. This winter has proved one thing, however, that all oysters must be taken off the flats before the harbor freezes up, or frost will kill what ice does not carry off. Of the 300 bushels of Virginia oysters left on Crane's bar, in 4 feet of water at low tide, about three-fourths have died, but the one-fourth now living have the same flavor as the native oysters, and are very fat. The native oysters have all done well. Those planted on the off-shore acres have increased about 200 per cent., and those in-shore about 150 per cent. I think we can safely estimate that the 8,500 bushels of seed taken from about 3,000 bushels of shells laid down in 1868, and transplanted in April and May, 1870, will now turn out 22,000 bushels of thrifty stock.

April 1.—Began working and watching oysters. * * * We now have the ground all staked out, and find that the whips put down last fall have all remained in their places, unbroken by ice, as were the larger. Hereafter we shall use whips instead of stakes. The original stake on the south line is gone.

April 10.—Mr. F—— began cleaning ground of the Virginia oysters planted last fall, and putting them inside of the eel-grass above the creek. The mud in the ditch at Fort Hale has smothered a great many of the oysters under cultivation there, and all the shells spread last summer have disappeared. The heavy gales last winter have destroyed the southwest sea-wall, and killed large quantities of fine oysters put there for the purpose of multiplication. We shall, however, shell the ditch again this summer, and keep up the cultivation.

April 20.—I find that the 198 bushels of seed-oysters planted along the north line by Anson Moulthrop, April 8, 9, and 20, have not thrived well, as the sea-weed grew up and choked them; many, also, have been eaten by the sea-drills.

April 22.—Have carefully examined the lots planted with shells, except the two most southern ones, and have not found one single young oyster.*

May 18.—Began taking up and planting, and am pleased to find the different beds looking so fine.

June 24.—I find that on the acre No. 414 (planted in August and September, 1868, with Fair Haven river seed), where we laid down 2,595 bushels of oysters, we have taken off and planted on other acres 5,070 bushels. The gain, although considerable, is not as great as it would have been had the oysters been transplanted last year. On some squares of 30 feet we took up 100 bushels. I find our great mistake has been that of planting the oysters too thick. New Haven harbor seed, one year old, on mud bottom, should be planted at the rate of 12 bushels to 30 feet square. Then, when three years old, they will be fit to open, and if allowed to remain four years, they will take up at the rate of 75 bushels to the square.

June 28, 1871.—I have this day taken several of the brick piers used in the foundation of the barracks, just taken down at Fort Hale, and placed them at intervals of 30 feet along the north line of the oyster-tract adjoining land occupied by Mr. G—— and I—— B——. The ice having destroyed our stakes, I have taken this means to preserve our north line.

July 15, 1871.—I have carefully examined the shells this day, laid down July 7, by Goodale, and find a set of shells known as "boats",† which are the forerunners of the young oysters, and look very much like them to the inexperienced. I have not yet been able to discover, even with the help of a glass, any signs of spat.

July 20.—The native oysters are now about half out of spawn, and I notice on the shells laid down July 7 and 11, a set of a greenish color in spots, which may be the oyster-spat. It is my opinion, from careful observation during the last four years, that oyster-spawn, after leaving the oyster, remains floating about, say a day or a week, until it matures, when it adheres to any clean, hard substance which has been just thrown into the water, and is free from slime. After this the coating breaks and the spat takes the shape and form of an oyster. Clean bits of wood, leather, bones, glass, iron, and stone have been picked up covered with young oysters, which proves that almost any substance thrown into the water, when it is impregnated with spat, will catch it. For catching and propagating oyster-spawn the French use brush, but we find that oyster-shells are better. Young New Haven native shells are considered the best, as they are thin, and when the oyster grows large enough to keep out of the mud, the shells break asunder and the oyster grows in better shape. Where there is much motion in the water, stones have been used, and where the water is quiet, scallop shells are preferred by some.

August 1.—The shells are becoming covered with some kind of spawn, green, black, and a silver color, which may be the eggs of the oyster just ready to break.

*An entry made July 16, 1871, reads: "I find, on examining again, the set was, in spots, good enough to pay expenses."

†The slipper limpet or deck-head, *Crepidula*; three species occur in Long Island sound, of which the *C. fornicata* is the best known.—

August 4.—I can now safely say that the spat has begun to adhere to the shells. I have several very fine specimens. The eggs at first look (under the glass) like very fine pearls with a black spot, which adheres to the shell and seems then to break out and take the form of an oyster.

August 5.—I notice to-day that the young oysters on shells laid down July 31 are as large and abundant as on the shells laid down July 7 and 15; and, from a careful examination, I am sure the little pearly specks with a black dot, noticed on the shells from, say, July 25, were really oysters in their incipient state. On one shell I have counted, with the naked eye, over 200 well-formed oysters; and under the glass they are too numerous to count with certainty. Calm and hot weather, from July 10 to August 10, is necessary to make the spawn mature and adhere to the shells properly.

August 7.—I have proved to-day, to my own mind, that the green spots first seen on the shells laid down early in July are not oyster-spat or spawn. The dark, muddy substance on the shells, I am inclined to think, comes from the oysters and envelops the spawn, protecting it while drifting around until it becomes fit to adhere to a stool and hatch out. The eggs, when they leave this covering, look like fine sand, transparent under the glass, with a black dot. I have proved this by opening several oysters on Saturday, August 5, and, after removing the meats, carefully laying the shells down near a stake in the center of a bed of oysters just out of spawn; to-day, August 7, just 48 hours later, I find on these shells a fine "set" of young oysters, some of them just formed, others just attaching themselves and dropping off at the slightest touch.

I also notice that the young oysters which have attached themselves to shells on Black Rock bar, and are hardly ten days old, have an enemy in the small black wrinkle or snail,* and in the drill, which bores holes in the shell and destroys them by the hundred.

August 8.—I have decided to put down 600 bushels more oyster-shells, as I find the water is full of spawn.

August 9.—Have put down 300 bushels to-day off Black Rock bar, along the edge sand and mud, and 400 bushels to August 9, which finishes spreading shells this year. Total amount 5,190 bushels. Shells bought at the copper-works have cost us 7 cents laid down. Shells from Fair Haven 2½, and 5 cents boating, equals 7½ cents laid down. Shells from oysters opened by our own help 2½ cents laid down.

August 10.—Have examined carefully the shells laid down July 31, and find an increase in the set, and a very rapid growth. I find that by opening oysters and laying down the shells, that in three tides we find a set of spat, which proves that the water is now full of spat. I have also noticed that for the first two days after the young oysters have been taken from the water they seem to increase in size. They then die and some drop from the shells.

I estimate the total amount of bushels now planted as follows:

	Bushels.
Spawns of 1868 planted in 1870, and now doubled by increase.....	16,200
1868 seed (spawn of 1867) transplanted	6,130
Fort Hale (spawn of 1866), planted on Black Rock bar.....	3,225
Oysters on beds (spawn of 1869) transplanted last year.....	1,250
Fort ditch, Fair Haven, and Cove	1,000
Young seed on shells of 1870.....	1,000
Total.....	28,805

Allowing the growth of this to increase one-fourth this season, and adding this 7,000 bushels to the 28,805, we have 35,805 bushels of oysters actually growing. To this may be added 5,190 bushels of shells well set, to say nothing of the set on the shells laid down in 1870, which will amount to something. The estimate, therefore, sums up as follows:

	Bushels.
Total oysters planted.....	28,805
Increase through growth.....	7,000
Stools and set.....	5,190
Total property.....	40,995

August 19.—The spawning-season is now over, and I find this year's experience should not advise laying down shells later than August 10 or earlier than July 10. The spawn seems to have drifted in flakes. Some areas have a better set than others. The drills and small black snails are killing the young oysters by the millions, and where it runs bare at low water it is worse.

September 1.—I notice that where the spat has set on oyster-stakes in the eel-grass, that the grass sweep the young oysters off the stake; but out of the reach of the grass the oysters are solid and reach up within a few inches of the water-surface at high tide, and the grass seems to prevent the drill from getting up the stake to the young oysters. Oysters are very poor, except those laid in the sluice.

September 25.—We have caught up, sent to market, and laid on the flats, about 500 bushels three years old. Oysters over three years old are now large enough for shell-oysters. I saved a specimen of oyster set on a stake, and will next year try brush for the spat to set on.

EXTENT OF OYSTER-CULTURE IN NEW HAVEN.—Out of the seven or eight thousand acres "designated" in New Haven harbor and its offing, only from 3,000 to 3,500 are in actual use as yet. The largest possession is Mr. H. C. Rowe's; he operates upon about 1,500 acres. Several other planters have from two to six hundred, while many have a hundred acres under cultivation. The major part of this is in deep water, and is yet regarded to a great extent as an experiment, particularly by those who live in other parts of the state. Thus far the success has been encouraging. One gentleman calculates that he has 200,000 bushels of oysters of all ages on his offshore land. Another planter gives me his estimated wealth as follows: On 70 acres, 75,000 bushels, suitable to be sold as seed in the spring of 1880, at an average of 50 cents a bushel; on 50 acres, shells and a good set; elsewhere, in one tract, about 3,000 bushels of young spawners, on which shells are to be thrown; on another tract, 20,000 bushels of seed useful in 1880; and, lastly, an area holding about 5,000 bushels of "set". A 30-acre lot yielded this firm 12,000 bushels in three years, which were sold at 70 cents.

* *Tritia trivittata*, or perhaps *Hyamassa obsolata*. No doubt various of the small gasteropods devour incipient oysters and other young mollusks.

RAVAGES OF STARFISHES AND THIEVES.—As yet starfishes have not proved a resistless enemy to the outer beds, although individuals have suffered great harm through their ravages in isolated cases. There are not so many rocks and hiding places for them here as exist in the western part of the state, which may account for the present partial immunity. It is feared, nevertheless, that continued planting will cause a gradual increase of the plague, since elsewhere starfishes have increased in proportion to the expansion of the planting. A greater obstacle to success here is the liability of the bottom to move in gales and bury or scatter the beds. The drawback from thieving has already been touched upon. This nuisance has been greatly abated, and a much healthier public sentiment prevails, but there still remain lawless men who will watch their chance to push out from some cove, or come in from the sound, and steal the bivalves. Hence a watchtower has been built at Long Wharf, in New Haven, in which a man is kept night and day. Another is built on the flats that run out from the West Haven shores. Still others are kept off the Light-House point, and at a point off Branford harbor. The oyster-planters share the expense of such provisions for keeping their property from thieves, each paying according to the amount he has at stake.

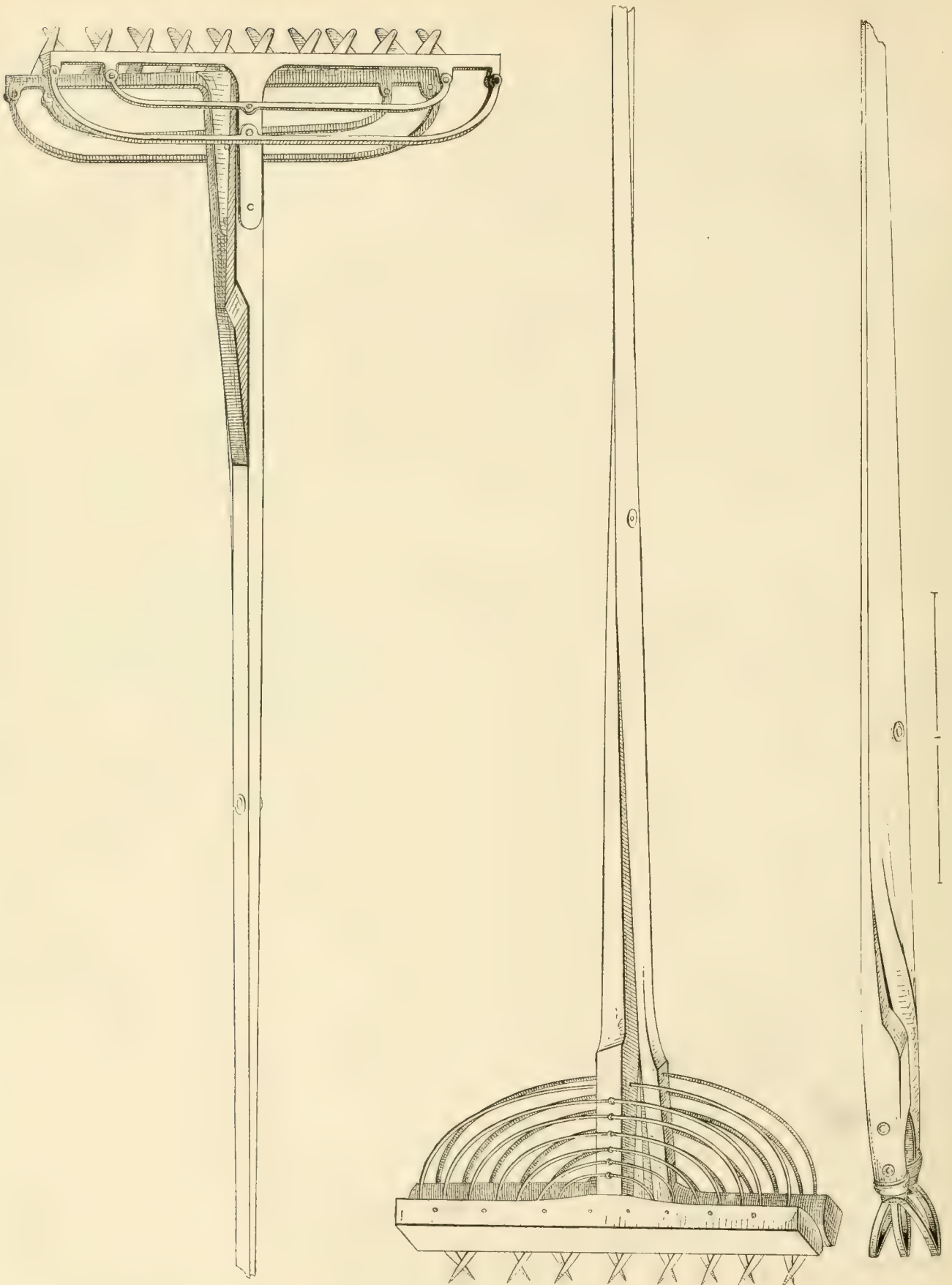
QUALITY OF OYSTERS IN 1879-'80.—The present season (1879-'80) the native oysters grown in all parts of river and harbor, especially in the neighborhood of Morris cove, are of very unusually poor quality. I have heard suggested but one plausible explanation of this. During July and August, 1879, a series of heavy inland storms occurred, and the Quinepiac and its tributaries were swollen with successive freshets; as a consequence, the water of the harbor, throughout its whole extent, was so roily that in place of its accustomed purity it was thick and brown for weeks together; it does not seem improbable that such an unusual condition not only proved fatal to the spawn in all parts of the harbor, as something certainly did, for no set was obtained, but cut off also the food of the adult oysters to such an extent that they were unable to recuperate from the long fast. The fact that oysters will "fat up" in a day, under good circumstances, is opposed to this theory, which is worth only so much as a suggestion.

31. OYSTER-CULTURE AT MILFORD.

HISTORY OF MILFORD AS A FISHING TOWN.—Leaving New Haven, the first stoppage for oyster-studies is at Milford, one of the most interesting and beautiful places in the state. It was settled in 1639, and long ago had an extensive West India trade and ship-building industry. The business in that line declined forty years ago. The gulf, harbor, and estuaries have always been more or less prolific of shellfish. Milford long-clams have a good reputation. Milford point, at the mouth of the Housatonic river, was a famous oystering place many years ago. Old citizens remember a row of huts, built of wreckage and covered with banks and thatching of sea-weed, which used to border this wild beach. In these huts lived fifty or sixty men, who made here their home during a greater or less part of the year, and devoted themselves to clam-digging and oyster-raking. Many of these men, who were utterly poor, thus got together the beginnings of a fortuné, which, invested in active agriculture, placed them among the most influential inhabitants. But for the last thirty or forty years such sea-industries as these have been declining, until nothing whatever was done on the water by Milford people, except the catching of menhaden, for the utilization of which two large factories have been built.

EXPERIMENTS OF MR. WILLIAM H. MERWIN.—About eight years ago, however, Mr. William H. Merwin, knowing what had been done about New Haven, began his valuable experiments in cultivating native oysters. He and some others had once before started an enterprise of raising oysters in the "Gulf pond" at the mouth of the Indian river. But the other stockholders, being older men, disregarded his advice, though he had always lived by the shore, and the effort failed. They insisted upon damming the river, so that the sediment brought down by the stream was deposited upon and smothered the oysters. It is this episode that gave rise to section 10 of the oyster-statute.

Eight years ago Mr. Merwin resolved to try oyster-planting for himself. He took up a few acres off the shore in water 8 feet deep at low tide. He had just got his oysters well planted and had high hopes of success, when a storm destroyed them all. His labor and money got no return but costly experience. He then tried again, further out toward the sea, in 18 feet depth of water, near the government buoy. He got so heavy a set, and his young stock grew so well, that he estimated his crop at 10,000 bushels. Cultivators from Providence and Boston came down and bargained with him to take it all about the middle of April, but the last of March there came a gale which drifted so much sand upon the oysters that they had not strength, after the severe winter, to "spit it out", and before they could be taken up so many died that only 3,000 bushels were sold. There had been an immense excitement over the seeming success of oyster-culture; a joint stock company had been formed and the whole harbor taken up; but this storm put an end to the enthusiasm, and everybody, except Mr. Merwin and his two sons, retreated. Mr. Merwin, however, saw that the trouble lay in the shallowness of the water. He therefore went down to Pond point, eastward of the harbor, and buoyed off 200 acres in water from 25 to 40 feet deep, upon a hard, gravelly, and sandy bottom. He placed upon this ground a quantity of full-grown oysters and shells and secured a large set, which has been augmented each year since, until he now has 100 acres under cultivation. In 1877 there was a very heavy set hereabouts; in 1878 less, and in 1879 least of all.



OYSTER TONGS AND NIPPERS.

THE MILFORD OYSTER-STEAMER.—Having thus got assurance of a profitable farm, for storms no longer seemed able to affect him, Mr. Merwin saw that he needed more rapid and sure means of harvesting his crop than the row-boats and skiffs afforded. He therefore employed the firm of Lockwood & Co., of Norwalk, to build him a steamer for the express purpose of dredging, and introduced the proper machinery for that work. With this steamer, which is, to a large degree, independent of wind and weather, he can do three times the amount of work possible for the same number of dredges worked without steam (500 bushels is not an uncommon day's result with two dredges), and do it best on the "dull" days, when it is too calm for his neighbors' sloops to work. Its owners often find profitable employment for their leisure in chartering the steamer to other oystermen, who desire aid in dredging or in raking off the starfish that infest some beds. One single instance of the advantage the use of steam was to this firm will be pardoned. In the spring of 1879 a Rhode Island planter sent a sloop, capable of carrying 1,500 bushels, to New Haven to buy small seed. The Merwins were invited to contribute to the cargo, the captain of the sloop buying on the principle of "first come, first served", until he had filled up, haste being the great desideratum. It happened, that upon the very day the sloop arrived a dead calm fell, and not a sloop from Fair Haven or Oyster point could haul a dredge. Meanwhile Mr. Merwin's steamer was puffing back and forth through the quiet sea, without an hour's cessation, and in two days placed 1,200 bushels of seed upon the sloop's decks.

LOCAL OPPOSITION TO OYSTER-CULTURE.—There are two rivers which come down to the sea at Milford, the pleasant Wepawaug, along whose banks the town lies, and whose upper waters turn numerous mills; and Indian river, which empties into the harbor close by the mouth of the former stream. Indian river debouches in an estuary called the Gulf, or Gulf pond. Except in one little spot no oysters grow now, or ever did grow, in this inclosed salt-water pond, although it would be the best possible place to cultivate them. But the popular feeling of the town is so strongly against the utilization of these advantages by private effort, that no ground is permitted to be set off, and any oysters put down there are liable to be seized as public plunder. Once, indeed, the oyster-committee assigned to Mr. Merwin a tract in the gulf; but as soon as it was found out, an indignation meeting was held and mob law was loudly threatened. Cooler judgment overruled that, but any cultivation of this valuable ground, otherwise wholly useless, was sternly interdicted.

PRESENT STATE OF OYSTER-CULTURE AT MILFORD.—Inspired by Mr. Merwin's success and pluck, various persons have taken up ground in the vicinity of his tract off Pond point, amounting in the aggregate to about 750 acres, divided among eight owners. One of these gentlemen, in addition to 100 acres here, has several smaller tracts at different points along the shore to the westward; in all, about 400 acres, upon which some thousands of bushels of young oysters are growing. There is plenty of good bottom still remaining off this shore, however.

32. METHODS OF CATCH AND DISPOSAL.

HOW GROUND IS OBTAINED.—The mode of obtaining ground under the new law of 1881, says a correspondent of the *New York Sun*, will be as follows: The person desiring ground must make application in the prescribed form of a blank, legally approved by the chief justice of the state, setting forth the quantity of ground he wishes, prescribing exactly where it is, and showing that it is not and has not been within ten years a natural oyster, clam, or mussel bed. A notice, which includes an exact copy of that application, is sent to the town clerk of the town opposite which the ground asked for lies, and must be posted in a conspicuous place in his office for twenty days, in which time objectors to the grant, if there are any, must file their objections with the town clerk. If no objections appear, the commissioners are authorized to give the applicant a deed of the ground, upon his paying the state \$1 per acre therefor and the expense of surveying and mapping the lot, which is covered by a charge of ten cents per acre. If any objections are filed with the town clerk they must be returned with the application to the state fish commissioners, who will institute an investigation and decide the case as seems to them just and lawful. The grounds for objections are, either that the grounds applied for are natural beds, or that some person claims ownership by virtue of many years' possession and enjoyment, or under a deed from the town. Fifteen years' possession is held to confer rights of ownership. In the matter of forbidding the designation to private individuals of natural shellfish beds, the law is especially severe, prescribing that the commissioner who knowingly does such a thing shall be subject to a fine of not less than \$100 nor more than \$500, and that the person illegally obtaining such natural beds knowingly shall lose his designation and forfeit all he has paid for it. Provision is made for the return of a purchaser's money in case his designated ground proves to be unfit for the cultivation of shellfish, and to prevent speculators from getting possession of ground and holding it indefinitely for a rise in value instead of for honest work, there is a clause compelling the cultivation of ground within five years from its allotment. A clause in the bill prescribes that no person can hold ground taken from the state, or from a grantee of the state, unless he has been a resident of the state for one year prior to his entering upon such possession. This clause the commission will probably ask the legislature to strike out. Not only is its narrow proscription an offensive feature, but conditions are easily conceived in which it would work great injury to persons desirous of retiring from business, and to heirs, beside shutting out much desirable capital. The law provides for the plain marking out of designated grounds by the grantees by permanent "stakes, buoys, ranges, or monuments", so that hereafter, or, rather, after operations are fully commenced under this law and commission, there need be no more confusions of property rights to ground under water than respecting real estate high and dry on a hill.

TONGS, RAKES, AND DREDGES.—In gathering seed near shore, and somewhat otherwise, tongs and occasionally rakes (those with long curved teeth) are used; but the marketable oysters are nearly all brought from the bottom by dredges of various weights and slight differences in pattern. In the case of all the smaller sail-boats, the dredges having been thrown overboard and filled, are hauled up by hand—a back-breaking operation. The oysters themselves are very heavy, and frequently half the amount caught is composed of shells, dead oysters, winkles, and other trash, which must be culled out, thus compelling the oystermen to twice or thrice the work which they would be put to if there were nothing but oysters on the ground. The work of catching the oysters by any of these methods is, therefore, very tiresome and heavy, and various improvements have been made, from time to time, in the way of labor-saving, from a simple crank and windlass to patented complicated power-windlasses, similar to those commonly used in the Chesapeake boats. When a proper breeze is blowing, dredging can be accomplished from a sail-boat, with one of these windlasses, with much quickness and ease. In a calm, or in a gale, however, the work must cease, as a rule.

Under these circumstances, and as the business increased, it is not surprising that the aid of steam should have been enlisted; nor, perhaps, is the controversy which has ensued to be wondered at, since the introduction of novel or superior power into some well-traveled walk of industry has ever met with indignant opposition.

BOATS.—In former times all oystering was done by means of small row-boats. That this has not been wholly abandoned is shown by the fact, that there are yet to be found fifteen or twenty dug-out canoes at and about New Haven, devoted to catching both seed and marketable oysters. Some of these canoes are of large size and good pattern, but few or none are now made new, so that their number diminishes, and they will before long disappear. These canoes are to be seen nowhere else along our coast between Maine and the Chesapeake, and with their decay goes a monument, not only of old oystering, but of all aboriginal life in New England.

The substitute for the old canoe is found in the square-ended skiff, which is only a small scow-boat. Of these, which are worth perhaps \$10 each, a walk along the Quinepiac will disclose a hundred or more, all devoted to oyster-work, chiefly as tenders on the sail-boats in the planting of seed, the bedding down of Virginia stock, and the transporting of cargoes. Many of these small boats, however, are used by planters of small means, who cannot afford to run a sail-boat.

The sail-boats of New Haven harbor are almost universally of the sharpie model, which is well known for its speed-giving and room-affording qualities. It is the boast of the Connecticut oystermen, and to them the world owes the perfection of this admirable craft, which has been developed to supply the need of a large-stowing, swift-running craft, which, at the same time, should be flat-bottomed and draw so little water as to run safely over the scarcely submerged oyster-beds. There are nearly 100 sharpies in the harbor, worth perhaps \$15,000.

OYSTER-STEAMERS.—The first utilization of steam in this business, so far as I can learn, was by Capt. Peter Decker & Brother, of South Norwalk, about 1870. They first put a boiler and engine in the sloop *Early Bird*, to turn the drums in which the dredge lines were hauled, still retaining the sails for the propulsion of the vessel. After a time they extended their facilities, by inserting a small screw in their sloop, to assist in propelling her when the wind was light, and at length, after further trial, they took this machinery out and put in a larger boiler and engine, with special winding apparatus, and discarding sails altogether. These changes cost \$1,300, and now, at an expense of 3 to 4 bushels of coal a day, this little steamboat hauls two dredges, and can take up 150 to 200 bushels per day.

After the Messrs. Decker's experiments, Mr. W. H. Lockwood, of Norwalk, not an oysterman, but an enthusiastic believer in steam-dredging, built the steamer *Enterprise* expressly for the business. Her length is 47 feet; beam, 14 feet; she draws 4 feet of water. She handles two dredges; has a daily capacity of 150 or 200 bushels.

These were followed by several other steamers. Mr. Joshua Levinness, of City Island, has a very large boat built for the purpose, and fitted with very heavy machinery; but it is said to be inconveniently arranged and expensive to run. She hauls four large dredges over the stern, and caught oysters so fast on the public oyster-grounds in the state of New York, that the owners of sailing-boats induced the New York legislature to forbid the use of steam on the public grounds.

The Merwins, of Milford, and Mr. Wheeler Hawley, of Bridgeport, also have steamers of large capacity, so that there are now in all seven in Long Island sound, but it is generally acknowledged that the most thoroughly equipped boat for this purpose, of the fleet, is owned by H. C. Rowe & Co., of Fair Haven, Connecticut. It is named the "*William H. Lockwood*", and is comparatively new, and cost between six and seven thousand dollars. The dimensions of this boat are: length, 63 feet; beam, 16 feet; draught, 5½ feet. Her boiler is larger and her engine more powerful than usual in a boat of her size, and she can therefore be used for towing, and can force her way through heavy ice in the winter, so that her owner is sure of a supply of oysters for his customers when other dealers may be unable, with sailing-vessels, to get them. Beside her regular propeller engine, she has a double engine for hauling dredges, which hauls all four dredges full of oysters at once, and lands them on deck, two on each side, at the rate of 800 bushels a day, if needed. This employs a crew of ten men, who are protected from the weather by a housing which covers in the whole deck.

OPPOSITION TO STEAM-DREDGING: GROUNDS OF OBJECTION.—Those who were not in possession of the steamers, however, quickly began to look askance at the rapidity and comprehensiveness of their work, and early

began to attempt to form public opinion and secure legislation tending to repress this dangerous competition. An early success was had, in so far that steam-dredging was permitted on public seed-ground in the sound only on two days of each week. Not satisfied with this, however, laws were sought which, if they did not prohibit the use of steam altogether, should at least restrict it to the designated planting-ground of the owner. The controversy which ensued then was long and bitter. In my inexperience it would be presumptuous in me to assume a judicial function; and here, as elsewhere, I shall restrict myself to a brief presentation of the arguments opposed, merely pointing out, before I begin, that this contest is apparently the same which has always been waged by hand-labor against machinery, and by poor machines against those more adequate to the work—a fight originating in ignorance and unprogressiveness, and perpetuated through jealousy and personal feeling. I do not say this of this controversy alone, but of the whole history of invention and progress in the arts. I have no doubt the Indians and first settlers thought the mollusks of the coast would be exterminated, when some enterprising Puritan or Knickerbocker brought the destructive rake and tongs or the terrible clam-hoe to bear upon them; and the owners of these again were filled with dismay, when the first dredge was explained to them and boldly thrown over, first from a row-boat and then from sloop and schooner. The transition to steam-power seems only another similar step, and the complaints against it are equally valid against superseding steam cotton-looms to hand-weaving, or the swift circular-saw to the old pit method. There is hardly any branch of the seine-fisheries now where steam is not profitably employed, having overcome opposition, and its service is widening every day. And as steam has won before, and approved its title to the crown by its results, so I feel confident it will again be victorious—for the world does move.

The arguments by which the employment of steam-power on Connecticut's public oyster-beds is sought to be abolished are about these, as I gather them, chiefly from a minority report to the legislature of 1881, on a bill before that body:

There are within the boundaries of the waters of Connecticut, at various points along the northern shore of Long Island sound, in the aggregate about 6,000 acres of "natural oyster-beds" of the state.

On a comparatively small portion of this area, lying in the channels of rivers and in shallow waters near the shore, oysters are customarily allowed to grow to maturity, and are gathered for market and for their own consumption by the poorer classes of the people. On a much larger portion of the natural oyster-beds the oysters are ordinarily collected when small, to be planted by oyster-cultivators as seed upon their private beds. The gathering of these seed-oysters is accomplished by means of dredges attached by ropes to boats in motion, and so drawn along the bottom over the oyster-beds.

There are directly interested in this business of gathering and planting oysters, about 3,000 citizens of the state, most of them small operators with limited capital, owning from two to twenty acres of designated ground for oyster-planting—and small vessels propelled by sail or oars. Some of them own no ground at all, but gain their livelihood by gathering the seed and selling it to larger proprietors. Seven individuals of the entire number of our citizens engaged in this pursuit employ steam tugs or propellers in dredging. The state, by previous legislation, has prohibited this use of steam-power on a tract which includes about 633 acres of the public natural growth, leaving a tract which includes about 5,100 acres subject to such use. The object of the desired legislation is to prohibit the further use of this steam-power, and to place all our citizens on an equality in the means employed in the collection of this their common property from this common or public domain. Such legislative prohibition seems to be called for as a matter of fairness and justice to all persons who, by virtue of their common proprietorship, are equally entitled to gather oysters and other shellfish from the public domains of the state, and more particularly to that large class of our citizens who depend upon the prosecution of this business for the livelihood of themselves and their families. It has been found, from evidence submitted to state-authorities under oath, that by reason of the limited resources of this large class of our citizens but very few, if any of them, are, or are likely to be, able to provide themselves with steam-power; that by the use of this power a single vessel can, in a given space of time, collect of this common public property a quantity twelve times larger than can be gathered by an average sailing-vessel; thus being independent of wind and tide, a steamer can prosecute its work about twice as many days in each week, and many more hours in each day; that the earlier part of the dredging season is equally subject to calms, and that by a combination of these various causes, together with the fact that the annual crop of seed-oysters is limited, and in any given season is liable in a great measure to be exhausted, the favored few, if steam-dredging on the public property is allowed to continue, will inevitably gain a vast and unjust advantage over the larger and poorer class, and practically drive them from the field, deprive them of their employment, in many cases reduce them to destitution, and create a monopoly of the business in the hands of a few individuals.

To this view of the case, it is objected, that though these facts may be undeniable, yet it is counter to the spirit of the age, and a blind and inequitable suppression of private enterprise, to deprive any individual of the free use of all the improvements which science and his own resources have placed at his command. This would have weight if the subject under consideration were simply a matter of private rights, if it were simply a question what improvements might be employed by individuals in connection with the use of their own private property.

But it is to be remembered, that this is a matter of public and common right, and that it is not only the privilege but the duty of the state, in relation to this common property, to see that it is fairly and evenly distributed among those to whom it equally belongs, and that no person or class of persons shall obtain more than a just share of its benefits. This principle is invariably recognized and acted upon in our legislation, relative to our inland fisheries; relative to game; relative to steam-dredging on private grounds in certain localities; relative to the taking of mature oysters, and even in the designation of grounds for the planting and cultivation of oysters, and any legislation that ignores this principle, by favoritism in the granting away of public land, or any other public property, is justly subjected to the reproach of its constituents.

Further, it is for the preservation of the public oyster-grounds. We have seen that the area was limited, there being in all only about 5,728 acres of the 500,000 acres covered by the waters of this state. This comparatively small fraction of the whole is the sole natural nursery of all our oyster-growth; and the existence of this natural oyster-ground depends entirely upon the condition of the bottom.

In order that any portion of the bottom may constitute a natural oyster-bed, it is essential that it should be composed of cobble-stones, gravel, shell, or other similar hard substance, from which, by the action of the water, slime and other impurities are naturally removed. Without these conditions the spawn, which is floating in the water, will not be deposited and adhere; no germ will be deposited; no oyster-bed be formed.

It is obvious, therefore, that any practice which tends to remove, diminish, or cover up this indispensable foundation for the bed, inevitably leads to the destruction of the bed itself, and reduces the area of the natural oyster-grounds of the state. The process of dredging necessarily removes, together with the seed gathered, some portion of this essential foundation of the bed; but by the style of construction and the comparatively light weights of dredges ordinarily employed by sailing-vessels, this objectionable feature of the business is in a large measure obviated; while we find that by the different style of construction and much greater weight of the dredges naturally and almost invariably used by the steamers, they sink deeper and penetrate further into the bottom; they more readily overcome resistance; they gather up and remove much larger quantities of the foundation-material of the beds, leave the surface in a broken and uneven condition, more liable to be buried in sand and rendered barren by the action of the waters in a storm; and they plough under, smother, and thus destroy the seed-oysters they do not gather up. We find, from the evidence, that such has actually been the result of steam-dredging on certain portions of public oyster-growth.

Prior to the fall of 1878, on the tract known as the "Shippen" bed off Stamford, there had been for years a good annual growth.

In the fall of that year a steam-dredge was worked over a very considerable portion of that bed, which portion, since that time, has been tried and found totally unproductive; but on other portions of the bed, immediately adjoining the place of her operations, a good supply has since been annually obtained.

Prior to the fall of 1879 the "Noroton" bed, a tract of some 300 acres, was for the most part yearly covered with an ample "set" of seed. A steamer dredged on a portion of that bed in the summer of that year, and thereafter the ground on which she dredged was found unfruitful.

For many years off Fairfield bar there had been a valuable bed. Two steamers worked it, and since that time no oysters have been found there.

In 1879 two steamers dredged upon a small tract of natural ground known as the "Pond point" bed, off the mouth of Milford harbor, which before that time had borne large quantities of oysters. It has since yielded nothing.

The owners of steamers argue that they will go into deep water and make beds, and assert that "only a few years ago the natural bed off Bridgeport was only a little patch. By the work of the vessels it has been spread out until it is five miles long and nearly a mile wide. There is no reason why it should not be made four times as large by the introduction of steam".

In respect to this a citizen of South Norwalk remarks as follows, claiming to know whereof he speaks:

The Bridgeport bed was discovered in July, 1867. Then it extended from Black Rock harbor to Point-No-Point, at least four miles, and was from one-half to one mile wide, covering about three thousand acres. Capt. Samuel Byxbee, Joseph Coe, and William M. Saunders were the first to go on it from this town. In one drift, in a light breeze, they caught over 300 bushels of seed. Capt. J. Levinness, in going across the bed three times, took 1,000 bushels. Capt. Barnes piled the deck of a fifty-ton sloop in one drift. Catching seed there was a constant letting go and hauling, and men became so exhausted they fell down from sheer fatigue. At one time 450 sails were counted at work on the bed and they had plenty of room. That number of vessels could not be set on three acres, place them side by side. Now the bed does not actually cover 40 acres, and is in small patches, scattered over the ground of the former bed. It has been worked almost to death, and it only needs one season of steamers to exterminate it entirely.

This same gentleman expressed the sentiment of many of his neighbors, too, when he wrote to the *Sea World* in 1879:

Permit me to say that your correspondent uses sophistry in his argument that steam and machinery have the right of way, and that manual labor must quietly submit to be displaced by it. It is the right and duty of every citizen of this state to ask that the legislation be for the benefit of the many and not the few; in the interests of labor rather than capital; the weak rather than the strong; and that the public domain be reserved for the benefit of all its citizens.

On the other hand, in the language of the minority report referred to above:

No evidence has been offered to show, and it has not been claimed, that similar disastrous consequences result, or have anywhere resulted, from the operation of dredges drawn by sailing-vessels, but, on the contrary, sailing-vessels in the act of dredging, being compelled to pass beyond the borders of the beds (a movement not necessary or customary in vessels controlled by steam), thereby enlarge the borders of the natural ground, and so far work a common public benefit.

As to the effect of steam-dredging on the general public, it appears to us that in the event, either of the monopoly heretofore suggested, or of the gradual extermination of the natural oyster-grounds menaced, the price of oysters would ultimately advance, to the detriment of the consumer.

In addition to the foregoing considerations, and as a fact of very great consequence, it is to be observed that some states of the Union having large oyster-interests, particularly New York and Maryland, have totally prohibited steam-dredging within their waters; and other states, to wit, Rhode Island, New Jersey, Delaware, and Virginia, have gone even further and prohibited all dredging of every kind upon their natural beds.

Lastly, it is asserted that one or two considerable dealers have tried steam, and given it up as unprofitable.

ARGUMENTS IN SUPPORT OF STEAM-DREDGING.—Opposed to this, those in favor of the use of steam as a motive-power in dredging, set forth the following facts and arguments:

The number of steamers now in use is seven only, yet this small number has extended the cultivation, increased the production, and as a consequence, has materially reduced the price of oysters.

Prior to the introduction of steam, oyster-dealers of Connecticut were obliged to purchase oysters in other states to supply the home demand; now the production within the state is sufficient, not only for local demands but also for a large export. A business so increasing is of benefit to the whole state, particularly in enlarging the supply and reducing the cost of an important article of food.

The owners of sailing-vessels engaged in this business, and having interests on the shores of Long Island sound, west of Bridgeport, are the only opposers of steam, and they have local, political, and selfish reasons, outside of the merits of the case. Is it the duty of law-makers to pass a law prohibiting this use of steam, to the injury of the people of the state, to gratify the jealousy of a class, and thereby hinder the development of the oyster-culture and discourage enterprise and progress? In the same way the introduction of steam in the manufacture and transportation of cottons, woolens, grain, and for many other purposes, was bitterly opposed by those with whose labor it came into competition; yet no one doubts the wisdom of its introduction, because the sequel has proved that the application of steam-power to any branch of industry decreases the cost of the product. The claim that steam, as applied to this business, was objectionable, is effectually disposed of by these indisputable facts:

1st. That the steamers are used by their owners on their own private beds ten months of the year. Does any man of sense believe they would be so used if they damaged the beds? And if the private beds are not damaged, how should the public ground suffer?

2d. It is ridiculous to claim that an iron bar, dragged on the bottom by steam-power, will have a materially different effect than if dragged by wind-power. On the contrary, the motion of a steamer is more steady and certain than that of a sailing-vessel, and a dredge drawn by it must, of necessity, leave the bed smoother than one drawn by any power less steady and certain. The dredges used by steamers are not heavier than those used upon the larger-sized sailing-vessels without objection by any one. "It was proved that twenty-two sailing-vessels from New Haven and vicinity dredged on the Bridgeport bed during 1880, using a dredge as heavy as the average dredge used by steam vessels."*

3d. The "Bridgeport bed" has yielded a larger catch this last season; was greater than it has been since the year of its discovery. Steam-vessels had dredged all over this bed during the preceding season, and seem to have increased rather than diminished the size and productiveness of the bed, while many of the beds from which the steamers were excluded had an inferior set.

4th. The statements made against steam have been assumptions. It has been asserted that the dredging *would* injure beds and oystermen not thus operating; but no evidence appears that it has hurt either in any part of the state.

5th. To follow the example of New York and other states would be anti-progressive, since before they adopted this policy they sold thousands of bushels annually to Connecticut; whereas now Connecticut largely supplies the seed for the beds in both those states.

*These are the words of a majority report made to the Connecticut legislature in 1881, but it is extremely difficult to get at the truth. A year previous a letter from South Norwalk contained the following statements:

"Sailing-vessels use dredges weighing from 15 to 35 pounds, which hold at the most but three pecks. Steamers use dredges weighing from 60 to 100 pounds, holding a barrel. One goes over the bottom lightly; the other subsoils it, burying everything it does not catch. In the fall of 1878 W. R. Lockwood's steamer worked three weeks on the Shippen bed, taking off 1,600 bushels of seed. During the entire summer period Adison Merrill worked with a 22-foot sail-boat on the same bed and caught but 500 bushels. After the steamer left sail-boats could not dredge at all. The bottom had been so subsoiled the light dredges filled with sand and could not be hauled. During that spawning-season men with small boats worked on it a long time for the sole purpose of cleaning the bottom for the spawn. As soon as the spawn set the steamer came, caught, and destroyed it all. The next spring nothing could be caught on that bed. In the summer the sailing-vessels stirred it up again. The spawn set—Hoyt Brothers' steamer worked on it a few days and the seed was either on their private beds or smothered. The same thing was done at Roton point, destroying that bed entirely."

CONNECTICUT LAWS REGULATING STEAM-DREDGING.—The existing law at the time of this controversy was the "Compromise Act". It allowed sailing-vessels only to dredge on natural oyster-beds west of the Bridgeport bed, and permitted all classes of vessels to dredge upon Bridgeport and other beds. This law was accepted as satisfactory to all interested, and was regarded as finally settling the controversy in this business between steamers and sail-vessels; and, acting upon that assumption, investments have been made in steamers by various persons who asserted that they would suffer greatly if steam was prohibited in dredging. Nevertheless the legislature of Connecticut, at their spring session in 1881, adopted in place of it the following, which is now the law:

AN ACT regulating the dredging for shellfish and shells.

Be it enacted, etc.

SECTION 1. It shall not be lawful for any person or persons to use a boat, or any other contrivance, dragged, operated, or propelled by steam, in taking up or dredging for oysters, oyster-shells, clams, or other shellfish in any bay, river, or other waters within the boundaries or jurisdiction of this state; *Provided*, however, that this section shall not be so construed as to prevent the use of steamboats in taking up, or dredging for, oysters on private, designated grounds in any such waters, by the owners thereof.

SEC. 2. Any person who shall violate the provisions of the preceding section shall be deemed guilty of a misdemeanor, and shall be punished, in the discretion of the court, by a fine not exceeding the sum of one hundred dollars, or by imprisonment in the county jail not exceeding six months, or by such fine and imprisonment both.

SEC. 3. Prosecutions under this act may be heard and determined by a justice of the peace, subject to the right of appeal by the accused to the superior court, as in other criminal cases.

SEC. 4. All acts and parts of acts inconsistent herewith are hereby repealed.

SEC. 5. This act shall take effect from its passage, but shall not affect any suit or prosecution now pending.

FRESHENING OYSTERS.—It is customary, on bringing the oysters in from deep water, to throw them overboard into the fresh flood of the Quinepiac and "give them a drink", as the oysterman expresses it. To this purpose some planters devote wholly their river lots. Others have small areas near their shore-houses where the bottom is planked; while some put the oysters in large floats which are moored by the wharf or shore.

NEW HAVEN PRICES.—During January and February of 1880 the following prices were asked at Fair Haven:

For Virginias, clear, per gallon	75 to 85 cents.
For Virginias, mixed, per gallon	90 cents to \$1 00.
For natives, clear, per gallon	\$1 00 to \$1 25.
For natives by the bushel	\$1 00.

OYSTER-OPENING AND OYSTER-OPENERS.—As nearly all of the trade in Virginia oysters is carried on at Fair Haven, so to this locality alone is confined the business of opening the oysters for shipment to any considerable extent. The openers or "shuckers" are mainly women of all ages, though some men are constantly at work. They are mainly American in nationality, and many of them are in good circumstances and only work to provide themselves with pin-money. It is an occupation no refined girl would choose, nevertheless, for the whole person becomes at once spattered with mud and water, and the hands are inevitably bruised and lacerated beyond repair. The method used in opening the shell originated here, but has spread elsewhere, and is known as "breaking" or "cracking". The shucker stands or sits before a stout bench (which may be a long table partitioned off into working spaces for each one, or may be an individual bench that can be moved about) and has her oysters in a pile before her. Immediately under her hand is a block of wood into which is firmly inserted an upright piece of iron about two inches long, one inch high, and a quarter of an inch thick, called the "cracking-iron". The shucker is also provided with a square-helved double-headed hammer, and a stiff sharp knife in a round wooden handle. On her left hand she wears a rough woolen, rubber, or leathern half-mitten, known as a "cot", to protect the skin. Seizing an oyster in her left hand, with the hinge in her palm, she places it upon the cracking-iron, and with one blow of the hammer breaks off the "bill" or growing edge of the shell. In the fracture thus made the strong knife is inserted and pushed back between the meat and the shell until it cuts off the attachment of the adductor muscle to the flat "upper" valve, after which, with a quick, dexterous twist, the other "eye" is severed, the meat tossed into the receptacle, which stands handy, and the shells are dropped through a hole in the bench into a barrel or tub placed underneath. Practice teaches extreme celerity in this operation. The knife and hammer are held in the same hand when the oyster is cracked, which does away with the expense of time and trouble in dropping one to pick up another; and the knife hilts very soon have a long spiral groove worn in them by the chafing of the hammer-handle. The oysters, as fast as opened, are flung into a tin receptacle called a "measure", holding five quarts. Much of the liquor of the mollusk also goes in with the meat, and when the measure is full it is taken to the foreman and poured into the "skimmer", the shucker receiving in exchange a tin or brass check, entitling him to a shilling or 12½ cents, at the rate of 2½ cents a quart. There are also "half-measures" of 2½ quarts. This is called "liquor" measurement; if all the liquid was strained out only about two-thirds of the measure would be filled. One shucker told me that five quarts of large-sized oysters counted about 475 in number.

A good day's earnings for an oyster-opener at Fair Haven is \$1 50; this, of course, is often exceeded, but the books of one firm showed me that the average wages for a whole season was only about \$20 per month. It very frequently happens that no work is done at one or another establishment for several days, or only a little opening each day. Hence about 350 openers serve the whole business by moving around. Men, as a rule, earn more than women.

In regard to the population supported by the oyster-business in this neighborhood, I find it extremely difficult to get accurate statistics. It is a variable and partial quantity. I estimate the number of principals—planters, dealers, and shippers in and about New Haven—at 125; of laborers (men), at 135; and of openers (chiefly women), at 340.

PACKING AND SHIPMENT OF OYSTERS.—As soon as the oysters are opened they are placed in a flat pan with a perforated bottom, called a skimmer, where they are drained of their accompanying liquor. From time to time a quantity is dipped out and put into a large colander, or conical basin with perforated bottom and sides, which is placed over a tall cask. Here a stream of water is turned upon them, and they are stirred about until washed clean, after which they are put into wooden tubs for shipment, or tin cans for local traffic. The tubs are all labeled with the name of the owner, and are returned by the customer. Their covers fit with exactness, and lock with rivet and seal in such a way that they cannot be opened on the road without certain discovery.

The expressage of oysters from Fair Haven to the interior of New England is so large that the afternoon trains have one car, and sometimes two cars, devoted exclusively to the carriage of these goods. Large shipments were formerly made in wagons to Albany and thence westward, especially to the large towns in central New York. Now these oysters go by rail, of course, but also much farther westward, even to Cincinnati, Chicago, and San Francisco.

STATISTICAL RECAPITULATION FOR NEW HAVEN HARBOR, CONNECTICUT :

Number of planters, wholesale-dealers, and shippers	135
Extent of ground cultivated..... acres.....	2,600
Value of shore property	\$100,000
Number of vessels and sail-boats engaged :	
Steamers.....	2
Sail-boats.....	100
Row-boats.....	150
	—
	252
Value of same, about	\$30,000
Number of men hired by planters or dealers	200
Annual earnings of same.....	\$50,000
Number of women hired.....	275
Annual earnings of same.....	\$30,000
Total number of families supported, about.....	400
Annual sales of—	
I. Native oysters..... bushels.....	128,250
Value of same.....	\$130,000
II. Chesapeake "plants"..... bushels.....	450,000
Value of same.....	\$350,000
Total value of oysters sold annually.....	\$480,000

G. THE HOUSATONIC AND SAUGATUCK REGIONS.

33. OYSTER-FISHERIES OF BRIDGEPORT AND WESTPORT.

NATURAL BEDS AND SEED-OYSTERS.—Having passed to the westward of New Haven and Milford harbors, we come upon a new feature of the oyster-business. This is the systematic dredging of natural beds in the sound and along the inlets of the shore, for seed to be placed upon the artificial beds in the eastern part of the sound, in the East river, and on the south shore of Long Island. This department of the business will demand more and more attention, as I progress toward its headquarters at Norwalk. The most easterly natural bed which these dredgers attack is one off Clark's point, just east of the mouth of Oyster river. (In Oyster river itself, by the way, no oysters have ever been known, within the memory of tradition, although that name appears in a map drawn prior to 1700.) The next natural bed consists of a reef, five acres in extent, on the western side of Pond point. Beyond that, off Milford point, at the mouth of the Housatonic, lies the Pompey bed, which afforded sustenance to the sea-hut colony that used to frequent Milford point, and where now a crop can be gathered about once in five years.

Upon the opposite side of the entrance to the Housatonic lies one of the principal seed-grounds in the sound; that side of the Housatonic river is one vast natural oyster-bed all the way from Stratford light up to the bridges, a distance of about three miles. There are many persons who live along the shore in Stratford, who devote almost their whole time to the gathering of the young oysters and selling them to the vessels, which in summer throng the bay. They get from 15 to 25 cents a bushel, and there are perhaps 50 men who make this a business.

SEED-GATHERING AT THE MOUTH OF THE HOUSATONIC.—In May sloops and small schooners begin to come after the seed, which is of a year's (or less) growth. They hail principally from Norwalk and its vicinity. This fleet gradually increases, until in mid-summer there are sometimes to be seen from 75 to 100 vessels at once in the mouth of the river. These vessels do not dredge for the seed. They anchor near the bed and send out skiffs, with a crew, who tong the oysters up until their skiff is full, when they take it to their vessel to be unloaded. From one to half a dozen skiffs are employed by each vessel, which is thus able to load up quickly, go home with its cargo, and be ready to return. To avoid any loss of time, however, in voyages back and forth, some owners of beds keep one or more vessels anchored in the Housatonic all the while, upon which the crews live, who load other vessels that are constantly passing back and forth. The rapidity of this work is shown by the fact, that one man with two assistants will put upon his sloop a full cargo of 500 bushels in two days, and be off and back in another two days, ready to go at it again. Persons who live upon the shore, and who claim to found their estimate on trustworthy facts, say that 400,000 bushels of seed were taken off these Housatonic beds between May and November, 1879.

OBJECTIONS TO PRESENT METHOD OF SEED-GATHERING.—Notwithstanding this heavy and long continued drain, these nurseries do not seem in danger of depletion. Few oysters, of course, manage to reach maturity, but there are enough to furnish spawn to repopulate the district, which the constant scraping fits in the best possible manner for securing a set. The people of Stratford, however, are beginning to object to longer allowing an unrequited privilege to everybody to rake the beds. Such an indiscriminate crowd embraces many loose characters, and frequent petty annoyances, with some serious trespasses, have occurred on shore. There seems no way to get rid of the nuisance, however, except to declare the whole ground available for culture, and stake it off. This is urged by some of the shoremen, who think they see in this plan some chance of making the meadows and river-bottom a valuable property, and a blessing instead of a curse to them. This meets with considerable opposition, however, and the old foolishness about "natural beds" seems an insurmountable obstacle. Every year the staking-off and cultivation of this river-bottom is delayed Stratford loses by it in a way she will one day regret. Stratford also possesses along her front very good deep-water ground, running from Stratford point to the Middle Ground, which remains to be utilized. The Housatonic seed, however, could not be utilized on this outer ground, since it is the long, fresh-water variety, which would not flourish in water so salt as that of the outer sound.

OYSTER-BUSINESS AT BRIDGEPORT.—At Bridgeport there is a small but flourishing oyster-business, participated in by three firms of planters. The natural oyster-producing ground off this harbor extended from Stratford to Black Rock, a distance of about five or six miles, but by 1850 it had become exhausted of all salable oysters, and even became of little value as a seed-producing area. Previously to that seven boats were owned at Bridgeport, all of which, since 1850, have been obliged to go elsewhere or change their work. Long ago, however, a Fair Haven man utilized ground at the point of the beach at the mouth of the harbor, to bed down southern oysters, and his example was followed in a small degree by Bridgeport men. The first planting of native seed, however, was not until 1844, young oysters being brought from the Saugatuck and from Westport. At present Stratford and Housatonic seed is chiefly used. For opening purposes the Housatonic river seed is regarded as the best, because it becomes salable one year quicker than the sound seed; but for shipping in the shell the deep-water seed produces more profit, though of slower growth, the mature stock being single, shapely, and of large size.

The practice of catching seed-oysters on shells prevails here with much success, but will be so fully discussed in a future chapter, that I refrain from doing more than mention the fact here; and add that Mr. Wheeler Hawley, the largest planter at Bridgeport, believes himself to have been one of the first, if not *the* first, to adopt this method of oyster-culture in Long Island sound, putting the date of his experiments at 1853.

Replying to my questions in regard to methods and cost of following this practice in this harbor, one of the planters informed me that, in his case, he counts expenses per acre in preparation of oyster-bottom as follows:

500 bushels shells ("stools") at 5 cents	\$25 00
50 bushels of "spawners" (unculled).....	12 00
Total cost of seeding.....	37 00

From this, he thought he ought to take up 1,000 bushels of seed to the acre of marketable oysters after two years, with a remainder left for the third year. The cost of taking up would be about 20 cents a bushel. If seed-oysters are bought to be placed upon the ground, from 25 to 60 cents a bushel must be paid for them.

The total acreage under cultivation at Bridgeport, for which a rental of \$2 an acre is paid to the town, is about 110 acres. On this ground there were raised in the winter of 1879-'80 about 8,000 bushels, which were mainly sold in the shell to New York buyers, at an average of about \$1 12½ a bushel. These oysters were large and fat, often opening six quarts to the bushel, as I was informed. In 1857 they brought \$12 a barrel.

The fleet employed by the oystermen here consists of nine sail boats, worth, perhaps, \$2,500 in total: the care of the beds and running of the boats give support to about a dozen families, and occasional wages to others at the height of the season, the pay being about \$2 a day.

OYSTER-BUSINESS AT WESTPORT.—Westport, Connecticut, is a little harbor on the Saugatuck river, one of the most beautiful of the many charming streams that debouch along this part of the coast. The river has long been celebrated for the abundance, large size, and excellent flavor of its natural oysters. They grew almost continuously, in favorable seasons, from the mouth of the river up to the village bridge, a distance of about four miles, and the farmers who lived along the river were accustomed to gather them in any desired quantity, without a thought of exhausting the supply. The depletion came at last, however, and now few marketable oysters, native to the Saugatuck, are ever procured.

Some years ago, when attention was first called to the desirability of transplanting oysters and raising them upon artificial beds, the Westport men staked off a large area at the mouth of the Saugatuck. No ground within the river, however, was allowed to be assigned, the town reserving all this as "common ground", where seed might be gathered by poor men and everybody, to be sold to the planters. The amount of seed thus procured annually varies greatly with different years. The highest trustworthy estimate given me for any one year (and this not recently) was 50,000 bushels. Last year, however, only about 4,000 bushels were caught; half was planted locally and half sold to outside buyers. In midsummer a score or so of men in skiffs may often be seen in the river at once, raking seed-oysters, but these work only occasionally, and there are less than a dozen men who really derive their support "by following the creek" (chiefly oystering), in the whole town. The seed used is between one and three years of age, and it is sold by the skiffmen for 35 or 40 cents a bushel. Smaller mixed stuff sometimes sells for 20 cents. There are only two or three sail-boats devoted to this work.

The first efforts at planting were made in the mill-pond east of the village—a pond of salt water about 40 acres in extent. The bottom of this pond is a soft mass of mud; not barren, clayey mud, but a flocculent mass of decayed vegetation, etc., apparently inhabited through and through by the microscopic life, both vegetable and animal, which the oyster feeds upon. Although the young oysters placed there sank out of sight in this mud, they were not smothered, on account of its looseness, but, on the contrary, thrived to an extraordinary degree, as also did their neighbors, the clams and eels, becoming of great size and extremely fat. Ten years ago oysters from this pond sold for \$3 a bushel; and for one lot \$16 50 is said to have been obtained. Before long, however, a rough class of loungers began to frequent the pond, and the oysters were stolen so fast, that planting there has almost wholly ceased, and prices have greatly declined.

Something over 500 acres of oyster-ground have been set apart in the waters of the sound belonging to Westport. This ground lies in the neighborhood of Sprite's, Hay, Calf-pasture, and Goose islands. Two-thirds of it is owned by Norwalk men and other non-residents, and therefore the town has derived no revenue of consequence from it.

The principal planter in town is Mr. Eli Bradley, who gave me the most of the information obtained here. He has been long engaged in the business, and has planted many thousands of bushels of seed upon his beds, as, also, have his neighbors, but there has been so much litigation concerning boundaries, so much actual thieving, and so incessant persecution by the starfishes and drills, that not much has been realized. Last year (1879) no oysters whatever of consequence were placed in the market from these beds. Outsiders, however, shifted certain oysters into Westport waters, temporarily, and saved a good crop, the figures relating to which appear elsewhere. All the residents at Westport assert strongly the extreme suitability of their ground for successful oyster-raising, barring the damages inflicted by the starfishes, which, they think, they can keep free from with sufficient labor.

STATISTICAL RECAPITULATION FOR THE HOUSATONIC AND SAUGATUCK REGION:

Number of planters and shippers	6
Extent of ground cultivated	110 acres..
Value of shore-property	\$3,500
Number of vessels and sail-boats engaged	12
Value of same	\$3,000
Number of men hired by planters	15
Annual earnings of same	\$5,000
Total number of families supported	21
Annual sales of—	
Native oysters	bushels.. 9,000
Value of same	\$11,000
Total value of oysters sold annually	\$11,000

H. THE EAST RIVER AND PECONIC BAY.

34. OYSTER-INTERESTS FROM HELL GATE TO PORT JEFFERSON, NEW YORK, AND NORWALK, CONNECTICUT.

EAST RIVER DEFINED.—To oystermen, and for all the purposes of the present report, the East river is that narrow part of Long Island sound, at its eastern end, which extends from Hell Gate to the Norwalk islands on the Connecticut shore, and to Port Jefferson on the Long Island side. It is a district very old in the annals of oyster-gathering and culture, and one which contributes largely to the trade.

EARLY HISTORY OF OYSTERING.—Traditions concerning the beginning of oystering as a regular industry are very few and faint. I am indebted to Mr. Theodore S. Lowndes, of Rowayton, Connecticut, for some pleasant reminiscences.

It seems not to have been until about 1814 or 1815 that much attention was attracted to the oyster-beds of the East river, as a source of business advantage. At that time it was considered a degrading thing to rake oysters for a living, yet the father of my informant, Mr. Edward William Lowndes, went energetically into the enterprise, with several of his neighbors—William Price, Drake Sopers, Stephen Jennings, James Jennings, and Benjamin Totten, the last named having returned from loyal participation in Commodore Perry's victory on lake Erie. All of these gentlemen lived on City island, and their descendants are still to be found among the leading citizens of that community. At that time there was no occasion to plant oysters, the bivalves being plentiful upon their natural beds, and easy of access with dredges, rakes, and tongs, very similar to those now in use. Mr. Lowndes writes me as follows:

The oysters caught nearest Hell Gate were in Flushing bay, between Barien's island and Fisher's point, and I've heard my father say that he had caught oysters below Blackwell's island, on the edge of the flats at Newtown creek, on the Long Island side, but they were only a small lot.

My father was often annoyed, in his day, by local laws and prejudices against oystermen. On one occasion, as I have heard him tell, while he was at work off Shippen point, on Long Island sound, he was taken ashore at Stamford, and had a ride given him into the country. When brought back his vessel was unloaded, and he was told to get out as soon as possible, which he was glad to do. On returning to New York, he went to the collector of the port, General Morton, who sent Captain Calhoun, commanding a revenue cutter in the United States navy, to inform the captains of some packets that plied between New York and Stamford, that if any oystermen should be disturbed again in that locality, he would come up with the cutter and protect them; but there was no further trouble. My father was concerned in several such vexatious adventures.

Mr. Lowndes and his fellow-citizens showed it possible to work at this with so much diligence and pecuniary success, as to put this occupation in a more favorable light, and caused many more of their neighbors to enter it. The result is, that probably two-thirds of the population of City island, to-day, derive their support from the oyster-interests owned there. The same is true of the north shore of Long Island.

Natural oyster-beds once existed in greater or less abundance all along the shore of Westchester county, New York, and the opposite coast. Though the Harlem river and the region near Hell Gate have long been abandoned, through over-raking and the unfavorable conditions which have followed the incessant commercial use of these waters, now within the great city of New York; a little farther up, the raking is still practiced. The passenger on the Harlem and New Rochelle railway, can see from the cars, the boats of men catching oysters in all the little nooks and corners of the coast above Port Morris, and across toward College point. The steamboats run daily across seed-ground, and make landings amid plantations.

EAST CHESTER BAY.—The first oyster-ground of any consequence, however, going up the river, is found in East Chester bay, which surrounds City Island. Off Throgg's point, at the southern end of this bay, are great natural banks, which have withstood long and steady raking. In these waters are the oldest artificial beds in the East river, for the regular planting of oysters (inaugurated, according to tradition, by Mr. Orrin Fordham) was begun here half a century ago.

The planters all have their homes on City island, and are about sixty in number. In addition to these sixty planters, there are perhaps a dozen more men who get their living out of the business. It is safe to say, at any rate, that half a hundred families derive their support from the oyster-industry in this one community.

The total production of East Chester bay, last season (1879-'80), may be placed approximately at 55,000 bushels. In order to catch the seed of these oysters and carry them to the New York market, where all the crop is sold, there is owned here a fleet of one steamer, specially fitted, about 45 sloops, some 25 floats, and at least 100 skiffs. All of these craft are of excellent quality, and represent a value of something like \$35,000, which, with an addition of about \$5,000 for shore-property, may be taken as the amount of the investment in the industry at City island, exclusive of the value of the stock now lying under the water, on the various beds, and which is a sum hardly possible even to guess at.

PELIHAM TO MILTON.—At Pelham, New Rochelle, Mamaroneck, Rye, and Milton, the business does not attain much dignity, although a large number of families, fully 100, are supported partly by it and partly by digging

clams (mainly *Mya arenaria*), catching lobsters, and in other sea-shore occupations distinct from regular fishing. The ground occupied is embraced in little bays and sheltered nooks, for the most part, and is not of great extent. There are about 20 planters, who, at an average of 250 bushels—a large estimate, probably—would furnish a total of 5,000 bushels a year. Nearly if not quite all of this goes into the hands of peddlers, who dispose of it from wagons throughout the adjacent villages. Many of the planters, and some summer residents in addition, lay down seed wholly for private use. There is a large seed-bed off this part of the coast, which furnishes small stock, not only for local use, but for the towns both east and west. About \$5,000 would no doubt cover the investment between City island and Port Chester.

PORT CHESTER.—Port Chester is the last town in the state of New York, East Chester, just across the bridge, belonging to Connecticut. The exact boundary of the two states was long undecided, and was the cause of much annoyance and dispute among the oystermen of the contiguous waters, who were incessantly charging one another with violation of law and their neighbor's rights, by crossing the imaginary line, and so invading the property of the other state. In consequence of this a joint commission was appointed to settle the boundary between the states, the definition of which, so far as it relates to the waters of Long Island sound, is as follows:

Beginning at a point in the center of the channel about 600 feet south of the extreme rocks of Byram point, marked No. 0 on the appended United States' coast survey chart; thence running in a true southeast course three and one-quarter statute miles; thence in a straight line (the arc of a great circle) northeasterly to a point four statute miles true south of New London light-house; thence northeasterly to a point marked No. 1 on the annexed United States' coast survey chart of Fisher's Island sounds, which point is in the longitude E. three-quarters N. sailing course drawn on said map, and is about 1,000 feet northerly from the Hammock or N. Dumpling light-house; thence following the said E. three-quarters N. sailing course as laid down on said map, easterly to a point marked No. 2 on said map; thence southeasterly toward a point marked No. 3 on said map, so far as said states are continuous. Provided, however, that nothing in the foregoing agreement contained shall be so construed to affect existing titles or property, corporeal or incorporeal, held under grants heretofore made by either of said states, nor to affect existing rights which said states or either of them, or which the citizens of either of said states, may have by grant, letters-patent, or prescription of fishing in the waters of said sound, whether for shell or floating fish, irrespective of the boundary line hereby established, it not being the purpose of this agreement to define, limit, or interfere with any such right, rights, or privileges, whatever the same may be.

At Port Chester and East Chester lives a considerable colony of oyster-planters. In all, about 25 families derive their chief maintenance from this industry; but four-fifths of the planters find it necessary to supplement their profits from this source by other labor, in order to get a living. The total product of the locality was about 9,000 bushels last year, only a fraction of which is sent to New York. The price is now 80 cents for the small and \$1 for large size. In 1878-'79 it was 20 per cent., and in 1877-'78, 40 per cent. higher. There are eight sloops, with floats, arks, etc., owned here, which foot up an invested capital of about \$7,000.

Before leaving the New York waters of East river, however, it will be well to mention some laws applying to this coast. In the Revised Statutes of 1875, under Title XI, Fisheries, are the following sections applying here, in addition to the general important law prohibiting steam-dredging:

SECTION 5. Forbids taking oysters in Harlem river during June, July, and August.

SEC. 6. Provides jurisdiction in case of offense against section 5.

SEC. 7. Permits any owner or lessee of lands adjoining Harlem river to plant oysters in front of their property, where the ground is not occupied; but he must put up a plain sign, stating (with owner's name) that this is a private oyster-bed. No person except the owner shall take up oysters on such ground. Penalty, \$50.

SEC. 8. Empowers constables of either Westchester or New York counties to seize boats and implements of offenders against section 7.

SEC. 9. Defines how arrests are to be made and offenders prosecuted.

GREENWICH.—The next point eastward is Greenwich, where, at Greenwich, Old Greenwich, Greenwich cove, Cos Cob, and Mianus, a large business is done and a large number of persons is engaged, though oysters are not now raised here to as great an extent nor of so fine quality as formerly.

The mouths of all the rivers and each of the many coves that indent this rocky coast are filled with planted oysters, though a general feeling of discouragement, arising from various causes, prevails. In all about 800 acres are under cultivation, all in shallow water, and the total annual product for last year, of the whole region, may be set down at 33,000 bushels, the majority of which was taken to New York in the boats of the respective owners, and sold to the dealers at the foot of Broome street.

The number of families supported in this township, out of this occupation, it is hard to state. I estimate it at about forty. The craft employed amounts to one steamer, about 30 sloops, and perhaps 100 small open boats. These, with other estimated fixtures, foot up an invested capital approaching \$30,000, exclusive of oysters now growing on the beds.

STAMFORD.—The next oyster-producing point is Stamford, where, also, I found the planters bewailing the decline of their fortunes. The number of men raising oysters is about a dozen, and perhaps as many more are employed. From about 150 acres of improved harbor-bottom Stamford yielded for market, in 1879, about 5,500 bushels of oysters, the majority of which was shipped to New York. Their fleet counts up 9 sloops, which, with boats, floats, and so forth, are stated to be worth about \$15,000. The principal men at Stamford are A. M. Prior and Capt. John Decker.

DARIEN AND ROWAYTON.—At Darien, three miles beyond, about 3,000 bushels a year are sold from about 250 acres. They have ten or a dozen sail-boats, and a value in oyster-interests, generally, of perhaps \$5,000.

The next point is the very important station known as Five-Mile-River or Rowayton, where the cultivation of oysters has been systematically pursued for many years. In all, at present, there are about 35 planters or firms, and nearly or quite as many families are supported. The little creek-mouth is perfectly filled with oyster-boats, and the other conveniences of this pursuit. I find upon my list of the oyster-fleet 28 sloops and sail-boats, which belong here, some of them very large and well built. I estimate the value of these "sail" and the other floating and shore-property at Rowayton, directly concerned in the oyster-trade of the port, at not far from \$30,000. Rowayton produced, in 1879, which was considered a very poor year, something near 50,000 bushels. How far beneath occasional crops, if not beneath the recent average, this is, is shown by the statement made to me, that about five years ago a single dealer in New York city bought 32,000 bushels of Rowayton oysters. Little of the stock raised at this point fails to reach New York, and within the last three years Rowayton has supplied a large proportion of the oysters sent to Europe, partly by direct shipment. Like all other parts of the East river, the oysters are sold here wholly in the shell; and almost always by the barrel or bushel—the selling "by count" belonging to the region further west and to the Long Island shore.

SOUTH NORWALK.—Just eastward of Rowayton lies the city and harbor of South Norwalk, one of the most important oyster producing localities in Long Island sound, as well as one of the "oldest". The bay at the mouth of the Norwalk river is filled with islands, which protect the shallow waters from the fury of the gales. This whole bay, in old days, was full of native oysters from the sound, all the way up to Norwalk itself. Long before the elaborate means for growing oysters, at present in vogue, were thought of, therefore, Norwalk supplied the people of that region with fine, large, natural oysters, just as it had for centuries been a storehouse of shellfish food to the Indians, the remains of whose feasts and feasting-places are still to be found.

About forty years or more ago, however, the natural beds in the vicinity of Norwalk harbor had become so depleted that they no longer afforded to anybody employment that amounted to anything; nor was it until toward the year 1850 that any transplantation of seed, or anything in the shape of the propagation, was attempted. The business of oyster-growing here, therefore, which at first sight seems of immemorial age, is only about thirty years old. The history of its growth need not be given here. It will be sufficient to publish the statistics I have accumulated in regard to the present status of the business at this point.

The principal planters and shippers at South Norwalk (with which I include its suburb, Village Creek) are the Hoyt Brothers, Graham Bell, Oliver Weed, C. Remsen, Raymond & Saunders, Peter Decker, the Burbanks, and several others who raise more than 1,000 bushels a year. In addition to these there are many men who have small beds, which they keep increasing as fast as circumstances permit, and who make a part of their living by working at wages for planters whose operations are more extensive than their own. There is one firm, for instance, which employs the services of 18 or 20 men nearly all the time, and in some seasons largely increases this number. These smaller planters sell their little crops of from 100 to 1,000 or 1,500 bushels to the half a dozen shippers, chief among whom are the Hoyt Brothers and Mr. G. Bell, wisely preferring cash, at a small discount, to the trouble and risk of themselves taking their oysters down to New York, or elsewhere, in hopes of a slightly larger price. During the present season (1879-'80) the price paid at the boats has averaged about \$1, taking little and big together. The culling, as a rule, is done afterward, and the prices the shippers have received, after culling and packing, have been as follows—it is understood, of course, that these are sold in the shell and shipped in barrels, going chiefly to New York:

	Per hundred.	Per barrel.
Extras	\$1 40	\$5 25
Box	90 to 1 00	5 25
Culls	45 to 50	4 25
Cullenteens	35	4 25

Barrels are valued at 25 cents each.

The total number of bushels produced in 1879 (to which time my statistics refer for the sake of completeness), as well as this year (1880), makes a sum which is asserted to fall far short of what is considered an average or a high estimate. Nearly every man said to me: "Well, this year was a poor one." How much of this is to be attributed to modesty and a timid desire to belittle the figures, and how much is truth, it is hard to tell. I am inclined to think it pretty nearly true. Prices, at the same time, are much lower than formerly, owing to the unusually poor quality of the oysters of these waters this year and last; but I do not think that this is a permanent depreciation in fatness and excellence of taste (as I fear is the case from Stamford to Port Chester), but only a temporary misfortune. Between scarcity and inferiority, the oystermen of Norwalk find themselves much less cheerful just now than they are wont to be. The total production of this locality, during the season of 1878-'79 (the present season, 1880, will probably be found not greatly to differ from it), is given at about 65,000 bushels.

These oysters, as I have said, were the property of 50 planters, which gives an average of 1,300 bushels to each one. It is probable, however, that as many more persons got their living out of these oysters, from first to last, so that I do not hesitate to say that 100 families in South Norwalk and its immediate vicinity, are supported by the cultivation and sale of oysters there. The estimate of 200 families, which I have often heard made, is undoubtedly too high. This question is ever a hard one to answer, because, in many cases, the head of the family depends only

partially upon his professional means of support, the attention he pays to it and the income he derives, varying with each good or bad season. Most oystermen are also farmers or fishermen. Many of them, also, keep summer hotels, and thus add largely to their income during the dull season at the beds.

Every supposed available spot for oyster-operations, probably, is now set apart for that purpose, not only inside of the Norwalk islands, but also in the outside waters of the sound off the mouth of the harbor. Only a portion of this is in use, however; in all, about 680 acres out of 2,300, in round numbers, which have been designated in Norwalk harbor. The average production at present, therefore, is less than 100 bushels to the acre of land actually cultivated, and only about 28 bushels to the acre of bottom held for the purpose of oyster-cultivation. I see no reason why future years ought not to see ten times as large a proportion.

The fleet of Norwalk used by the oystermen in their business, consists of 2 steamboats, a dozen sloops, and about 30 sharpies and sail-boats, of less size and value than the "sloops", most of them being without decks. Besides this there are skiffs innumerable. This disparity in the number of large sloops between so important a place as Norwalk and some of the small ports westward, is explained by the fact that the planters here do not often themselves take their goods to New York.

What shall be given as the amount of the investment at South Norwalk is a difficult question. The answer can hardly be more than guessed at. There are several large warehouses and offices devoted to the work. Extensive wharves have been built, and arrangements for landing are made. There are 25 or 30 "arks", as they are termed, or floating oyster-houses, made by housing in half a canal-boat, a scow, or some old hulk, and there is an extensive outfit of boats and tools. I judge that the following table represents nearly the truth of the case:

2,300 acres oyster-ground, worth.....	\$6,000
Shore-property for business-use.....	10,000
"Arks" and scow-houses.....	5,000
Sloops and other boats.....	25,000
Steamers.....	6,000
Floats, dredges, tools, etc.....	3,000
	55,000

This, of course, leaves out all estimate upon the value of the oysters now upon the beds, or the money which has been spent (and sunk) in improvement, up to this time. This is a matter which it would be exceedingly difficult to ascertain, and of small importance, because constantly varying and undecided. I suppose about \$50,000 a year are reinvested in the beds at Norwalk, counting the time of the planters as so much money; if it were cash expended, however, instead of their own labor, they could not follow it. Few can afford to hire help, except occasionally, for a few days at a time. Wages, in that case, are from \$1 to \$2 per day.

SADDLE-ROCK OYSTERS.—From a particular part of Norwalk harbor, many years ago, came to Tom Donan's famous old shop in Broad street, New York, the original "Saddle-rocks", named from the reef around which they grew. These oysters were so large that 25 would fill a bushel basket; yet they were tender and luscious, and often sold for from 15 to 30 cents apiece. But they were not very numerous, and the raking of them was so profitable that the supply was quickly exhausted. Like the generous host who gave them name and fame, they have long ago departed, except from the branding-iron and sign-board of the dealer, whose "Saddle-rocks" now may have come from anywhere except Norwalk.

That is the story as I was told it at South Norwalk; since writing it I have seen an article on the subject, taken from the *New York Observer*, and vouched for by the Rev. Samuel Lockwood, who speaks of the writer as "our friend, Dr. O. R. Willis". This article places Saddle rock on the opposite shore of the sound. It reads thus:

The original Saddle-rock oyster was not only very large, but possessed a peculiar, delicious flavor, which gave it its reputation. And it received its name because it was discovered near a rock known as Saddle rock. A high northwest wind, continued for several successive days, always causes very low tides in Long Island sound and its bays. On the farm of David Allen, situated near the head of Great Neck, on the eastern shore of Little Neck bay, is a rock about 20 feet high, and from 15 to 20 feet in diameter. The shape of the top of this rock resembles somewhat the form of a saddle, and from that circumstance is called Saddle rock. At low water the upper or land side of this rock is left bare, while the opposite or lower side is in the water. In the autumn of 1827, after a strong northwest wind had been blowing for three days, a very low tide occurred, and the water retreated far below the rock, leaving a space wide enough for a team of oxen to pass quite around it. This extraordinary low tide revealed a bed of oysters just below the rock. The oysters were very large, and possessed the most delicate flavor; we collected cart-loads of them, and placed them in our mill-pond (tide-mill). The news of the discovery spread among the oystermen, and boat-loads soon found their way to the city, where, on account of their excellent flavor, they commanded fancy prices, even reaching \$10 a hundred!—an enormous price for those days. In a very short time the locality was exhausted, and for more than forty years there has not been a real Saddle-rock oyster in the market.

SOUTH SHORE OF EAST RIVER.—On the southern side of Long Island sound the "East river" extends as far as Port Jefferson, which lies nearly opposite Bridgeport. Beginning at the Narrows above Hell Gate, as before, we find the remains of ancient native oyster-beds all along the shore. This was one of the favorite points of market-supply for New York years ago. Its traditions remain, as witnessed by the following paragraph from DeVoe's *Market Assistant*:

In the month of September, 1859, a discovery of a great oyster-bed was made at Eaton's Neck, on the Long Island shore, by five fishermen from Darien, Connecticut. It is stated that "they found themselves too far out, and dropping overboard an oyster-dredge to

bring their boat to anchor", when ready to draw it in again on board, they found it very heavy, and after raising it to the surface they had it filled with fine large oysters, when they soon loaded their boat, and entered into a mutual compact of secrecy, but it was broken; the information was sold [for \$500], and the valuable discovery was soon made public. Thousands of bushels were taken and replanted, and those which were planted in deep water produced some extra fine large oysters, which found a ready sale in our markets.

For help in calculating the oyster-riches of this southern shore of the East river, I am indebted to the labors of Mr. Frederick Mather, of the United States Fish Commission, who also acted as a special agent of the Census there.

FLUSHING BAY AND VICINITY.—The first point, beginning at the western extremity, is Flushing bay. Twenty men are engaged here in oystering and clamming, almost inseparable employments along this shore. There are oyster-beds staked out here, worth, counting seed and appliances, \$8,000, and they produced last year 10,000 bushels of oysters. Six boats of four or five tons, cat-rigged, are employed. In addition to this four men, supporting three families, oyster in Flushing bay, but live at College Point, and sent to market 8,000 bushels last year, using two boats. All shipments are by boat.

In Little Neck bay the oyster-beds are free of cost, but are staked off in private claims and planted, a condition respected by neighbors, but giving no legal sanction. The seed is obtained from near by, and is worth 25 cents a bushel. "There is a desire," says Mather, "on the part of some of the oystermen to pay for their grounds and get some protection in return. Now their only claim is on the seed, and they can sue or prosecute a man for stealing that. I found a great difference of opinion among the oystermen on the bay in regard to the laws. Some holding that the statutes did, and others that they did not, protect the claimants of oyster-beds. A man's heirs claim his beds and the claim is respected, but it does not appear that the beds are salable in the sense of giving a deed for a consideration. In a discussion on this point, which I encouraged in order to get at the facts, one man said, derisively: 'I would like to see a good bed found and have the town attempt to sell it. There'd be fun, and somebody would get hurt, sure, for when there's a find we all go for it, and the one that gets the most is the best fellow.'"

One of the towns on this bay is Whitestone, from whence 4,500 bushels of oysters are sent; another is Little Neck, where 30 men make a living by oystering and clam-fishing, and raise an annual crop of 10,000 bushels. One sloop, over 20 tons, and seven over 5 tons, are engaged.

GREAT NECK AND VICINITY.—At Great Neck there is considerable business—about 5,000 bushels a year, which go to market in boats owned at Little Neck.

Off this coast, between Great Neck and Hell Gate, are very persistent natural beds of oysters, which annually furnish fair raking-ground, whence the planters in the vicinity obtain nearly all their seed. In the lower part of the river the oil and deposits from the petroleum refineries at Hunter's Point, have injured or wholly destroyed the beds. The best ground is directly in the steamboat channel, where the cinders falling from the innumerable freight, "sound line", and excursion steamers that pass daily, furnish a capital cultch for the oyster-spat to attach itself to. This ground is gradually extending itself into a productive tract half way to Norwalk. The seed lies particularly thick here in a bed about three miles long, off Eaton's Neck. In summer this whole region is excellent clamming-ground. I have counted 100 boats, doing well, at once between Sea Cliff and Throgg's Neck. Many boats had two men, and this number was not unusual. This scraping of the bottom with the big, deep-cutting, dredge-like clam-rake undoubtedly contributes to the growth of young oysters as well as young clams there, by preparing the ground to retain the spawn, which is at that very season floating about.

For oysters raised west of Great Neck, buying agents of New York houses paid the planters last season an average price of 75 cents per bushel.

PORT WASHINGTON.—Port Washington, on the other hand, a village upon Cow bay, in one of the most beautiful districts of Long Island, is the seat of a very large oyster-planting interest. It is a fine sight to look down from the hill upon the bay, crowded with its miniature shipping, dotted by the large floats which are anchored all along the shore, and its sunny surface enlivened by countless small boats moving about here and there in eager haste. At the wharves are usually to be found two or three sloops from New York buying oysters, with the names and advertisements of their owners painted in huge black letters on the broad mainsail; or at a favorable condition of season and tide the whole trim fleet spreads its canvas and sweeps out to the dredging-grounds in beautiful array.

It is more than thirty-five years since George Mackey first began the planting of oysters in this bay; now this industry is the main business in the town, and commands two-thirds of all the influence—out of 320 voters on the rolls, 200 being oystermen. Nearly all of these are heads of families, and as representative names I might mention the Mackeys, the Jarvises, J. J. Thompson, A. Thatcher & Co., Thomas Allen, Peter H. Holt, J. Van Pell, and various others. In order to carry on their business they have, perhaps, \$10,000 worth of shore-fixtures, and from \$40,000 to \$50,000 worth of floating property, embraced in 70 sloops and sail-boats, averaging \$500 in value, and in floats, skiffs, tools, etc. The amount of ground under use it would be impossible to say—I could get no notion of it—since it is scattered and is not measured for allotment as it is in Connecticut. Guessing at it, I should say there are 2,000 acres. The water is tolerably shallow—28 feet is the deepest told me of—and tongs are mainly used. The bottom, almost universally, is muddy, and no spring-shifting is resorted to. The total production last year (and

substantially the same will be true of 1880) was 75,000 bushels. These were sold on the spot, for the most part, to New York buyers, who paid an average of 75 cents a bushel. The yield of these beds this year was said to be unusually good, both in quantity and quality. These oysters were sold mainly at home, to buyers who came in sloops from New York. When disposed of by the bushel, they brought an average of 75 cents, or even less. Culled out and sold carefully by count, as was done often, the prices were: For the largest, \$6 per 1,000; medium size, \$3 per 1,000; poorest, \$1 per 1,000. One firm alone in New York, at the Broome-street wharves, is reputed to have taken over 10,000 bushels. Formerly they must have paid 20 per cent. more than the schedule of prices given above.

HEMPSTEAD BAY AND VICINITY.—Hempstead bay seems to be not so prolific in molluscan life as the preceding indentations of the coast. The planters go elsewhere for seed. In Roslyn about 30 men occasionally rake oysters and clams, and half as many families are thus partially supported. The year's catch is reported at 15,000 bushels.

At Glenhead 50 men are in the oyster and clam business, supporting 35 families. The product was about 15,000 bushels in 1880, nearly all of which went to New York by boat.

Glen Cove is the home of 15 oystermen, who say they have \$5,000 invested at present in seed-oysters, and \$2,500 more in boats and tools. The shipment is wholly by water, and amounts to 20,000 bushels annually.

Concerning the next inlet, Oyster bay, Mr. Mather writes that "it is a famous locality for oysters, and notwithstanding that the line between Queens and Suffolk counties strikes the bay at its eastern end, leaving Cold Spring on one side and the other villages on the other, the same law prevails. The oyster-beds are leased by the towns at 50 cents an acre; number of acres not limited. Some oystermen object to this, and a few of the principal ones refuse to pay, but stake off their claims and hold them by force. About three-fourths of the bay is staked off, and the greater portion is planted. The seed is obtained from Bridgeport, Connecticut, at 25 cents per bushel of (averaging) 5,000 oysters. It is not necessary to buy much when the spawn 'sets', as it did this year [1880] and last. A few shipments are made by rail, but mainly by boat, and a few have been packed for Europe."

Bayville is the first village on Hempstead bay to be considered, its railway station being Locust Valley. The oyster-interests here are said to contain an investment of \$30,000, and 60,000 bushels go to markets in New York and Connecticut annually. As the yearly revenue from this is only \$15,000, a large portion must be designed to seed other beds. The shellfisheries are said to support here about 75 families, and many women find irregular employment in opening oysters and clams. Thirteen sloops, of from 30 to 10 tons each, are employed, the total value of which is \$13,000; 4 cat-boats, \$400; and 100 row-boats, at \$15, \$1,500, making a grand total value of \$14,900. Much of this is employed in clamming, however.

At Oyster bay, \$25,000 are invested in oyster-beds, and 75,000 bushels of oysters are taken annually. There are 23 sailing-boats, large and small, owned by these men, and to a large extent, at least, devoted to oystering and clamming, which together are estimated as worth \$15,000.

In Cold Spring there are 45 men oystering in the season, half of whom have families. The harbor is three miles long by one mile wide, and three-fourths of it, or about 500 acres, is planted with oysters. The total shipments reported from these beds in 1880, amounted to 25,000 bushels. Most of these went to New York by boat, except in freezing weather, when the railroad carried some. Seven sloops, counting 56 tons in all, and worth \$6,000, belong at this port.

HUNTINGTON BAY AND VICINITY.—Crossing over now to Huntington bay, another good mollusk-district is met with. The principal town is Huntington, which is well landlocked. Here the investment amounts to about \$8,000, and \$1,800 in small boats, by means of which 15,000 bushels of oysters are got up for market yearly. Perhaps 20 families are thus supported.

Centreport contributes a larger corps of general fishermen and oystermen, 100 men being reported as engaged in the season, 60 of whom are married. Twenty-five sail-boats belong here, and are worth \$15,000; while \$100,000 are said to be invested in oyster-beds, that yield 50,000 bushels annually.

In Northport and East Northport, 15 men are engaged, half having families, but their additional investments and contributions are already accounted for above.

Very large interests are owned in Huntington bay by the Lowndes Brothers and others, of Norwalk, Connecticut, but the yield of their beds is not considered in the present account, because already counted at Norwalk. The ground is leased under local regulations at 50 cents a year per acre; and there is no tax upon it until it becomes of distinct value to the owner. The town treasuries receive a considerable revenue from this source. Should all lessees pay properly, the sum would be larger; but here, as frequently elsewhere, a legal doubt exists as to the right of the town of Northport to rent the bottom of the bay, since these waters and the bottom are claimed by the adjoining town of Huntington, under charters from King George III. The matter now is pending decision in suit. A similar plea on the part of Brookhaven, in respect to the eastern end of the Great South bay, has been upheld by the courts, notwithstanding that the land fronting on much of the water in question was long ago set apart from Brookhaven into the town of Islip.

The oyster-interests of Smithtown bay are very small, and chiefly centered at Stony Brook, where there are 16 sloops, worth \$10,000, employed, and a further oyster-investment of about \$20,000. The amount of oysters sold last year was 18,000 bushels. Out of the proceeds of this, large clam-grounds, and some fishing, 300 persons made a living here.

PORT JEFFERSON HARBOR.—Going over to Port Jefferson harbor, we find several villages united in the improvement of a single piece of water. At Setauket are two planters, with two sloops, \$3,000 invested, and 3,000 bushels produced. At East Setauket 50 men go oystering, 35 of whom are heads of families. There are \$25,000 invested in the beds here, but business has been poor of late, only 30,000 bushels having been taken. From Port Jefferson 35 men are engaged on the bay, of whom 20 are married. The oyster-ground here is leased by the town at \$3 an acre, and only four acres allowed each planter. This is the first season any systematic planting has been done, the seed being obtained from the Connecticut shore. At Mount Sinai, a little beyond, 800 bushels of oysters were sold in 1880. This is the last point of oyster-culture on the north shore of Long Island; beyond, the coast is abrupt and uncut by those sheltered and shallow bays so suitable for the business, with which the western end of the island is furnished.

GENERAL CONDITION OF THE OYSTER-BUSINESS ON THE NORTH SHORE OF LONG ISLAND.—In conclusion, some words of explanation or caution should be uttered in respect to the statistical statements relating to this north shore. The large array of men engaged (806), families supported (500), and sailing-craft (165) in use, does not compare well with the total of bushels raised, which is only 377,500, worth from \$300,000 to \$350,000. But it must be remembered that, in the large majority of cases, the oystermen are also farmers, and besides are engaged in the menhaden-fishing and various other sorts of seine-fishing; while they add to their income from their oyster-beds something like \$250,000, derived from the sale of about 181,000 bushels of quahaugs, or hard clams, and 293,000 bushels of soft clams, annually. It therefore happens that many, most, indeed, of the "oystermen", are really at work only a portion of their time.

NEW YORK OYSTER-LAWS, APPLICABLE TO EAST RIVER.—Certain enactments by the legislature of New York must be quoted, applying to the East river and the north shore of Long Island. These are substantially as follows:

Any person who shall * * * in any manner catch, interfere with, or disturb the oysters of another now or hereafter lawfully planted upon the bed of any of the rivers, bays, sounds, or other waters within the jurisdiction of this state, shall be deemed guilty of a misdemeanor. Penalties, fine not exceeding \$250, imprisonment not more than six months, or both.

No person who has not been a resident of the state for six months may rake or gather clams, oysters, or shellfish, in any waters of this state; but an actual resident may employ any person to gather shellfish for his benefit.

No dredging for clams or oysters within the state "with a dredge, operated by steam-power", is permitted, and no dredges are to be used exceeding thirty pounds in weight.

In the general statutes the following sections apply to Queens county:

SECTION 78. Persons who have been for six months or more inhabitants of Queens county, may plant oysters in any of the public waters of that county, except Hempstead harbor, Jamaica and Hempstead bays, and Oyster bay harbor; and may acquire exclusive ownership of such beds.

SEC. 79. Any person as aforesaid may use land under public waters in Queens county, as aforesaid, "not to exceed three acres in a bed, and on which there is no natural or planted beds of oysters, for the purpose of planting oysters thereon"; but he must clearly mark and define the portion so selected by him, as a notice to the public, and shall not hold possession unless he puts oysters upon it, within six months, to the extent of at least 50 bushels to the acre.

SEC. 80. Forbids any persons taking or disturbing oysters on beds mentioned in section 79.

SEC. 81. Penalty for violation of section 80, fine not to exceed \$100, or 60 days in prison, or both.

SEC. 82. Process of arrest and trial.

SEC. 83. Oyster-ground is forfeited in Queens county by ceasing to use it for one year, or at the end of two years from his removal from residence in the county.

SEC. 84. Forbids dredging for oysters in any waters of Queens county, except in Oyster bay harbor, and in Cow bay; and no person, unless a resident of North Hempstead, shall dredge in Cow bay. Penalty, fine not exceeding \$100, imprisonment not over 60 days, or both.*

SEC. 85. Repeals previous laws inconsistent.

SEC. 86. "The natural growth or bed of oysters in * * * Little Neck bay, in said [Queens] county, is hereby defined as being between low-water mark and a distance of 500 feet therefrom, into the waters of said bay toward its center, beyond which, in the planting of oysters * * * the word 'natural' shall not apply."

METHODS OF OYSTER-CULTURE.—The East river is the scene of probably the most painstaking and scientific oyster-culture in the United States, and the methods in use there merit careful notice. It is impossible to ascertain when it first became a custom there to transplant oysters from the abundant natural beds along the shore to staked-in tracts off shore, nor is it of much importance to inquire. Probably the very first of this was done in the Harlem river. Half a century ago, however, City island was populated by oystermen; and in 1853 the *New York Herald* reported that the largest proportion of all the East river oysters, used in New York, came from there, "where there are extensive artificial and natural beds". The same article stated that then City island owned a fourth of the 100 boats engaged in conveying East river oysters to the metropolis, and that 100 men and families on the island obtained a living by oystering. The whole amount of property invested there was estimated at \$1,000,000. This included the value of the beds, and was supposed to represent one-third of the capital of all the East river interest.

* Section 84 was repealed by chapter 402, laws of 1879, "in so far as the same relates to the waters of the county of Queens, lying on the north side thereof, except that portion of the waters of Hempstead harbor lying south of a line drawn from the center of Sea Cliff dock, on the east side of said harbor, to the center of Mott's dock on the west side thereof."

This writer asserts that twenty years previous—which would make it about 1833—East river oysters were almost unknown in New York markets; and that it was not until about 1843 that any planting was engaged in. The character of this planting is not indicated; but I have no doubt that, whatever was the date of its origin, the credit of first truly propagating oysters from seed caught upon artificial beds or prepared receptacles, belongs to the men of City island. It had been a matter of common observation, that any object tossed into the water in summer, became covered at once with infant oysters. The sedges along the edge of the marshes, and the buoys, stakes, and wharf-piles were similarly clothed. If the circumstances were favorable, this deposit survived the winter, and the next spring the youngsters* were large enough to be taken and transplanted. It was only a short step in logic, therefore, to conclude, that if objects were thrown thickly into the water, on purpose to catch the floating spawn, a large quantity of young oysters would be secured, and could be saved for transplanting at very slight expense. The next question was: What would best serve the purpose? Evidently nothing could be better than the shells which, year by year, accumulated on the shore from the season's opening trade. They were the customary resting-places of the spawn, and at the same time were cheapest. The City island oysterman, therefore, began to save his shells from the lime-kiln and the road-master, and to spread them on the bottom of the bay, hoping to save some of the oyster-spawn with which his imagination densely crowded the sea-water. This happened, I am told, more than fifty years ago, and the first man to put the theory into practice, it is remembered, was the father of the Fordham Brothers, who still pursue the business at City island. In 1855, Captain Henry Bell, of Bell's island, planted shells among the islands off the mouth of Norwalk river, and a short time after, under the protection of the new law of 1855, recognizing private property in such beds, Mr. Oliver Cook, of Five-Mile river, Mr. Weed, of South Norwalk, Mr. Hawley, of Bridgeport, and others, went into it on an extensive scale. Some of these gentlemen appear never to have heard of any previous operations of the sort. Discovering it for themselves, as it was easy and natural to do, they supposed they were the originators; but if any such credit attaches anywhere, I believe it belongs to the City island men. It was soon discovered that uniform success was not to be hoped for, and the steady, magnificent crops reaped by the earliest planters were rarely emulated. Many planters, therefore, decried the whole scheme, and returned to their simple transplanting of natural-bed seed; but others, with more consistency, set at work to improve their chances, by making more and more favorable the opportunities for an oyster's egg successfully to attach itself, during its brief natatory life, to the stool prepared for it, and afterward to live to an age when it was strong enough to hold its own against the weather. This involved a closer study of the general natural history of the oyster.

The first thing found out was, that the floating spawn would not attach itself to, or "set" (in the vernacular of the shore), upon anything which had not a clean surface; smoothness did not hinder—glass-bottles were frequently coated outside and in with young shells—but the surface of the object must not be slimy. It was discovered, too, that the half-sedimentary, half-vegetable deposit of the water, coating any submerged object with a slippery film, was acquired with marvelous speed. Thus shells laid down a very few days before the spawning-time of the oysters, became so slimy as to catch little or no spawn, no matter how much of it was floating in the water above them. This taught the oystermen that they must not spread their shells until the midst of the spawning-season; that one step was gained when they ceased spreading in May and waited until July. Now, from the 5th to the 15th of that month is considered the proper time, and no shell-planting is attempted before or after. This knowledge of the speed with which the shells became slimy was turned to account in another way. It was evident that the swifter the current the less would there be a chance of rapid fouling. Planters, therefore, chose their ground in the swiftest tideways they could find.

The mere manner of spreading the shells was also found to be important. If they are rudely dumped over, half their good is wasted, for they lie in heaps. The proper method is to take them from the large scow or sloop which has brought them ashore, in small boat-loads. Having anchored the skiff, the shells are then flung broadcast in all directions, by the shovelful. The next boat-load is anchored a little farther on, and the process repeated. Thus a thin and evenly-distributed layer is spread over the whole ground. Just how many bushels a man will place on an acre depends upon both his means and his judgment. If he is shelling entirely new ground, he will spread more than he would upon an area already improved; but I suppose 250 bushels to the acre might be recommended as an average quantity. Having spread his shells in midsummer, the planter, by testing them early in the fall, can tell whether he has succeeded in catching upon them any or much of the desired spawn. The young oysters will appear as minute flakes, easily detected by the experienced eye, attached to all parts of the old shell. If he has got no set whatever, he considers his investment a total loss, since by the next season, the bed of shells will have become so dirty that the spawn will not take hold if it comes that way. Supposing, on the contrary, that young oysters are found attached in millions to his cultch, as often happens, crowding upon each old shell until it is almost hidden, what is his next step?

* There is no word in the northern states for infant oysters, except the terms "set", "spat", "spawn", etc., all of which belong originally to the eggs or spawn of the oyster, and not to the young, but are frequently and confusedly applied as well to the half-grown mollusks. In the south the name "blister" (referring to its smooth, puffed-up appearance) is given to the infant oysters, and serves to distinguish them from "seed", "cullens", and "oysters", which represent the successively larger sizes and stages of growth.

The ordinary way in the East river and elsewhere, is simply to let the bed remain quiet, until, in the course of three or four years, such oysters as have survived are large enough to sell, when the bed is worked—at first, probably, with tongs and rakes, getting up the thickest of the crop. This done, dredges are put on, and everything that remains—oysters, shells, and trash—is removed and the ground left clean, ready for a second shelling, or to be planted with seed, perhaps right away—perhaps after the area has lain fallow, exposed uncovered to the influences of the sea for a year. Oystermen have an idea (probably well founded, though badly theorized upon) that this improves the bottom for oyster-culture, as much as a similar rest would the soil of an upland field for agriculture.

In the process of growth of the young oysters lodged upon the fields of cultch, when left undisturbed, there is, and must of necessity be, a great waste under the most favorable circumstances. Leaving out all other adversities, this will arise from over-crowding. More "blisters" attach themselves upon a single egg than can come to maturity. One or a few will obtain an accession of growth over the rest, and crowd the others down, or overlap them fatally. Even if a large number of young oysters attached to a single stool do grow up together equally, their close elbowing of one another will probably result in a close, crabbed bunch of long, slim, unshapely samples, of no value save to be shucked. To avoid these misfortunes, and, having got a large quantity of young growth, to save as much as possible of it, the more advanced and energetic of the planters, like the Hoyts, of Norwalk, pursue the following plan: When the bed is two years old, by which time all the young oysters are of sufficient age and hardiness to bear the removal, coarse-netted dredges are put on, and all the bunches of oysters are taken up, knocked to pieces, and either sold as "seed", or redistributed over a new portion of bottom, thus widening the planted area, and at the same time leaving more room for those single oysters to grow which have slipped through the net and so escaped the dredge. The next year after, all the plantation, new and old, is gone over and suitable stock culled out for trade, three-year-old East river oysters being in demand for the European market. This further thins out the beds, and the following (fourth) year the main crop of fine, well-shaped, well-fed oysters will be taken, and during the succeeding summer, or perhaps after a year, the ground will be thoroughly well cleaned up, and prepared for a new shelling.

All these remarks apply to a reasonably hard bottom, which requires no previous preparation. In portions of Long Island sound, especially off New Haven, it has been needful to make a crust or artificial surface upon the mud before laying down the shells. This is done with sand, and has been alluded to in the chapter on New Haven harbor.

Just what makes the best lodgment for oyster-spawn intended to be used as seed, has been greatly discussed. Oyster-shells are very good, certainly, and as they are cheap and almost always at hand in even troublesome quantities, they form the most available cultch, and are most generally used. Small gravel, however, has been tried on parts of the Connecticut coast with great success, the advantage being that not often more than one or two oysters would be attached, and therefore the evil of bunchiness would be avoided. Where scallop shells, as in Narraganset bay, or, as in northern New Jersey, mussels and jingles, *Anomia*, can be procured in sufficient quantities, they are undoubtedly better than anything else, because they not only break easily in culling, but are so fragile that the strain of the growth of two or more oysters attached to a single scallop or mussel-valve, will often crack it in pieces, and so permit the several members of the bunch to separate and grow into good shape, singly. I am not aware that any of the elaborate arrangements made in France and England for catching and preserving the spat have ever been imitated here, to any practical extent. The time will come, no doubt, when we shall be glad to profit by this foreign example and experience.

Although the effort to propagate oysters by catching drifting spawn upon prepared beds has been tried nearly everywhere, from Sandy Hook to Providence, it has only, in the minority of cases, perhaps I might say a small minority of cases, proved a profitable undertaking to those engaging in it; and many planters have abandoned the process, or, at least, calculate but little upon any prepared beds, in estimating the probable income of the prospective season. This arises from one of two causes: 1st. The failure of spawn to attach itself to the cultch; or, 2d. In case a "set" occurs, a subsequent death or destruction.

The supposition among oystermen generally has been, that the water everywhere upon the coast was filled, more or less, with drifting oyster-spat during the spawning-season, whether there was any bed of oysters in the immediate neighborhood or not; in other words, that there was hardly any limit to the time and distance the spat would drift with the tides, winds, and currents. I think that lately this view has been modified by most fishermen, and I am certain it greatly needs modification; but, as a consequence of the opinion, it was believed that one place was as good as another, so long as there was a good current or tideway there to spread shells for spawn, whether there were any living oysters in proximity or not. But that this view was fallacious, and that many acres of shells have never exhibited a single oyster, simply because there was no spat or sources of spat in their vicinity, there is no reason to doubt.

Having learned this, planters began to see that they must place with or near their beds of shells, living mother-oysters, called "spawners", which should supply the desired spat. This is done in two ways, either by laying a narrow bed of old oysters across the tideway in the center of the shelled tract, so that the spawn, as it is

emitted, may be carried up and down over the breadth of shells waiting to accommodate it, or by sprinkling spawners all about the ground, at the rate of about 10 bushels to the acre. Under these arrangements the circumstances must be rare and exceptional, when a full set will not be secured upon all shells within, say, 20 rods of the spawners. Of course fortunate positions may be found where spawn is produced from wild oysters in abundance, or from contiguous planted beds, where the distribution of special spawners is unnecessary; yet even then it may be said to be a wise measure.

The successful capture of a plenteous "set", however, is not all of the game. This must grow to salable maturity before any profits can be gathered, and it so often happens that the most promising beds in September are utterly wrecked by January, making a total loss of all the money and labor expended, that more than one planter has decided that it does not pay to attempt to raise oysters upon shells, so long as he is able to buy and stock his grounds with half-grown seed—a decision which may be based upon sound reasoning in respect to certain localities, but which certainly will not apply to all of our northern coast.

To what causes the well-filled artificial beds of infant oysters owe the destruction which seems often to overtake them in a single night, cannot always be told; we are not sufficiently acquainted either with the oyster or the conditions under which he lives, to detect the fatal influence. It is easily perceived, however, that these propagation-beds offer an unusual attraction to all the active enemies of the oyster, such as winkles, drills or borers, and starfishes, since they find there food not only in a superabundance, but thin shelled and tender, so as to be got at in the easiest manner. It has very frequently happened in the East river, that starfishes alone have not only eaten up many acres of young oysters in a single season, on shelled ground, but so colonized there as to ruin utterly that tract for any further use, so long as they remained. It is certain that the half-grown transplanted seed is less attractive to oyster-enemies than the propagation-beds; but when, as frequently occurs, the latter survive misfortune and attack, the yield of profits is so great as amply to compensate for the risk. Those who do not catch any or sufficient seed for their purposes, upon areas of shells or other cultch, annually procure young oysters of natural growth, or "seed" with which to stock their beds. To this end they send their sloops from Norwalk eastward to the Housatonic beds, as has been described in a previous chapter, out into the sound off Bridgeport and to Shippen point, while the more westerly planters get their seed in the East river and off the Long Island shore. There seems to be little lack of supply, but the scene of good dredging and the amount gathered are continually changing. On the whole, however, there is a decrease of supply brought about by the largely increased number of boats now fishing every fall. More or less of the seed gathered here is sold by those who catch it, to local planters, and some goes to beds in Rhode Island and New York bay, or the south shore of Long Island. On the contrary, some little foreign seed, chiefly from the North river, is brought to Connecticut beds. The deep-water sound seed is the best. The seed is not usually culled, but is sold to the planter at about 25 cents a bushel, and distributed upon his grounds just as it is caught. In a bushel of it, consequently, not more than one-fourth (in a fair run) will consist of living oysters, the remainder being dead shells and trash of all sorts. Of this mixed stuff from 300 to 400 bushels are put on an acre lot. If it were culled, even roughly, it would bring from 40 to 50 cents, and one-half the quantity would be enough for the same ground, since the danger of planting too thick must be avoided. Frequently this is done. Some planters here never disturb their beds until they begin to take them up for market; but others make a practice of shifting their transplanted oysters, when two or two and a half years old, to a new spot. There they lie for one year, and are then ready for sale. The cost of shifting is from 10 to 15 cents a bushel; but the increase, both in size and flavor, is thought to compensate for this extra outlay.

The great drawback to East river oyster-planting of every kind, is the abundance of enemies with which the beds are infested. These consist of drum-fish, skates, and, to a small degree, of various other fishes; of certain sponges and invertebrates that do slight damage; and of various boring mollusks, the crushing winkle, and the insidious starfish or sea-star. It is the last-named plague that the planter dreads the most, and the directly traceable harm it does amounts to many tens of thousands of dollars annually in this district alone. Indeed, it seems to have here its headquarters on the American oyster-coast; but as I shall devote to it a special description in my chapter on the Enemies of the Oyster, I will only mention here the fact of its baleful presence, which has utterly ruined many a man's whole year's work.

DESTRUCTION OF EAST RIVER OYSTERS.—Nearly all the East river oysters are sold in the shell in New York. Those from the Connecticut shore and City island are generally taken to the city in the sloops of the owners, and sold to dealers at the foot of Broome street. This is partially true also of those raised on the Long Island shore; but there the New York firms, themselves often co-planters with the countrymen, send boats to buy up cargoes at the beds at a small discount from city prices.

35. PECONIC BAY, OR EASTERN LONG ISLAND.

THE EASTERN END OF LONG ISLAND.—The whole extent of bays and inlets contained between the two promontories, Montauk and Orient, which terminate Long Island at its eastern end, is subdivided under several names, the principal being Gardner's, and Great and Little Peconic bays. Though this region is highly productive in respect to the swimming fishes, and to several kinds of edible mollusks, yet oysters are not commonly found

there, nor do they flourish when planted. This dearth seems to be due to the unfortunate abundance of enemies, especially starfishes, since there is evidence that anciently oysters were indigenous and plenty. At the extremity of the northern cape "Oyster pond" and "Oyster Pond point" still preserve the recollection of what was once good tonging ground. Mr. Sanderson Smith, of the United States Fish Commission, once told me that he had found near there an extensive bed of dead shells of very large size, perforated throughout by boring-sponges. It is not surprising to learn these facts, but they point to a state of things now past, for there is no oyster-catching or planting at present in Peconic bay, which has any commercial importance.

The collector of the port at Sag Harbor, Mr. W. S. Havens, has for several years kept statistics of the yield of the fisheries in this series of bays, from which it appears that in 1879-'80, 5,000 bushels of oysters were taken; their value was \$5,000. Of other shellfish (chiefly scallops), \$22,460 is given as the value of the catch, which seems to me too low.

At Riverhead a company of six men was formed in the spring of 1880. They put up \$50 each, and stocked one acre a short distance below the village with 675 bushels of seed from New Haven; but it did not grow well.

New Suffolk, Mattituck, and other towns in that neighborhood, do a large business in selling scallop-shells to Rhode Island and Connecticut fishermen, to be used as cultch on the propagating beds. The price is $2\frac{1}{2}$ cents a bushel, at which rate the 75,000 bushels of shells sold all alongshore brought in \$1,875.

At Southold oyster-culture has been begun by one man, who has planted 50 acres.

At Orient 800 bushels of oysters were taken last year, and an insignificant quantity on the Napeague shore, inside of Montauk. In the center of Montauk point is a large fresh pond, which it is proposed to turn into an oyster-pond, by opening a sluice so as to admit the salt water. At Sag Harbor 500 bushels are reported as the local catch, and another 500 bushels at Southampton. These three reports add up only 1,800 bushels. I suppose the remainder of Mr. Havens' total of 5,000 bushels were picked up at chance times by fishermen in various parts of the bays, and locally used.

STATISTICAL RECAPITULATION FOR EAST RIVER (AND PECONIC BAY):

Number of planters, wholesale-dealers	958
Value of shore-property	\$347,200
Number of vessels and sail-boats engaged	1,268
Value of same	\$218,800
Number of men hired by planters or dealers.....	125
Annual earnings of same	\$67,500
Annual sales of—	
Native oysters.....bushels..	669,800
Value of same	\$708,925

I. THE SOUTH SHORE OF LONG ISLAND.

36. THE GREAT SOUTH BAY DISTRICT.

TOPOGRAPHY OF GREAT SOUTH BAY.—"Every schoolboy knows," as Macaulay used to say with his fine contempt for illiteracy, that all along the shore of Long Island, between the outer fence of the rigid and pitiless surf-repelling beach and the habitable shore, lie a series of shallow lagoons. The largest of these—thirty miles or more long and from one to five miles wide—is the Great South bay. This water is the salvation of all southern Long Island. If the land ran straight to the sea, and Fire island was not an island but simply a shore, the whole great extent would be as uninhabitable as the bleak rear of Cape Cod, all the way from Prospect Park to Moriches. But the bay furnishes an abundance of harbors; it abounds in fish profitable to catch; it tempts the ducks to its sedgy shore, and so invites an annual migration of money-spending sportsmen; it is paved with the "luscious clamms and crabfish" which the old Dutch poet extolled; and it furnishes to the world that marvel of delicacies, the oyster. Hence, in place of a pine-barren and a howling, friendless coast, we find a string of populous and thriving villages, the winter-havens of thousands of mariners, and the summer resort of city pleasure-seekers.

This shallow sound communicates with the ocean through Fire island inlet and a few more openings to the westward. The eastern part communicates through a narrow pass at Smith's point with East bay, which has no communication with the sea, and is almost fresh. The depth of water in the bay does not exceed two fathoms in its deepest part, and the rise and fall of the tide are very small, probably not more than a foot at the average. The bay receives considerable supplies of fresh water from a number of streams, celebrated for their fine trout. The western part of the bay has a sandy bottom, and its water, being in more direct communication with the ocean, contains more salt than that of the eastern part, where the bottom is a mixture of black mud with sand.

ABUNDANCE OF OYSTERS, PAST AND PRESENT.—This Great South bay has been called the most populous oyster-ground north of the Chesapeake bay, but the natural beds are all confined to the eastern end, where the

mud-bottom is. They do not occur much eastward of Smith's point, nor westward, in general, of a line drawn from Nicoll's point across to Fire island. Occasionally temporary and inconsequential beds "strike" in the tideways of inlets farther east, but nothing with regularity or of importance. This south-shore locality has been celebrated from time immemorial, and as early as 1679 had become an object of an extensive industry, as is witnessed by the following local ordinance, which I find stated in Watson's *Annals of New York*, (p. 284):

Oysters: To prevent the destruction of oysters in South bay, by the unlimited number of vessels employed in the same, it is ordered that but ten vessels shall be allowed, and that each half-barrel tub shall be paid for at the rate of 2*d.*, according to the town act of Brookhaven.

This right of the town of Brookhaven to dictate regulations in this matter exists to the present day, and arises from an ancient colonial grant to the town by patent from the king of England. Recognizing this grant, there was made an agreement in 1767 between William Smith, who was at that time the holder and representative of the rights and interests of the fishing in Great South bay, whereby the town, in exchange for the right to control the bay, contracted to give to him and his heirs forever one half of all net income accruing to the town from the use of the bottom of the bay. This, of course, applied almost exclusively to oyster-culture, and the agreement has been kept, the revenue of the town from that source, in 1880, amounting to \$1,032 95, half of which went to the heirs of old William Smith.

OYSTER-LAWS OF GREAT SOUTH BAY.—The present laws regulating oyster-matters at the eastern end of the bay are as follows:

SECTION 10. The owners and lessees of land bounded upon that part of Shinnecock bay lying west of a line drawn due south from Pine Neck point, in the town of South Hampton, in the county of Suffolk [Long Island], may plant oysters or clams in the waters of said bay, opposite their respective lands, extending from low-water mark into said bay not exceeding four rods in width.

No planting upon any "beds of natural growth", however, is authorized, or will be protected; nor can any person hold oyster-ground unless it is planted and occupied "in good faith". The locality of such planted beds must be designated by stakes and a monument on shore. To plant oysters or clams on such designated ground, without permission of the owner, subjects the offender to a forfeit of \$12 for each offense, under stated processes of law. Heavy penalties also are inflicted upon persons who remove or deface boundary stakes. [This law, or legal permit, is practically a dead letter, since it has been found useless through the too great freshness of the water, and for other reasons, to plant in Shinnecock bay.]

Sections 100 and 101 of the Revised Statutes of 1875, Title XI, forbid dredging in the Great South bay, Long Island, or having in possession instruments for that purpose.

Sections 102 and 103 enjoin that "no person shall take any oysters, clams, mussels, or shells, or any substance growing on the bottom, from any public or private bed, or in any of the waters of the said South bay, except between sunrise and sunset on any day".

Section 104 forbids "catching any oysters, spawn, or seed-oysters" in Great South bay between June 15 and September 15.

The penalties for violation of the above-given regulations are a fine not to exceed \$250, imprisonment up to six months, and an additional forfeiture of \$200 for each offense; half the penalty goes to the informer, the remainder to the poor-fund.

REGULATION OF OYSTER-CULTURE IN SUFFOLK COUNTY.—In 1879 a law was passed regulating the formation of corporations for oyster-culture in Suffolk county, Long Island. Whether this law has ever been taken advantage of I am unable to say. It is as follows:

SECTION 1. Five or more persons who have leased or hold oyster-lots in Suffolk county may organize a company for the promotion of oyster-culture upon those lots, and shall become a corporate body, after filing prescribed statements, in writing, with the county clerk.

SEC. 2. There shall be not less than three nor more than nine trustees, holding office one year. By-laws shall be made to regulate the business of the corporation. Every lot owner shall have one vote, and a majority of votes shall control all questions.

SEC. 3. The trustees shall have the superintendence of the several oyster-lots held by the members, and shall regulate the methods of conducting the business by by-laws, which shall be publicly entered on a book, and which may be changed at annual meetings by a majority vote of the members of the company. The trustees may employ persons, and make monthly assessments upon the members, for money to meet the expenses of the company; and any member failing to pay such an assessment within 30 days may be sued by the corporation.

SEC. 4. If any member violates a by-law of the company, he forfeits \$25, which may be recovered in an action against him by the corporation.

SEC. 5. Whenever, under the laws of this state, an action shall accrue to any member of said company for trespass, or for penalty by reason of any act or thing done or committed by any person, to or in or about the oysters, upon the lot leased, occupied, or held by such member, and said member shall assent thereto in writing, said action may be brought in the corporate name of said company, and all recoveries in said actions shall be the property of the company.

SEC. 6. The oysters upon the several lots of the several members of said company shall be and remain the separate property of the said several members, except that any and all shall be liable to levy and sale, under execution, for all judgments recovered against the company.

REGULATIONS OF OYSTER-CULTURE BY TOWN-LAWS OF BROOKHAVEN.—It will be known, of course, that Brookhaven does not consider any of these state laws as applying to her, since she regards the bottom of so much of the Great South bay as lies within her boundaries, as being wholly under her own control, and not amenable to state jurisdiction. The trustees of the town, therefore, make all the regulations thought necessary, which are not many in number.

A supervisor is appointed, who has charge of the letting of ground, in lots of one acre, to each male applicant of age, who is a resident of the town. The supervisor inspects the ground to see that it is not "a natural bed", places it upon his map, looks after its proper staking-out, and collects a personal fee for his services. The owners of oyster-grounds then pay to the town \$1 a year rent per acre, and pay taxes upon their floating personal property engaged in the business, and upon oysters admitted to be upon their ground. In addition to this, every man, cultivator or not, who wishes to wield oyster-tongs on Brookhaven oyster-grounds, must pay \$1 a year license-fee to the town for the privilege. This fee is known by the curious name "toleration", and it arose in this way: When the town ordered that every citizen might hold a lot, upon the conditions outlined above, it meant that no person should hold more than one. If, however, A got the use of B's name, and so acquired the control of two or more lots, no one objected. The theory was that every man worked his own lot; but soon men began catching seed-oysters in Bellport bay, around Smith's point, and elsewhere, and selling to the planters, who paid from 25 to 40 cents a bushel. In order to derive a revenue from this also, the town therefore ordered a "toleration-fee" of \$1, to be paid by every man who handled a rake. In the fiscal year 1879-'80 these license-fees amounted to \$371 50, while the rental of oyster-ground in Brookhaven during the same time was \$1,056; total receipts of the town, \$1,427 50, of which "the poor" got one-half. Any seeming lack of sufficiency in the amount of the toleration-fees must be charged to the fact, that many, no doubt, took advantage of the custom of commuting for the fee, by throwing upon the public ground eight or ten bushels of seed, *pro bono publico*.

RESTRICTIONS OF OYSTER-FISHING BY TOWN-LAWS OF BROOKHAVEN.—The stated restrictions placed by the town upon oystering are: that no dredging shall be done; no oyster-raking at night, nor between June 15 and October 1; and that no one not a citizen of Brookhaven shall be allowed to rake in her waters, or any person take or dispose of any oysters to be transplanted elsewhere. These regulations, being considered by those inside only as protective measures due to themselves, and being branded as an illegal and unkind selfishness and monopoly by those outside, have naturally caused considerable conflict between the oystermen of Brookhaven and their neighbors—a large part of the town of Islip, separated from Brookhaven before the full value of the oyster-bottom of the bay was appreciated. Brookhaven now claims that the water opposite Eastern Islip was not granted to Islip at the time of the separation, and that she retains control of it. To this Eastern Islip objects, and, with an additional reason, claims, with Western Islip, Babylon, and the state at large, the free right of Brookhaven waters. Brookhaven offers to let Eastern Islip men, in consideration of the old connection, rake with her own citizens, by paying a toleration-fee of \$2, and anybody else for a fee of \$3. This is paid by few or none, and Islip brought suit, which has long been pending, intended to break the monopoly. Meanwhile she and all the rest steal as much seed as possible—nearly all they need, in fact—from Brookhaven waters, the evidence required by the law being so very definite that they run small risk, even if caught, of being proved guilty in court. At the same time Islip and Babylon procured legislation authorizing the leasing of the bay-bottom in four-acre plots to citizens of those towns, for the purpose of planting oysters thereon, and it was made a misdemeanor for non-residents to tong oysters in any of the waters within their jurisdiction. This exclusion was a matter of indifference to everybody acquainted with the fact that no seed-beds of value existed in either town to tempt non-resident tongers. Brookhaven is now endeavoring to get aid from the state in securing to itself more protection. At a late town meeting one trustee made the astonishing statement, that during the spawning-season three thousand tubs of seed are weekly stolen from the bay and transplanted in the protected beds in other waters, those of Connecticut included. "As the seed is worth \$1 a tub, the injury to the oyster-interests in Brookhaven is readily seen. While the oyster-planters of other towns are growing rich, those of Brookhaven are being made poor, and the time to seek protection was while something remained that was worth pocketing." One speaker said he controlled several hundred acres of excellent oyster-bottom, but was prevented from utilizing it by the depredations of non-residents; at which the said non-residents grinned with saturnine glee. What will be the result of the struggle between exclusion and free-raking, remains to be seen.

BROOKHAVEN BAY OR "BLUE POINT" OYSTERS.—Having thus stated the conditions and regulations under which oyster-culture exists in the Great South bay, let us turn to a consideration of the natural supply there, the methods of artificial increase, and the results in market-produce and active prosperity.

The natural, original growth of oysters in this sound, as I have already stated, is confined almost wholly between Smith's point and Fire island—practically to the waters east of Blue Point, known as Brookhaven bay. This was the home of the famous celebrity, the Blue Point oyster, which was among the earliest to come to New York markets. The present oyster of this brand is small and round; but the old "Blue Points", cherished by the Dutch burghers and peaked-hatted sons of the Hamptons, who toasted the king long before our Revolution was thought of, was of the large, crooked, heavy-shelled, elongated kind with which one becomes familiar all along the coast in examining relics of the natural beds, and which even now are to be found by the thousand in all the mussel-lagoons of the gulf of Saint Lawrence. Now and then, a few years ago, one of these aboriginal oysters, of which two dozen made a sufficient armful, was dragged up and excited the curiosity of every one; but the time has gone by when any more of these monsters may be expected.

In 1853 the *New York Herald* reported that the value of all the Blue Point oysters, by which name the Great

South bay oysters were generally meant, did not exceed yearly \$200,000. "They are sold for an average of ten shillings (\$1 25) a hundred from the beds; but, as they are scarce and have a good reputation, they sell at a considerable advance upon this price when brought to market. At one period, when they might be regarded as in their prime, they attained a remarkable size; but now their proportions, as well as their numbers, have been greatly reduced. There are about two hundred persons engaged in the business, including the proprietors and the hands employed in working the beds."

EXTENT OF SOUTH BAY BEDS IN 1873.—Twenty years later (in 1873) Count Pourtales, of Cambridge, made an examination of the oyster-producing districts near New York, at the request of the superintendent of the coast survey. In respect to this great bay south of Long Island, Count Pourtales wrote:

The beds are of various extent, from a few acres to a hundred or more. They form large accumulations of dead shells, on the top of which the spawn attaches itself and produces a succession of crops. * * * Among the beds visited by me, the following deserve particular mention: Smith's point has been mentioned as being the eastern limit of the oysters. The water was found there to be only brackish, and the bottom of clear quartz pebbles, offering attachment to a small variety of oysters, tasteless though fat. They are only used for planting.*

The Great bed (subdivided into North and South beds) off Patchogue appears to be one of the oldest. The tongs bring up large quantities of dead oyster-shells of great size, such as have been mentioned before. The living oysters obtained by a fleet of boats at work on it appeared to be generally about three years old, and were intended for planting at Rockaway until fall. Another celebrated bed is off Blue Point, which has a celebrity for the quality of its oysters in the New York and Boston markets. The California bed off Sayville is one of the largest, about 100 acres in extent. It is the westernmost natural bed, and was formerly extremely productive, but has been very much reduced by over-fishing. The oystermen recognize the oysters from that bank by the abundant growth of red sponge and scutularias on them. The mussel-beds are the nearest to the inlet, and the greater saltness of their flavor is a consequence of it. The lower shell is more frequently ribbed and the edge scalloped in the oysters of these beds than those from beds in the eastern part of the bay. To the westward and between these latter beds, the bottom is more sandy, and the scattering oysters found on it are known as "sand" oysters; they are easily recognized by their clean shells, scalloped on the edge and somewhat striped with dark colors when young; the growing edge is very thin but hard, while further east it is generally flexible. This would indicate a greater proportion of lime in the water, but the reason is not obvious, since the eastern part of the bay contains a much larger quantity of shells in a state of decomposition.

SIGNS OF EXHAUSTION IN THE OYSTER-BEDS.—It is nearly ten years ago that this inquiry was made by Count Pourtales, since even then apprehensions were felt, lest the supply of native oysters, once thought inexhaustible, should speedily find a sudden end. For a hundred years no one had thought anything like protection to the beds, or even moderation in raking, necessary. Boats had come from Rhode Island and Massachusetts, year after year, and had taken away unnumbered loads to be transplanted there, in addition to all the home-market consumption and the supply for Rockaway and Staten Island beds. Only 10 to 25 cents a bushel was asked for the seed by the easy-working catchers, and there seemed no bottom to the mine. This state of things attracted more and more men into the business of dredging seed and tonging marketable beds. All at once young oysters began to be hard to get, and the increase seemed to be almost at an end. The young men had little knowledge of the great armies of infant mollusks which the old men had seen speckling the gravel beaches and rocky shoals all over the bay a few years previous. It began to be seen that if any oysters were to remain, none must be sold out of the bay, and all oystermen must hasten to organize beds and encourage growth. Then came the attempts at help from legislation, but the trouble was too deep for that, and the oystermen of the present generation suffer a scarcity that their grandfathers would have thought it impossible should ever occur.

EXTENT OF OYSTER-INDUSTRY AT THE PRESENT DAY.—Nevertheless, the beds are not exhausted yet, as is evident from the great fleets that spring and fall operate to advantage in the waters between Moriches and Blue Point. I suppose that no less than 500 sail-boats spend their time on the bay at these seasons in gathering seed, carrying it away, and buying it for outside planters. To every one of these 500 sail-boats, mainly well-built sloops and cat-boats, three men may be counted, so that 1,500 men are probably employed in this industry alone at these times. How much seed is procured each season—the fall of 1879 or spring of 1880, for instance—it is impossible to state; but I should judge it to be not less than 100,000 bushels, or twice that amount for the annual yield; yet the amount is not large enough to supply the demands of the South Shore planters, who were compelled to bring in last year (1879) about 100,000 bushels of seed procured in the Newark bay, the North river, East river, and New Haven, Connecticut. This estimate is too small, if anything.

DISPOSITION OF SEED-OYSTERS: PRICES.—The poorer seed caught is sold to a great extent in the rough—stones, shells, dead stuff, and all—just as it comes up, since on much of it there is clinging "spawn"; that is, young oysters too small to be detached. For this 25 cents was the ruling price last year. Much, however, is culled, boys going in the boat and picking the tongfuls over as fast as they are poured out upon a board, which is placed across the middle of the skiff, from gunwale to gunwale. For this from 40 to 60 cents is paid. The buyers are planters at Bellport, Patchogue, Blue Point, Sayville, and the towns farther west, and occasionally a man from Rhode Island or Connecticut, who wants this seed to work up into a particular grade on his home-beds. Count Pourtales mentions something I did not learn of in this connection, namely, "a class of men intermediate between the fishermen and the marketmen. They use sloops and small schooners, and buy up from the oystermen the produce of each day's fishing as they come in at night. A basket hoisted to the masthead is the signal indicating a wish to

*This seed, however, makes the hardiest and most preferred oysters for the European trade, and is much sought after.

purchase." This looks as if he referred to the well-known *packers*, of whom I shall speak later; but he shows that, partially at least, it is seed they buy, for he continues: "The price paid at the time of my visit was about 60 cents a bushel for all sizes and qualities mixed. These oysters are carried to Rockaway, Hempstead, and other bays near the west end of Long Island sound, near Captain's island, where they acquire rapidly a better appearance and flavor. The men who simply carry them there to resell to planters, realize a profit of 15 cents a bushel for freight."

SCARCITY OF SEED AND INCREASE OF PRICE.—The insufficiency of native seed to supply the cultivated beds, complained of this year to a greater extent than ever before, is to be traced mainly to the cause which might long ago have been anticipated, and which has before been so ruinous to our oyster-interests—over-fishing. So long as oysters are permitted to grow for a proper time—say till they are four or five years old—before they are raked up for market, so long will they, in favorable places, increase with a rapidity that it would hardly be possible for a scarcity to occur. To an extent safe against ordinary demands, the more an oyster-bottom is "tonged" the more stock will be found. This is due to the fact that constant raking stirs up the bottom, rinses off the shells and gravel there, and so prepares it to receive the floating spawn. But here in South bay the oysters gathered for market-use are exceedingly small, many of them not larger than a silver quarter. They have not yet spawned, in most cases, and hence their removal is like digging plants up before they have left any seeds behind; it is destroying the root as well as the branches of oyster-growth. The seed imported from outside the island is of a different quality, if not inferior—two opinions exist on this point—not producing stock of precisely the flavor esteemed most highly on the South shore, and to which the original Blue Point and Oak Island bivalves owe their high reputation with epicures. Moreover, where formerly seed was to be had for the catching, or bought at 10 to 20 cents a bushel, 30 to 60 cents must now be paid for it. Such an outlay at the beginning makes an increase of the selling-price necessary. The shippers are loth to give the increase, since they do not see wherein the profit will return. Lately, indeed, money has been lost rather than made on oysters from the south side of Long Island, at least upon those grown at the eastern end of the bay, whence the stock is almost wholly sent to Europe. The question, therefore, as to the best way to restore the natural beds to their ancient productiveness, or whether it is possible to induce the formation of new seed-banks, is a very important one in this locality, and I endeavored to collect all possible information bearing upon it.

REMEDIES FOR THE EXHAUSTION OF THE SEED-SUPPLY.—To begin with: It appears that there has been no season when there was a wide-spread and abundant catch of spawn and successful growth of young oysters in Brookhaven bay since about 1870. In 1872, it is said to have failed altogether. Every year, however, there is more or less spawning observed, and it is the belief of the baymen, that every fourth year this exceeds in quantity the intermediate three years; but the misfortune is that the spawn seems, year after year, to go to waste, or, if it attaches itself at all, to be killed by the winter-storms, which stir up and shift the mud of the too shallow bay, or by some other accident.

It is my opinion, however, that nothing like the required number of adult oysters exist, undisturbed, in Brookhaven bay to supply naturally sufficient seed to keep pace with the accidents of bad weather and the fall-raking. It is a well-known fact, that the oysters upon the transplanted beds do not propagate successfully. Though all the surrounding circumstances seem favorable, the shock they have sustained in being transplanted, or some other reason, limits their spawning; and if they do emit eggs, there is usually nothing near by for them to catch upon. It is to the wild oysters, then, that the planters must look for the annual renewal of the seed-beds. They are few in number, and every circumstance is against them.

One source of trouble lies, I believe, in the laws intended to be beneficial, which, perhaps, present the only difficulty in the way of an entire restoration of the old productiveness. I consider that the prohibition of dredging is bad policy; that, on the other hand, dredging should be permitted all the year round, at least half of each week. It seems to me, also, that beneficial effects would follow the opening of the beds to free-fishing in summer, dredging included, and the closing of them, at least for a few years, from the 15th of July until the following spring, say up to March 1. The reasons for this have been indicated in previous chapters. The continued raking and dragging of the ground in summer, spreads and thins the thicker beds, keeps the bottom clean, and prepares the shells, gravel, and scraps there for the attachment of the spawn, by turning over and rinsing them, and this at the very time most necessary, when the oysters are spawning and the eggs are making their brief floating search for a foothold. But having thus been provided with resting places in abundance, over a continually widened area, it is necessary that the disturbance immediately cease and the young oysters be permitted to rest entirely quiet, until they have become strong enough to withstand the shock of change to new, private beds. This will not occur until they are at least six months old. The present custom of seed-gathering in the fall saves that which is a year old, but it ruins an enormous quantity of small seed of the year only three months old, which has not grown to sufficient strength to withstand the change. I believe that the only seed which should be removed from its birthplace in the fall, is that which catches on gravel beaches between tide-marks or elsewhere, where it would surely be killed by cold during the ensuing winter; and that the abundance the succeeding spring would more than make up for the apparent loss of the opportunity at present made use of. If such a course as this were deemed impracticable, then would it not be well to adopt a system of raking one part of the bottom one year and another

the next? Perhaps not more than a single year's interval would be required; but I should hope that only a third of the bottom might be raked annually, so that each bed would have two years' rest between times.

The general characteristics of the Great South bay having thus been mentioned, it remains to describe particular districts, and offer such statistics as I have been able to collect.

BELLPORT AND MORICHES.—The most eastern point at which any oyster-operations are conducted on the south side is Bellport, and there they are only begun. East of this, in Moriches bay, seed beds exist—there are no oysters in Shinnecock bay—but at Bellport land is now being staked off and planting has begun. Bellport planters will have the advantage of the best and hardiest seed close at their own doors, but are three miles or more from the railway.

PATCHOGUE AND VICINITY.—The next point is the important town of Patchogue, the center of the Brookhaven bay interests. More than any other of the thriving towns on the south shore, it owes its existence to the bay, but has distanced them all in point of size. Every other man you meet is a captain, though the craft he commands is rarely better than a sloop. With few exceptions, to be born and bred here means to be a bayman, and a curious result follows socially. The women of the village know a vast deal more than the men. As soon as a boy is old enough he is sent to school; but by the time he gets acquainted with the manners of the school-house, he has become big enough to “go cullin’” in an oyster-boat, and that is the end of his education. Henceforth he sits in a skiff on the bay and assort oysters, until he is old enough to handle a pair of tongs, when he “goes tongin’” until he dies or has energy and savings enough to become a buyer and shipper. The alternatives to this are to go to New York to seek his fortune, or to become a clerk in a village shop. The girls, on the other hand, stay in school long after their brothers are taken away. They are pretty—that goes without saying—and healthy, because nobody is anything else down here, and are acquainted with fashion through seeing so many stylish people in the summer. Then they admire the honest, rugged frame and heart of a bayman, marry him, and become his confidential clerk in business.

The chief business of the bayman at this eastern end, is the catching and cultivation of oysters, and there are about 1,000 acres of bottom under cultivation in front of the town. This area includes all the coast from Patchogue to Bayshore, thus taking in the settlements and railway stations, Bayport, Youngport, Blue Point, Sayville, and Oakdale. A part of these lie in the town of Islip and the rest in Brookhaven, and thus come under slightly different regulations, but otherwise they form together a homogeneous district, and the oysters they raise go to market under the general brand-name of “Blue Points”. The artificial beds upon which these oysters grow are all near shore, and in water rarely more than two fathoms deep, and often less. The bottom varies, but, as a rule, consists of mud overlying sand. The preference is in favor of water 6 to 10 feet in depth, which is deep enough to escape ordinary gales, and is not too expensive to work. The oysters fatten better there than in shoaler water, one planter said. The seed consists of the native growth, eked out by cargoes from New York bay, the East river, and elsewhere. The experiment of planting Virginia oysters as seed has proved a failure. The result is a shell which grows closely to resemble the natives, but the moment the oyster is opened the difference and inferiority of the meat is apparent, both to the eye and the taste. It has therefore been discouraged. Southern oysters will survive the winter in this bay, grow, and emit spawn; but most planters consider that they tend to reduce the quality and price of the native stock, and hence have almost ceased to bring any. To raise and sell them as “Virginias” would not pay, since this region cannot compete with Staten Island. Whether native or outside seed grows faster is another undecided question, but all whom I asked said they preferred to plant all home-seed, if possible, on general considerations. The differences in the experiences related to me are no doubt due to the differences in the particular localities whence the seed was brought. It is generally understood that oysters taken from the eastern to the western end of the bay grow more rapidly than those not changed. Count Pourtales remarked upon this district as follows:

These beds produce oysters of different qualities, according to the locality; the cause of the variation is not known, but depends probably on the density of the water, supply of food, etc. The oysters grown on the beds are called bed-oysters, by the fishermen, to distinguish them from the broken-bottom oysters. The former have generally a rounded shape; the second, which grow in scattered bunches on broken or muddy bottom between the beds, assume an elongated or spoon-shaped form, evidently produced by their tendency to sink in the mud by their own weight as they grow. The beds have probably originated in the same way, as the tongs bring up from them frequently old and very large spoon-shaped shells of oysters, such as are not now found living there. The broken-bottom oysters have a much more rapid growth than the bed-oysters, being two or three times as large as the latter at the same age. The greater supply of food will no doubt account for it. At the same time the meat is more watery and held in less estimation until after it has improved by planting in other localities.

The ordinary amount of small seed put on an acre is 500 bushels, chiefly laid down in the spring. In the fall the owner goes over them and thins them out, finding a great many which are large enough for market, though no bigger than a silver dollar. The rest remain down longer, and meanwhile constant additions of seed are made alongside.

BAYSHORE.—As you go westward to the extremity of the “Blue Point” district, in the neighborhood of Bayshore, you find a feeling of discouragement. The oysters there do not grow as fast or become as finely flavored as those to the eastward, and all the seed must be bought or poached stealthily from Brookhaven. Large quantities of ground there, which may be procured in four-acre lots at \$1 a year rent per acre, are not taken up, although with the help

of capital it might be made productive, and there are very few out of the many planters in Bayshore who depend to any considerable degree upon their oyster-beds for their support, even if you add to this the profits they derive from clamming.

THE USE OF "STOOLS" TO RECEIVE OYSTER-SPAT.—Following the lessening product of the seed-beds and the increasing appreciation of the oysters of this region, attention was turned some years ago to the possibility of saving a portion of the wasted spawn with which the imagination filled the waters of the whole bay, by giving it suitable "stools" upon which to rest.

It has been the custom, therefore, for several years in Brookhaven bay, to spread down shells, scrap-tin, and other cultch, in hopes of catching a quantity of oyster-spawn and so getting plenty of seed. This seems to have succeeded just in proportion to the contiguity of mother-oysters to the receiving-bed, and the success has generally been so uncertain, that no great dependence has been placed upon this source of supply, nor has the practice been systematically engaged in, as at New Haven and Norwalk. The experience of Mr. King Benjamin, of Sayville, for instance, may be given as that of the average planter in this respect. He told me that it was his custom to spread his shells at the middle of the spawning season, which here comes early in July, where the tide-currents were tolerably swift, and spread them lengthwise of the current. Then across the tide, near the middle of the bed, he puts a rank of spawning-oysters from the North river, and has rarely failed for ten years past to get a good set to a distance of 15 or 20 rods, but no further. The risk now begins, and it is rare that any considerable quantity of the seed so caught survives the breaking up of the winter, when the ice goes out and the northeast gales churn up the bottom of the shallow bay. A large proportion of all the oysters, large and small, in Brookhaven, which have lain in health all winter, are destroyed every spring. This is one argument used to sustain the propriety and profit of fall-raking for seed.

The spreading of shells, without placing among them mother-oysters, is steadily practiced, in the hope of some day catching a fortune, but up to this time this practice has hardly repaid the small expense incurred. On the other hand, in spite of ill-luck, those planters who have worked more cautiously, placing spawners among their shells instead of trusting to chance, have got plenty of young. There seems no reason, therefore, why the race of "Blue Points" should become extinct for loss of seed, and no doubt a more urgent necessity than now exists will introduce into that locality the better methods of saving spawn and safely raising the young, which are surely possible. At present it is preferred to purchase seed of natural growth, or of somebody else's raising.

That the Brookhaven men consider the putting down of stools worth the effort, is evinced by their petition to the town-authorities in May, 1880, for additional ground for this purpose on the southern, and as yet, useless shore of the bay. After long discussion, this petition met with the following response, which opens a new field of industry to Patchogue, which there is every reason to suppose will prove of profit. The town decreed as follows:

Whereas, there is a large portion of the South bay adjoining the South beach which is clean sand-bottom, and could be made available for raising seed-oysters by the spreading upon said ground shells for seed to catch upon, thereby making the flats and shoal-water ground productive to our citizens, and an increased revenue to our town: Therefore, be it

Resolved, That this board of trustees lease four acres of such ground to the west of Blue Point and east of a line drawn south from Munsell's landing, to any citizen of the town of Brookhaven, for the purpose of propagating and raising seed-oysters thereon, whether a lot for growing oysters in said bay has already been leased to him or her, or not, at the annual rent of \$4 for the term of one year, with the privilege of renewal annually for nine successive years thereafter, and on the other conditions upon which the board of trustees are now granting leases for the purpose of growing oysters.

OYSTER-VESSELS AND OYSTERMEN AT EAST END OF GREAT SOUTH BAY.—The fleet and the number of persons supported by the oyster-industries of the eastern end of the Great South bay are very large, but it was impossible for me to get exact statements in respect to either. At Patchogue and neighborhood, however, an estimate of 250 boats was concluded upon after much inquiry. Eastern Islip will add to this 200 boats, and the shore from there westward to Bayshore from 100 to 150 more; say the lesser number. All of these boats are sloops or cat-rigged, and are of good size and quality, so that they will range from \$600 to \$1,600 in value. The minority, however, are of the more expensive pattern, and about \$750 would probably fairly cover the average value. This would make the 550 sail-boats, built for the oyster-business and used from two-thirds to the whole of the time in that business, owned from Bellport to Bayshore, represent a present cash value of about \$425,000.

In addition to this must be counted, say 500 skiffs, worth, perhaps, \$25,000. It is probable that \$50,000 more would not more than cover the value of ground, sheds, implements, packing-tools, etc., required, so that the floating property of the oyster-planters from Bayshore eastward to Bellport, concerned in that business, must be estimated as high as half a million of dollars. This, however, is distributed among about 600 planters, 400 of whom live in Brookhaven and the rest in Islip. These are all, supposably, heads of families, and they employ, or otherwise support, perhaps 600 more men and boys to help them in the busy season, half of whom thus support families. It may thus be said that in Brookhaven 600 families, and in Islip 300—total 900—derive their sustenance directly or indirectly from oysters, though most of them, at the same time, are, to a considerable extent, farmers, or fishermen, or both.

YIELD OF BLUE POINT OYSTERS IN 1879-'80.—The past year (1879-'80) has been a very poor one, both

in respect to quantity and quality, for Blue Point oysters, both the amount sold and the price received being small. The crops gathered at the different ports were approximately as follows:

	Bushels.
Patchogue to Blue Point, about.....	55,000
From Oakdale, about.....	80,000
From Sayville, about.....	60,000
From Bayshore, about.....	20,000
	215,000

About half of these were sent by rail, and the other half, or a little more, by water-sloops sailing to New York with loads of barrels. This traffic is very important to the railway, and the water competition has served the shippers the good turn of keeping freight-charges at a low figure, particularly as there were many advantages to be gained in shipping by boat. The average receipts by the railway, per bushel, for oysters transported in 1879, to New York, from all stations on the Great South bay, was between 8 and 9 cents.

EXPORTATION OF "BLUE POINTS" TO EUROPE—The principal market for "Blue Points" is now, as for some years past, for the European trade. Their superior flavor, round, thin shell, and small size, commended them when this shipping business was first begun, and they have retained their supremacy over all other brands, until the unfortunate season of 1879, when they proved so poor that the "Sounds" beat them in the estimation of the epicures abroad, and money was lost by shippers on Long Island. Another unfortunate thing which detracted from their success, was an attempt to substitute southern oysters, nurtured for one season in the bay, for native "Blue Points." As has been said before, the southern seed takes on in growth so close a semblance to the genuine Brookhaven product as to deceive any but the most expert eyes, so far as the *shell* is concerned; but the meat never looks nor tastes so well as that which is imitated. On this account, the leading shippers looked upon the advent of Virginia oysters to the bay with some anxiety, fearing that weak-kneed or unscrupulous persons would some day foist the imitation upon the London market, under the brand of genuine "Blue Points."

One day an agent of one of the New York houses suspected that such an attempt was being made, but could not easily verify it. At the station, however, while the suspected barrels of oysters were being placed upon the freight cars, he procured an opportunity, unobserved, to look at their contents, and found them nearly all "Virginias" mixed with a few natives. He telegraphed at once to his principal in New York, who forwarded a cipher dispatch to his agent in Liverpool. That merchant gave a hint to the customs authorities, and a watch was kept. When the adulterated consignment arrived they were seized by officers, their inferior character proved, and the whole stock confiscated; moreover, the agents of these people in Liverpool were arrested, charged with fraud in selling food under a false label, which is an offense visited with heavy penalties under the English law, and they only escaped through the intercession of American oyster-dealers there, who explained that the shippers probably thought southern oysters laid down in Blue Point waters might properly pass as "Blue Points." Such a construction is plausible, but the inferior nature of the stock was well-known nevertheless, and would have tended to injure the reputation of these fine oysters irretrievably.

Mr. George H. Shaffer, of New York, one of the pioneers in shipping to Europe, preferred "Blue Points" at first, and has continued ever since to be a very large buyer of them. To the kindness of his agent at Patchogue, Mr. More, I am greatly indebted for assistance in my investigations. Mr. More and all his brother-agents are known as "packers". They are very busy men, traveling along the shore every day, in all sorts of weather, and striving against one another in the purchasing-boats for friendly advantages. Each packer has a sloop and crew with which he cruises on the fishing-grounds. That he has come to their vicinity, and is ready to purchase, is known to the oystermen by the signal of a basket hoisted at his masthead. They row up to him, measure out the "tubs", each of which holds two bushels, and receive their cash-payment on the spot. Several thousand dollars a day are thus disbursed in this region all winter through. When this market-boat is full she makes for the shore and lands her cargo in her owner's shanty, which, firmly secured against the wind and banked up with sea-weed, occupies a place just out of reach of the tide on the sandy beach. Here the oysters are "culled": that is, assorted into three sizes. The largest ones, of small amount, are reserved for the home trade, while the two small sizes are snugly packed in barrels, well shaken down, to be sent abroad. The barrels used are old flour-barrels, supplies of which are sent down from New York, and they will hold a scant three bushels; but in the course of packing, discarding and waste occur, until it is estimated that every barrel of Long Island oysters sent to Europe represents fully four bushels taken from the beds. I presume the same will hold true at Perth Amboy and elsewhere. The residue of the packing, big and little, the packer throws overboard upon a plot of ground reserved for the purpose, near his house, whence he occasionally takes up such as are suitable for market, so that really there is little waste.

ADVANCE-CONTRACTS FOR OYSTER-CROPS.—The system of contracting for a planter's crop a season ahead, has been followed here by the packers to considerable advantage. The planter judges what he will be able to rake or procure from his neighbors during the winter, and contracts to deliver so many barrels to the shipper at such a price. Last season was disadvantageous for the contractors, owing to scarcity of stock, but as a rule they have done fairly well. The packers also sometimes advance capital to a man with which to start an oyster-bed, on condition

that he will sell only to them and share the profits equally. This sort of bargain is encouraged by the shippers, and a diligent man need never fear to undertake such an obligation, since it is bound to be mutually profitable, if properly conducted; yet many cases have occurred where the offer has been refused, for no apparent reason better than lazy shiftlessness. Indeed, it is an unfortunate characteristic of too many of these seemingly shrewd and certainly hardy and adventurous baymen, that they are contented with the small supplies of the happy moment, unwarned by past scarcity to provide against future suffering, and are as reckless of advantages which might be improved, as they are of saving the money in hand. To this indifference may be traced their slowness to experiment toward the improvement of their oyster-grounds, or the preservation of more of the vast abundance of spat which, they all believe, whether it is the fact or not, is drifting just under the steely-blue surface of their beautiful midsummer bay.

PRICES OF BLUE POINT OYSTERS.—The prices of Blue Point oysters have never been lower than at present; even a hundred years ago more money was paid for them than now, which shows the general public advantage of cultivation. During the season of 1879-'80, the prices paid the producers by the packers ranged from \$1 50 a bushel for small lots of "best selected", to 60 cents for poor stuff. Much was sold at a dollar, but a fairer average would be 90 cents. Twenty years ago, according to Count Pourtales' report, "\$2 to \$3 a bushel" was the selling price. For those destined to form foreign shipments, from \$3 50 to \$4 a barrel was paid, the highest prices ruling near Patchogue, and the lowest westward. This was from 20 to 30 per cent. above the prices paid at the same time for the "Sounds", although the latter were better received and worth more in the English market than those costing more here. The profits in "Blue Points" and "East Rivers", therefore, were small, while those in "Sounds" were fair, if not large.

AGGREGATE VALUE OF BLUE POINT OYSTER-CROPS.—Multiplying the 215,000 bushels sold between Bellport and Bayshore ("Blue Points") by 90 cents, the average price, gives \$193,500 as the approximate amount of money put into the pockets of the oystermen along a strip of about 20 miles of shore. Dividing this among 900 families (see page 104) gives an average of about \$215 as the season's income for each. This takes no account of the two or three hundred single men, who earned \$2 a day at oystering during a portion of the season, but a considerable part of whose earnings reverted to their employers or neighbors, in payment for board and supplies.

BABYLON: "OAK ISLAND" OYSTERS.—At Babylon the business of oyster-cultivation is comparatively a modern institution, though Messrs. Udall and Oakley, with some others, have been at it for ten years or more.

No natural oyster-beds are to be found in this town, or nearer than Brookhaven bay; nor have they ever existed, except that in the inlets and tideways through the beaches and marshy islands opposite the village of Babylon, as in the neighborhood of Fire island, occasional scattering patches of young sometimes "catch". Unless taken up the same fall, however, they rarely survive, and no dependence is placed upon this chance supply. Now and then a few at Oak Island will manage to live and grow. They develop a remarkably fine flavor and bring extraordinary prices in the market.

There are said to be about 1,000 acres of bottom belonging to the town suitable for oyster-culture, but only about 200 acres are at present improved. These are all alongshore and almost wholly around Oak Island, on the southern shore of the bay, since the central part of this broad, shallow lagoon grows full of eel-grass in midsummer, the bottom everywhere being muddy. The water is nowhere more than 6 or 7 feet deep at high-tide, and the larger part of the grounds are laid bare at low water. On this account there is great risk in trying to keep any oysters upon the beds through the winter, the ice often settling upon the beds at low tide, freezing fast to mud and oysters, and carrying both away when it drifts off upon the rising tide. The winter of 1878-'79 was destructive of nearly all the beds in this way. Such complete devastation is rare, however, and the winter of 1879-'80 was so mild that no harm was done. Men who cross to the beaches, shooting or wrecking in winter, often find a feast in the oysters which are frozen into the cakes of ice piled up on the shore, and these are the best, too, for the shallowest water produces the finest quality.

There are at Oak Island 30 planters, each of whom cultivates 4 acres under the special state law enacted for Babylon and Islip. This law, which, in 1878, was made to take the place of previous statutes, comprises several sections, and reads substantially as follows:

SECTION 1. Any person of full age, who has been an inhabitant of Islip or Babylon, Suffolk county, for one year, upon complying with the ensuing conditions, may "locate a lot not exceeding four acres in extent under the public waters of the Great South bay, in either of said towns, where the taking of clams cannot be profitably followed as a business", and shall have exclusive ownership.

SEC. 2. "For the purpose of ascertaining and determining what * * * portions of said bay may be taken for the purpose of planting oysters as aforesaid, a board of commissioners, consisting of two from the town of Islip and one from the town of Babylon, whose official titles shall be 'oyster-commissioners', shall be appointed each by the board of town-auditors * * * of his or their said town, respectively". They hold office one year, their appointment to be certified to by the auditors and filed with the town clerk.

SECS. 3, 4, 5. Each oyster-commissioner must take an oath of office and furnish a bond of \$200 or more for the faithful performance of his duties; in case of refusal to serve, or vacancy, the auditors may appoint a substitute.

SEC. 6. It shall be the duty of said commissioners * * * to attend and examine the lot applied for, and ascertain and determine whether the taking of clams can or cannot be profitably followed as a business thereon; and if they shall determine that it cannot, then, and not otherwise, they shall locate the lot for him, which shall be clearly marked and defined. The commissioners must also secure maps and surveys of all ground allotted, and on all questions of boundary the decisions of the commissioners shall be final. On payment by

any applicant of the expense of locating his lot, which shall be determined by said commissioners, but shall in no case exceed the sum of \$10 and the additional sum of \$1 per acre as yearly rent, they, or a majority of them, shall give to such applicant a certificate * * * which certificate shall entitle the person named therein to the possession of said lot, for the purposes of this act, so long as he shall keep the said lot clearly defined in the manner so directed by said commissioners; but if such person shall neglect to plant his lot with at least 100 bushels of oysters and shells during the period of one year from the date of his certificate, or shall neglect to pay said yearly rent on or before the first day of April in each and every year, his rights to the possession of said lot may be terminated at the option of a majority of said commissioners. Certificates of this fact (as well as all other documents) must be made in duplicate and filed with the town clerk.

SEC. 7. Each of said commissioners shall be allowed the sum of \$5 per day for his services actually rendered under this act, the same to be paid only out of the fund received for locating lots * * * and shall not receive any additional fees or compensation from any person or persons whomsoever; and each of said commissioners shall, at the usual annual auditors' meeting of said towns, account for and pay over all moneys in his possession * * * .

SEC. 8. It shall not be lawful for any person to retain possession of any such lot after he shall cease to be a resident of either of said towns of Islip or Babylon, but he may sell and assign his interest in any such lot to any inhabitant of either of said towns for one year; but no person shall acquire possession of more than one lot by purchase or otherwise.

SEC. 9. A penalty of fine not exceeding \$100, or imprisonment not over 60 days, or both, is provided for taking or disturbing of oysters on such lots by unauthorized persons.

Of the thirty planters alluded to above, twenty-two have formed themselves into a protective association, and hire a watchman at \$40 a month; but, in spite of this, complaints of theft are frequent.

The old way of planting at Oak Island was to buy small seed and plant it in the spring. The following autumn the bed was thinned out, and more than half of it taken up and sold, chiefly to planters from Rhode Island, to be laid down again. What remained grew to better advantage and was ready for market the following spring, if the ice did not haul it off before then. About 1870 seed could be procured in Brookhaven bay in abundance, simply by the trouble of catching, or could be bought for 10 to 20 cents a tub. About 1875 Mr. Edward Udall told me young oysters were so plenty off Patchogue and Smith's point, that a man could work profitably at 5 cents a tub. In 1877 he bought seed largely for 10 cents a tub, but in 1880 the same was worth 25 cents at Patchogue, and 40 cents when delivered at Babylon.

The growth of oysters transplanted to Oak Island waters is extremely rapid. They have been known frequently to double their size in a single season, and are often sent to market at the age of fifteen months; that is, the second fall after their birth. This rapidity of growth is attributed to the freshness of the water, but undoubtedly is due to the excess of confervoid and other food in the water. I know no place where it is more abundant; and it is quite possible that the fishermen are right when they attribute the circumstance that oyster-spawn never catches west of Nicoll's point, except around the mussel-beds in the inlet, to the great prevalence of slime in the water; for this "slime" is the vegetable and hydroid growth that furnishes so much nourishment to the adult oysters, and everywhere covers the bottom with a slippery growth and deposition.

The planting of southern oysters was tried here, but did not yield a profit, since a large proportion of the oysters died. They grew well enough, but few lived, the supposition of the oystermen being that the water is too salt.

Experiments have been made to a limited extent in catching spawn upon artificial beds of shells. When it has always been possible to buy Brookhaven seed at 10 to 20 cents, and secure in one or one and a half years' growth enough upon it to pay the planter from 75 cents to \$1 a bushel, no other method was considered necessary. Now, however, there threatens to be such a scarcity of seed that shell-beds will probably be laid down extensively, and I see no reason why good returns should not follow.

The enemies to be contended with are the ice, as before mentioned; rare easterly gales of sufficient power to disturb the beds; the borers, which are on the increase, and two years ago nearly extinguished the beds opposite Sayville; and the common crabs. In respect to the crabs, I had not heard before that they were injurious, but was assured that immense damage by them annually happens to the young oysters on planted beds; one man losing 500 bushels in one week. This matter is more particularly discussed under "Oyster Enemies".

The Oak Island planters put down in 1880 between 15,000 and 20,000 bushels of seed, and their next crop will probably be a large one. This season, however, though their oysters were of superior quality, the amount was so small that not more than 2,000 bushels were sent to market. These chiefly went into the export trade, and were sold to Sayville shippers at \$1.25 to \$1.50 a bushel, which was a large advance upon the previous year's prices. There is a feeling of discouragement at this locality.

AMITYVILLE, SOUTH OYSTER BAY, FREEPORT, AND BALDWIN.—Going west from Babylon, the small producing points of Amityville and South Oyster bay are passed, and then you reach Freeport, where there is an old and extensive business in oyster-culture.

The beds opposite Amityville, the most westerly point on the Great South bay, are a new property, and as yet yield small crops. The situation seems favorable, however. There are ten or a dozen planters (and as many sail-boats), the principal of whom are the Messrs. Ketcham. They obtain most of their seed at present from the East river, and have now planted about 5,000 bushels. In addition to this, about 1,500 bushels of Virginia oysters were laid down this year. The crop reported sold last winter amounts to 2,000 bushels. "No drawbacks" is the encouraging report.

At South Oyster bay, four miles westward, a planting interest has grown up only of late. The name of the piece

of water and the village is derived from its being the southern part of the town of Oyster Bay, which owes its name to the ancient productiveness of its harbor, on the north shore, in our favorite mollusks. There are 22 planters here, 18 of whom are joined in an association for mutual protection. They rent ground under the laws of South Oyster bay, although many of the members are residents of Hempstead. They can each have as many acres as are wanted, for simply the trouble of staking out and recording. They have pursued a somewhat different course from their neighbors, buying this year (the spring of 1880) two-year-old seed at New Haven, which cost them 60 cents, put down. This they propose to take up and sell the succeeding fall, and expect by that time it will have doubled its size, so favorable are these grounds regarded for oyster-growth. These planters intend in future, nevertheless, to buy small seed, that is, when they can procure it at less cost and trouble than was possible last spring. I should think this locality ought to become a profitable oyster-depot.

Five miles westward of South Oyster bay lies the considerable hamlet of Freeport, where oyster-planting has long been followed in the shallow bay of the same name opposite the town, about 40 acres of bottom being in use. About 35 planters are engaged here, all of whom live at Freeport, and make a pretty prosperous village of it. Besides these 35 owners, probably 25 families get their living out of the trade, so that the industry is very considerable here. The method of cultivation is similar to that employed eastward, except that considerable seed is got at Staten Island and in the East river, but no southern oysters are planted. The crop last season amounted to about 30,000 bushels. It was of high quality, and brought an average price of about \$1 35 in New York. Nevertheless the Freeport men complain of a poor business and dim prospects.

At Baldwin's, two miles west of Freeport, there are 18 planters, occupying an acre each of the bottom of Hempstead bay, an inlet separated from South Oyster bay by islands, and about as many more who find steady employment. These planters get seed mainly from the westward, and in 1879-'80 sold about 11,000 bushels at \$1 50. They report their beds in "very fine condition" and their "prospects very bright".

At Christian Hook is a small business, also in the waters of Hempstead bay, in respect to which I was prevented by accident from getting and saving many particulars. I judge, however, that the business there is much the same as at Baldwin's, and, therefore, credit its productiveness at about the same rate—11,000 bushels annually.

37. THE ROCKAWAY DISTRICT.

TOPOGRAPHY.—At the western end of the south shore of Long Island is a series of interlacing channels, through a great marshy lagoon, protected outwardly by Longbeach from the rage of the Atlantic, and separated from Hempstead bay, east of them, by large islands. This confusing net-work of shallow, tidal creeks, ramifying in all directions through an immense expanse of sedge, lies on the eastern side of the township of Rockaway. West of the town spread the more open waters of Jamaica bay. In both these waters oysters are grown in great quantities; and as every village, beach, inlet, and channel in the whole region has the name Rockaway attached to it in some shape, it is not surprising that these oysters should take the universal name, too, in the New York markets, whither they all tend. The annexed map will show what an amphibious kind of region this is, and its relation to other localities.

HISTORY OF PLANTING: LAWS.—All of the planters live at the village of East Rockaway, and within a mile of it on the western side, and are a different class of men, socially inferior to the oystermen of the Great South bay. Though a large number are engaged, no one among them is an extensive dealer, three or four thousand bushels being the largest amount raised by any one man, while the majority of the planters produce less than 500 bushels a year.

The first planting was done here about thirty-five years ago, by Captain Samuel Pearsall and Mr. James Murray, as tradition relates. There were never any natural beds here, and they procured their seed at Patchogue, or wherever they could get it most easily. Nor were they particular as to ground occupied. Later, however, when the business became one of importance, special laws were enacted by the state of New York, at the instance of the towns of Hempstead and Jamaica, to apply to these waters. These legal regulations, which illustrate the selfishness of all oyster-laws, govern not only the Rockaway oystermen, but also those all along the shore from South Oyster bay to Fort Hamilton. They are as follows:

SECTION. 78. Exempts Jamaica and Hempstead bays from the "public waters" of Queen's county.

SECS. 79 to 87 are irrelevant.

SEC. 88. Persons for one year inhabitants of Jamaica and Hempstead, Queen's county, may plant oysters in the waters of those towns, as heretofore provided; but no person not a resident shall be allowed such privilege.

SEC. 89. Inhabitants of Jamaica and Hempstead can use three acres, but must mark, define, and make use of, as stated in section 79.

SEC. 90. "Before any person shall occupy any lands under the public waters aforesaid, for the purpose of planting oysters, * * * he shall prove to the satisfaction of the board of auditors of town accounts * * * that the land selected is not a planted bed of oysters, or, if planted, is not planted by any person other than the applicant, and shall also prove, by at least five reputable residents and freeholders of said towns [Jamaica or Hempstead], that he is, and has been for one year preceding, an inhabitant of the town. All the aforesaid proof shall be taken in writing, and signed and sworn to. Such board of auditors, or a majority of them, shall thereupon give to such person a certificate under their hands," embodying the facts stated above, which shall be filed with the town clerk.

SEC. 91. Persons obtaining and using oyster-ground in Jamaica or Hempstead shall pay to the supervisor of the town an annual rent of \$5 an acre. This money shall go to pay current annual expenses of the town. Any oystering or clamming on ground so set apart, without authority of the owner, is forbidden.

SEC. 92. Penalty for taking oysters, or disturbing beds in Jamaica or Hempstead, \$100, to be recovered by the owner.

SEC. 93. Defines process of arrest and recovery.

SEC. 94. Forfeiture ensues when the owner of ground in Jamaica or Hempstead waters ceases to use the ground for one year, or at the end of a year after he ceases to be a resident.

SEC. 95. Persons given until January 1, 1872, to remove their oysters from the waters of Jamaica or Hempstead, or to acquire new rights.

SEC. 96. Forbids dredging in the waters belonging to Jamaica or Hempstead, under penalties of \$100 fine, or 60 days imprisonment, or both.

SEC. 97. Repeals the act of April 8, 1865, relating to this subject.

Under these closely protective laws the whole town, nearly, has turned itself into oyster-growers, and the coming generation are taking the beds their fathers leave. They pay into the town treasury of Hempstead about \$900 a year, and into that of Jamaica about \$400, which, at \$5 an acre rent annually, shows that few of the planters occupy the three acres which they are permitted to. This is not for lack of room, however; plenty of good ground remains.

OYSTERMEN'S WAGES.—The total number of planters that one may count up in Rockaway varies from time to time, but there are not less than 150 constantly engaged, and devoting their whole time to their beds, except in midsummer. Besides these planters, properly speaking, there are as many more men who support their families by picking up the oysters that have drifted on to public ground from the planted beds, and selling them for market or for seed; who catch crabs, dig clams, and mend boats and tools, when not directly employed in assisting the planters make their beds or harvest their crops. It is particularly at the harvest-time that this help is employed, and the laborers receive from 20 to 25 cents a bushel for getting up and bringing in the oysters and culling them for market. It may safely be said, therefore, that 250 families, and many single men, in this village alone, obtain their support from the local oyster-industry.

METHODS OF CULTURE.—Rockaway men get their seed from Brookhaven and Newark bay, but prefer East river seed to any other, and use the largest quantity of it. It is brought to them in sloops. Rockaway itself owns few large sail-boats; its channels are too shallow and devious to admit of easy navigation, but every man has a skiff, and all the planters, flat planting-boats. Virginia oysters have been tried, but have never done well. Now none are planted. They say the water is too salt for them. The growth of Rockaway oysters is extremely rapid. The mud in the bottom of these marshy channels, which is only sufficient to hold the oysters from being smothered, seems to be full of nourishment, and the oysters are always large and fat. Some few men deal only in "box" size; but the majority of the planters sell, nowadays, much smaller oysters than formerly they were wont to, so that the average shipments now will run about 275 to the bushel. Lately, also, Rockaway has been able to contribute considerably to the European trade, selling what they term "French" stock, measuring from 1,500 to 1,700 to the barrel, and receiving \$1 a hundred for it. I understand that these oysters have given very good satisfaction abroad.

MARKETS AND PRICES OF ROCKAWAY OYSTERS.—When Rockaway oysters first began to get a name in the city markets, they were sent there by the packet-sloops that used to run for fast freight and passenger traffic from the south shore to the metropolis, in rivalry with the lumbering stage-coaches on the shore, and brought about 75 cents a basket. When the war of the Rebellion cut off the southern supply, northern oystermen profited, and "Rockaways" were so good and regular, that at the close of the war they were worth \$4 for ordinary stock at the boats, after which they were carted to the city in peddlers' wagons. This rate dwindled, however, very rapidly; yet Rockaway oysters have always held a good place, and last season were sold readily at \$1.25 for small and \$2 for the larger sort. The quality was unusually poor this season. The total quantity raised annually by this community, I estimate, after much study, at 100,000 bushels, judging that 700 bushels is the largest average permissible, and counting 150 planters.

NORTHWEST POINT.—On the eastern shore of Jamaica bay is a little oyster-settlement calling itself Northwest Point, which disposes of its oysters as "Rockaways". The beds here are in a swift tidal channel, where the water is shallow, and many beds are left bare at low tide. Here are from 40 to 45 families, chiefly supported by the business. Four or five of these are planters, raising from three to five thousand bushels annually; but the majority are small planters, who get from \$150 to \$100 a year out of their beds. They own here about 20 oyster-sloops, which do also a good deal of coasting, and in summer enter into the pleasure-excursion business at the beach hotels. The total crop of the locality, therefore, does not exceed ten or fifteen thousand bushels. Last year these were of poor quality, and were sold on the shore at \$1.25 a bushel. As a rule, most of the oysters are taken by water to the foot of West Tenth street, New York, and there disposed of, generally to good advantage. Mr. Henry Wanser, to whom I am chiefly indebted for information, prophesied that the crop of 1880-'81 would be a good one in quality, because the mollusks had spawned early, and therefore had time left them to get strong and fat before the cold autumn weather began. He thought oysters must be in good shape by August 20, or they would not be good at all.

A few other planters are scattered singly about the shores, but they are of no importance, and cater chiefly to the hotels and local trade in summer.

GRAVESEND.—On the western shore of Jamaica bay is a small interest centering at Gravesend, in procuring an account of which I was greatly assisted by Mr. R. L. Van Kluk, postmaster of that village.

There are no natural oyster-beds in this region, except that a few bushels are caught every fall in Garrettson's creek, between Gravesend and Flatlands. Between Gravesend on the west and the western shore of Jamaica bay on the east, there are 22 or 23 planters, all of whom get their seed from Newark bay. This business and clamming, together, support about 25 families. Last season the crop amounted to between 15,000 and 20,000 bushels, sold in New York at an average price of \$1 25.

STATISTICAL RECAPITULATION FOR SOUTH SHORE OF LONG ISLAND:

Number of planters and shippers	800
Extent of ground cultivated	2,000 acres..
Value of shore-property, about	\$25,000
Number of vessels	170
Value of same	\$136,000
Value of small craft (800 boats)	\$100,000
Number of men hired by planters or dealers	400
Annual earnings of same	\$150,000
Annual sales of—	
I. Native oysters	bushels.. 400,000
Value of same	\$400,000
Total number of families supported	1,200

J. NEW YORK BAY. (EXCLUDING THE CITY OF NEW YORK.)

38. HISTORY OF OYSTER-INDUSTRIES OF NEW YORK BAY.

ALLUSIONS TO OYSTERS IN EARLY COLONIAL LITERATURE.—Among the riches of a new country enumerated to the Old World by discoverers, the products of the sea always have held a prominent place. They were not forgotten in the case of the shores of the island of Manhattan, the splendid river to which Hudson left his name, and the great bay where it finds entrance to the sea, and the bright expanse of which is the scene of the story of the present chapter.

The fishes of these waters attracted the attention of the earliest voyagers in a marked degree, and the mollusks—a part of them in popular estimation—were not neglected.

Whether the wealth of oysters would have been apprehended so speedily had it been necessary to “discover” the beds, is doubtful, though the fact that they then grew abundantly all over the edges of New York bay, and the entering streams—Shrewsbury, Raritan, Passaic, Hackensack, Hudson, and East rivers—must have been apparent to the most careless observer; but the explorers and colonists were saved any trouble in the matter, for the Indians were in the habit of gathering clams and oysters at all practicable seasons, and depended upon them largely for their food. In a poem by an early Dutch settler and poet, this very thing is celebrated, with seemingly strict attention to truthful details:

Crabs, lobsters, mussels, oysters, too, there be,
So large that one does overbalance three
Of those of Europe; and in quantity,
No one can reckon.

Then, as now, it appears that all the hard work of obtaining the delicacies fell upon the women. A quaint old book, written by William Wood, and published in London in 1634, entitled *New Englands Prospects, etc.*, contains a poem upon the kinds of shellfish, in which the following elegant verse occurs:

The luscious lobster, with the crab-fish raw,
The brinish oyster, mussel, perriwigge,
And tortoise sought by the Indian Squaw,
Which to the flatts dance many a winter's jigge,
To dive for cockles and to dig for clams,
Whereby her lazy husband's guts she crammes.

How greatly this molluscan abundance was valued by the first colonists, is plainly shown by frequent allusions in the early descriptions of the country. In 1621 “very large oysters” were too common at Nieuw Amsterdam to find a market, everybody being able to supply themselves without charge. A few years later (1671) Arnoldus Montanus speaks of “oysters, some a foot long, containing pearls, but few of a brown color”, as one of the common advantages of the young settlement. Sir George Carteret, as one of the inducements in advertising the region about the mouth of the Raritan, where he wished to establish colonies, tells intending emigrants that “the bay [*i. e.*, of New York] and Hudson's river are plentifully stored with sturgeon, great bass, and other scale-fish, eels, and shellfish, as oysters, etc., in great plenty, and easy to take”. This was in 1681. Three or four years later letters

were written home to England from what is now Perth Amboy, which are preserved in Smith's *History of New Jersey*, which bear out the truth of Carteret's assertions handsomely, as proved by these extracts:

And at Amboy point and several other places there is abundance of brave oysters.

Oysters, I think, would serve all England.

We have one thing more particular to us, which the others want also, which is vast oyster-banks, which is the constant fresh victuals, during the winter, to English, as well as Indians; of these there are many all along our coasts, from the sea as high as against New York, whence they come to fetch them.

Oyster shells upon the point, to make lime withal, which will wonderfully accommodate us in building good houses [of stone] cheap, warm for winter, and cool for summer.

We have store of clams, esteemed much better than oysters; on festivals the Indians feast with them; there are shallows [scallops], but in no great plenty.

OYSTERS IN THE HUDSON RIVER AND IN THE "KILLS".—Just how far up the Hudson river this "store" of "brave oysters" extended is hard to determine. In his manuscript notes, furnished me with a liberality which his known regard for science and his native generosity would lead those who know him to expect, the Rev. Samuel Lockwood says, that five or six miles above Teller's point, near Sing Sing, is the uppermost spot "where they ever flourished". Captain Metzgar mentioned Rockland lake as the northern limit. The distance from here to Sandy Hook is no less than 50 miles, and all the way it was an almost continuous oyster-bottom. Bedloe's island, in the harbor, was first known as Big Oyster island, and some rocks and tide-bars south of it as Little Oyster island, the latter still keeping its name.

In the neighborhood of Staten Island the circumstances were especially favorable, and there were numerous beds. Staten Island lies in a mainly east and west direction, filling the southwestern corner of the bay; the northern shore is rocky and unfit for oyster-growth for a considerable distance, but the southern and western sides are eminently favorable. Between the island on the west and the contiguous shore of New Jersey, at Bergen and Elizabeth, the strait is narrow and was long ago called by the Dutch Kil von Kol, or the Kol, which has been corrupted into modern Kill von Kull, or shortly, the Kills. Everywhere in these swift tide-ways oysters grew abundantly. South of the island there is a broad expanse of shallow water separating the island from the Jersey shore of Monmouth county, into which the Raritan pours a heavy flood of fresh water. To the Staten Islanders and New Yorkers, this part of the bay is known as Staten Island sound, and the oysters grown in it receive the market name of "Sounds". Jersey men more often speak of it as Raritan bay, and sell the oysters they raise on their shore as "Amboys" and "Keyports", the former town being the ancient village at the mouth of the Raritan river, and the latter, a modern town, several miles eastward. To the eastward of Keyport again, near the base of Sandy Hook, Shrewsbury river comes in, and here was another oyster-center, famous at one time, but now declined. The only other locality worthy of special mention is Prince's bay, on the southeastern shore of Staten Island.

FISHERIES AND LEGISLATION IN THE EIGHTEENTH CENTURY.—With reference to oyster-matters history is mute during the close of the seventeenth and beginning of the eighteenth century, except that chance allusions here and there show that large numbers of persons—nearly everybody in fact—took advantage of this natural storehouse of food to supplement their luxuries in summer, and victual their cellars for winter. It is also evident that the fame of Carteret's "great plenty and easy to take", had spread abroad, and so many aliens sailed into the placid bay to rake upon the "vast banks", that at last the colonists became alarmed for the continuance of their precious supply. Thus it arose that as early as 1715 was passed the first colonial law in relation to oysters, prohibiting—

That from and after the Publication of this Act, it shall not be Lawful for any Person or Persons whatsoever (Native Free *Indians* only excepted) from and after the first day of *May*, until the first day of *September*, Annually, to gather, Rake, take up, or bring to the Market, any Oysters whatsoever, under the penalty of Twenty Shillings for every Offence, to be recovered before any of His Majesty's Justices of the Peace, who are hereby Authorized and required to hear and finally Determine the same, one half thereof to him, her or them, that shall bring the same to Effect, and the other half to the Poor of the place where the Offence shall be committed.

And * * * That it shall not be Lawful for any Negro, Indian, or Mulatto Slave to sell any Oysters in the City of *New York*, at any time whatsoever, upon the penalty of Twenty Shillings for every Offence, to be paid by the Master or Mistresses of such Slave or Slaves, to be recovered and applied as aforesaid. This Act to be [in] Force from the Publication hereof, during the term of Five Years and no longer.

Four years later (1719) the colony of New Jersey saw the matter in the same light, for the legislature resolved:

"WHEREAS, it is found by daily experience, that the Oysterbeds within this Province are waisted and destroyed by Strangers, and others, at unseasonable Times of the Year, the Preservation of which will tend to the great Benefit of the poor People and others inhabiting this Province; BE IT THEREFORE ENACTED," etc.

The provisions were that no gathering of oysters should take place between May 10 and September 1, and that no oysters should be put upon any vessel or boat not wholly owned within the Province. For the enforcement of these acts special officers were named,* and legal provisions for seizure and punishment were arranged.

NEW YORK AND NEW JERSEY LAWS OF 1730-1775.—In 1730 New York again found need to make a second

* "The Persons appointed being all dead it is thought improper to swell the Volume by inserting their Names.—Laws, 1776.

law in respect to shellfish, and in 1737 a third, owing to the too great demand made upon the beds around Staten Island by crews of boats from New England, New Jersey, and elsewhere, special protective legislation for these waters was obtained from the colonial legislature. The preamble of this act of 1737, states the necessity for the law, "since it has been found by daily experience that the Oyster-Beds lying at and near Richmond County, within this Colony, are wafted and Destroyed by Strangers; the preventing of which will tend to the great Benefit of the poor People and others inhabiting the aforefaid Colony." The Act therefore forbids any one "directly or indirectly, to rake, * * * any Oyfters within this Colony, and put them on board any Canoe, Periauger, Flat, Scow, Boat or other Veffel whatsoever, not wholly belonging to, and owned by, Persons who live within the aforesaid Colony", under penalty of having the craft and all its contents seized. This law is almost an exact reproduction of the New Jersey statute of 1719. It then names ten citizens of Richmond county—many of whose names still figure in the oyster-business of Staten Island—as a police to carry out the law, and empowers them for that purpose. The method of condemning and selling the goods seized are then prescribed.

In 1775, New Jersey, finding that to have her beds and markets open till May 10, when New York stopped work May 1, did not work well, changed her close-day to May 1 also; and in addition a new provision was enacted, in view of the fact that "a Practice hath prevailed of raking and gathering great Quantities of Oysters with Intent to burn the same for Lime only, whereby great Waste is made, and the Oyster-Beds thereby in danger of being entirely destroyed". The penalties against an offender under this new law were very severe.

Both states made their laws somewhat in a spirit of mischief and retaliation, for Jerseymen then, as ever since, came in contact with Staten Island planters, often to the extent of mutual belligerency.

BEGINNINGS OF OYSTER-CULTURE, 1810-1835.—In spite of this protection, however, all the natural beds gradually gave out, and it was long ago found necessary to supplement them by artificial means. The precise date when oyster-planting began here it has been difficult to fix. Captain Cornelius Brittain, of Keyport, New Jersey, tells me, that his father was the first man to plant in York bay, about 1810. This was at Bergen point. Opposite his place, just below Bedloe's Island, was "Oyster Island", a flat covered by high water, where previously some natural oysters used to be got, but hardly within Captain Brittain's remembrance. Captain Benj. Decker, of Keyport, places the first bringing of Virginia oysters to Prince's bay at "55 years ago", that is, in 1825. Long before this, certainly as early as 1816, as I learn from a newspaper advertisement at that time, cargoes were brought to New York from the Chesapeake; at first, though, none were laid down to wait for growth.

As to native oysters at Staten Island, I was told that they were certainly cultivated in Prince's bay at least sixty years ago. In some localities on the opposite shore the industry is probably older, since a suit was brought about seventy-five years ago, in old Shrewsbury township, New Jersey, originating in the question, whether or not a man had exclusive right to the oysters he had planted. At Keyport, planting of native oysters is probably not more than forty or fifty years old; and at Amboy, according to report, it was not until fifty years ago that any beds were staked off.

The use of these waters for planting occasioned an immediate effect upon the villages of the neighboring coast which was very striking. "In fact," remarks a cotemporary chronicler, "the prosperity and rapid increase of the population of that island [Staten] is owing, in a considerable degree, to the oyster-trade of this city. Before Prince's bay was laid out in oyster-plantations there were very few persons living on it, and it was almost wholly uncultivated * * *. A few years after the first beds were planted an extent of coast of from five to ten miles was covered with oysters taken from the 'rocks' of Virginia."

The number of men employed upon the beds in 1853, and who lived upon the island, with their families, was computed at 3,000.

STATE LAWS FOR THE PROTECTION OF OYSTER-PLANTERS.—To encourage this new productive-industry, which had thus suddenly come into existence, New York and New Jersey both enacted laws calculated to protect the planters. They have been the object of much change and amendment, as experience ripened the judgment and new circumstances arose.

At present the laws of New York applying to this subject and locality are as follows:

General statutes:

Forbidding any natural bed being staked off for private use, or being planted upon; forbidding any person, not for six months previous a resident of the state, from taking any shellfish within the state (but an actual resident may employ any non-resident); and prohibiting the use of any dredge weighing over 30 pounds, or operated by steam-power.

Special statutes:

I. Asserting that no person not an inhabitant of the state may plant oysters in the waters surrounding Staten Island, "except the consent of the owner first be obtained"; and no non-inhabitant may take oysters or clams "from their beds of natural growth in any of said waters".

II. Forbidding dredging or dragging for oysters in the neighborhood of Staten Island "upon beds of natural growth of oysters (not planted)".

III. Forbids any person taking up or disturbing oysters planted under all the waters of this state surrounding Staten Island, without previous permission from the owners.

New Jersey's laws, applying here, are substantially similar :

I. No summer raking or sale of oysters allowed on public ground.

II. No dredging in any shape allowed.

III. No oysters to be gathered to be made into lime, or to be used in iron manufacture.

IV. No person, not a resident of the state for six months previous, may gather oysters or clams in state waters for himself or for his employer.

V. Any owners or licensed persons may plant oysters or clams upon any flats or coves (not natural beds) and one chain beyond the same, along the shores of Newark bay and Staten Island sound, under prescribed conditions of staking out, etc. A penalty is fixed for taking oysters without authority from such inclosures.

VI. Prohibits taking "from any natural oyster-banks or beds in this state any old shells other than such as cannot be removed or separated from the oysters without injuring the same; and all such shells shall be culled and thrown back again upon the said natural banks or beds"; but this does not apply to private beds.

LAW-MAKING: QUARRELS AND LITIGATIONS.—These laws grew up one by one, and at first were misunderstood and willfully disregarded on all sides. Between New York and New Jersey, in the persons of the Staten Islanders and Jersey men, there were constant quarrels, and even open war, now and then, owing to alleged infringements of the vague boundary-line, by one party or the other. If one side thought they discovered that an oysterman from the opposite shore was placing his oysters within their waters, they felt no hesitancy or compunction in at once raking his stock up, claiming that he had no right to this ground, and consequently the oysters he had bought and placed there were public plunder. Arrests for larceny would follow, tedious imprisonments ensue, armed guards patrol the domains of the respective states, a few men get shot, perhaps, and much trouble to the whole community be caused. This state of affairs has not yet ceased; and I suppose it never will. The accusation was constantly being made, also, chiefly by the penniless and shiftless, against prosperous planters, that natural-growth ground had been staked off and was being used privately, to the detriment of the general welfare of the community. Then, too, there were plenty of persons who altogether disputed any rights of property in planted oysters, and failed by their conduct to recognize the law which said there *were* such rights. Nor, in northern New Jersey at least, was it until fifty years had elapsed after the laws relating to planted oysters had first been published, that the subject was finally and clearly settled by the supreme court. On an appeal from Cape May, tried in 1858, it was charged that Thomas Taylor had stolen oysters to the value of \$18 from George Hildreth. This time the question of the right to oysters planted where there was no natural growth was reached and decided. The counsel for the defendant (Taylor) pleaded that "oysters being animals *feræ naturæ*, there can be no property in them unless they be dead, or reclaimed, or tamed, or in the actual power or possession of the claimant".

The chief justice, in giving the opinion of the court, said :

The principle advanced by defendant's counsel, as applied to animals *feræ naturæ*, is not questioned. But oysters, though usually included in that description of animals, do not come within the reason or operation of the rule. The owner has the same absolute property in them that he has in inanimate things or domestic animals. Like domestic animals, they continue perpetually in his occupation and will not stray from his house or person. Unlike animals *feræ naturæ*, they do not require to be reclaimed and made tame by art, industry, or education, nor to be confined in order to be within the immediate power of the owner. If at liberty, they have neither the inclination nor power to escape. For the purposes of the present inquiry they are obviously more nearly allied to tame animals than to wild ones, and perhaps more nearly allied to inanimate objects than to animals of either description. The indictment could not aver that the oysters were dead, for they would then be of no value; nor that they were reclaimed or tamed, for in this sense they were never wild and were not capable of domestication; nor that they were confined, for that would be absurd.

It was the decision of the court that the owner has the same absolute property in oysters that he has in inanimate things or domestic animals, and that an indictment would lie for stealing oysters planted in a public or navigable river, where oysters do not grow naturally, and the spot designated by stakes or otherwise.

On the other hand, courts decided that action does not lie for taking oysters claimed as planted in a common navigable stream in which others were found. The court seemed to consider the throwing of oyster-plants where there is a natural growth as an abandonment, and compared it to a man "who should take a deer in a forest and be simpleton enough to let it go again in the same forest, saying, 'this is my deer, and no man shall touch it;' it would never be asked by the next taker what was the intention of the simpleton; the very act of letting it go was an abandonment."

VIRGINIA SEED AND NATIVE SEED.—In early days Virginia oysters were more largely planted than now, except by a few New York dealers, and the beds of natives were supplied by seed found at home or at most in York bay, it merely being necessary to gather it up from the scattered spots where it lay or had "struck", and place it upon the private beds; the immediate waters of Staten Island or the neighboring coasts have furnished little or no seed. It is seventy years, I was told by Capt. Benjamin Decker—to whom I am greatly indebted for information—since any young oysters have "struck" along the southern shore of the island, in quantities worth getting. The great natural beds there and in the mouth of the Raritan and the beds off Shrewsbury, were exhausted years and years ago, and although now and then small deposits of young oysters are found in various parts of these waters, no reliance is

placed upon such a source of seed. Sixty years ago old oystermen remember working upon the "Chingora" bed, two miles below Keyport; and upon the then famous "State-beds" just at the Raritan river light-house. Now artificial planting covers both these banks. Fifteen years ago a bed of wild oysters was discovered down near the southwest buoy, and is supposed to have originated from spawn drifted across from Fort Hamilton, where the rocks conceal many oysters in their crevices. Since then small patches are occasionally found elsewhere. This sporadic growth seems entirely due to the native oysters planted in the sound, for during all the years previous that "Virginias" were planted in the greatest profusion, nothing of the sort occurred. Though the southern oysters would survive the winter, as a rule, and were even kept over two winters, when it was undesirable to sell them, they never spawned effectually, and are considered by the oystermen incapable of doing so, who attribute all the "set" which occurs anywhere in that vicinity to northern stock. I have had no opportunity of proving this, right or wrong, but am inclined to believe it true. This year a ruinously large proportion of the southern stock planted died.

I may mention, in this connection, that on the New Jersey shore much oyster-spawn "catches" every year in all the creeks, and a certain portion of it survives. A common experience is to find it attached to the sedges. By autumn such will become so heavy as to fall in the water, and the main part of it will die. What survives, however, will be as big as half a dollar, and are caught for seed. Enough remains, nevertheless, to tempt a few fishermen to return the very day the summer close-time expires, and rake again. What they get are "yellow as gold", and of extraordinary quality. These oysters are called "naturals", and are only enough to supply the home-tables for a few days, at extravagant prices. I see no reason why the judicious throwing of shells or other cultch in these creek-mouths would not save large quantities of this fine seed. It would be objected to by the populace, however, no doubt, on the plea that it was "natural ground"—an argument that might serve for any part of all these shores, which have occasionally been covered with the spawn along their whole extent.

The southern oysters that formerly made the chief business of these shores were variously known as "Virginia seed", "Chesapeakes", "soft", and "fresh" oysters. I restrict myself in the use of the word "seed", however, to the very small native northern oysters which were transplanted to private beds, and allowed from eighteen months' to two years' growth. The business was certainly very extensive for the condition of the oyster-market; nor has it yet more than declined, since probably 300,000 bushels are annually laid down even now.

METHODS OF CULTURE, PAST AND PRESENT.—The methods of work were and are not different from those pursued elsewhere in respect to southern oysters, and need not be redescribed in detail. Rappahannock and York river stock seems to have been preferred always in this district, and a large number of sloops and schooners ran each spring to and from those rivers. The crews of these vessels were not only native Jerseymen or Staten Islanders, but often Chesapeake men, who came up for a brief season's work, and then returned to their homes.

"They are required," says an account written in 1853, "in the transplanting of a bed, to heave the oysters overboard, to clean the bed about once a year, and perform various other work of a like description. The cleaning of the beds takes place generally every fall, and is accomplished by means of 'scrapers', singular looking instruments, somewhat resembling scythes, with this exception, that at one side of the blade a large bag, constructed of iron ring-work, like many purses we have seen, is attached. Into this all the scourings of the bed, cleaned off with the front of the blade, fall, and the whole is hauled up at regular intervals and deposited in the boat, to be afterward thrown into the current. In this manner the whole floor of the bed is scraped quite clean, after which it is considered fit for the reception of the oysters. The process of cleaning a bed is performed by the vessels under full sail. It is a very laborious task.

"The oyster companies have to pay about \$1 a year each for the privilege of planting in a portion of Prince's bay, called Ward's point, which is regarded as admirably adapted for the purpose. As many as 1,000,000 bushels of oysters are scattered in this favorite locality yearly; but it is the only part of the bay for which the dealers are required to pay. Each company have their own ground marked out, and the whole space thus occupied extends over ten miles in length by about five in breadth. The depth of water varies from 8 to 25 feet. Besides the Virginia oysters, there are several other kinds planted in this bay, among which are the East river and Delaware oysters."

The war of the Rebellion interfered greatly with this industry, and had a great influence in turning the current of oyster-planting toward the cultivation of home-stock.

39. OYSTER-INDUSTRIES OF NEW YORK BAY, 1879-'80.

CULTURE OF TRANSPLANTED NATIVE OYSTERS.—Turning now to the consideration of the growing of transplanted native oysters, I find that this is gradually superseding the other (southern) planting, the objection to that being that, with higher prices at the south and lower selling-rates in the north, too many risks are attached to make it profitable. The planters of old, elated by their profits, which, during the war of the Rebellion were very large, over-crowded the grounds and each other, until the business nearly collapsed. The present revival in the line of growing natives is likely to prove equally profitable in a sounder way. But this planting of native seed oysters in New York bay is an old industry. In 1853, for example, it was stated that there were at least 1,000 men employed in cultivating "York Bays" for the purpose of shipping them. "The hardness of their shell and the

peculiar saltness of the meat render them better adapted for shipping than any others, and they are, therefore, used almost wholly for the western trade. The boats employed in transporting them from the North river and Newark bay to the artificial beds are open, and are each generally manned by three or four men * * *. These men work in sloops and skiffs owned by themselves. The owners of each boat are also proprietors of one or more beds planted by themselves. There are about 200 boats, altogether, each of which is valued at an average of \$800."

OYSTER INTERESTS OF STATEN ISLAND IN 1853.—In reviewing the interests, during the same year, of the south side of Staten Island, whence came the "Sound" oysters of the markets, the *Herald* estimated the business as follows:

From 150 to 200 men are employed in their cultivation, or in bringing them to market, and the value of the whole amount sold during the year does not exceed \$50,000. The boats used in transplanting and in transporting them to this city are sloops and skiffs, or open boats, each being manned by three or four hands. The average value of each boat is about \$200, and the whole amount of capital invested in the sound-trade, including boats and beds, may be estimated at \$250,000.

It is added that one-third of all the seed planted at that time came out of the North river, from beds "which extend at intervals from Piermont to Sing Sing", where the growth was said to be exceedingly quick and abundant, but the oysters, especially those from the higher beds, of inferior quality, and wholly useless until transplanted.*

OYSTER-CULTURE ABOUT STATEN ISLAND.—The home resources along the shores of Staten Island, in York bay and the North river, having long ago been exhausted, or greatly depleted, the planters in Prince's bay and on the Jersey shore now get "seed" oysters, with which to stock their beds, wherever they can. The chief source is Newark bay and Raritan river, though the North and East rivers and Long Island sound are drawn upon. A considerable quantity of seed is brought from as far away as Fair Haven and Blue Point. In most cases the planters themselves gather what they use, by going after it in their own sloops, taking a small boat and a man to help. There is no reason why they should know precisely the number of bushels they cull out of their tongs and carry home, or why they should endeavor to calculate its exact cost. It would be difficult, therefore, for them to answer precise questions as to how much they got, or what it cost them, let alone how much they had upon their beds at a given time. For what they buy, from 30 to 40 cents a bushel was paid last season, to the many persons who made a practice of catching seed to sell. I may mention here an incidental custom.

Whenever the tides are especially low, there is a hurried concourse of people along the shore to pick up the mollusks, old and young, disclosed by the retreating flood, who work as far out as they possibly can. Such a general turnout is an interesting sight and an important fact to the planters, many of whose beds are bounded on the shoreward side by ordinary low-water mark. Though an extra low tide discloses grounds and beds of planted oysters legally held, the eager populace regard it as no infringement to pick up from such planted grounds, whenever they can reach them unobstructed. The truth is, this ground, occasionally exposed by the tide, is debatable territory, and the planters find it prudent not to contest the matter, but to be especially vigilant over their property, lest unscrupulous persons, of whom there are many, shall wade in to the beds and make a wholesale theft, under excuse of low water.

OYSTER-CULTURE AT KEYPORT AND PERTH AMBOY.—The seed usually gathered at Keyport and vicinity grows on soft mud and in sedgy places, and hence is long, slender, crooked, and ill-shaped. It is roughly culled on the boat, as soon as caught, and sold by the basket or bushel. Planted in from 10 to 15 feet depth of water, purer, salter, and upon a better bottom than before, it rounds out into good shape, and grows with considerable rapidity, in good seasons. The best bottom is a thin layer of mud overlying sand, and the best time for planting is in March, April, and May. As a total of the bushels of seed planted last spring, nothing better than an estimate is possible, and I consider the best way to make this estimate, is to consider that the crop, each year, is about equal to what is planted, the growth making up for the loss. I know the crop of northern oysters of the region under review amounts to about 250,000 bushels, which may also be taken to represent the amount of seed put on the beds. Multiplying this by 35, the average price per bushel, you have \$87,500 as the total amount of capital sunk in stocking the beds. From 100 to 150 per cent. added, gives the amount of sales, after two to three years' waiting, and the expenditure of a considerable outlay in handling.

* Before leaving this point, I may add an opinion expressed by the late Count L. F. de Pourtales, in a report to the Coast Survey, about ten years ago, in respect to the oyster-beds of the United States, regarding the North river. He wrote:

"Having been informed that oysters are obtained for purposes of planting, from the Hudson river, I visited Sing Sing, which had been indicated as about the highest point at which oysters are found. My visit was, unfortunately, after the close of the fishing season, the 1st of June; but I had the good fortune to be referred to the oldest fisherman of the vicinity, a colored man named Brady, at Sparta, from whom I obtained some valuable information. He had found oysters as high up as Cruger's, above Croton point, but they were subject to considerable vicissitudes there, being at times entirely destroyed by freshets or ice. From another informant I learned, that off Croton point there existed considerable beds of oysters, but all dead. According to Mr. Mitchell's observations, the specific gravity of the water at the bottom off Cruger's is 1.003 at the end of flood, and only 1.001 at the end of ebb. The best and largest oysters are now found in the deepest parts, 20 to 25 feet, but they are rather scarce now. Formerly they were abundant and grew close to the shore, where none are found now. This Brady attributed to the construction of the railroad skirting the shore—a plausible explanation—since the washing of the embankment must have produced a layer of mud, in which they have become smothered. The clearing of the forests in the basin of the Hudson must have had, also, a considerable influence in checking the growth of oysters by mud deposits. There is no regular business of oyster-catching as high up as Sing Sing, as the town laws prohibit strangers from taking oysters, and the inhabitants take only a few for their own use."

The method pursued in this region has grown to be careful and systematic, and furnishes employment to a considerable number of men not planters. In the spring, as soon as the weather gets fairly settled, the "natives", intended to be sent to market the following fall, are taken up from the place where they lie, culled over, and cleaned, if needful, and relaid, more thinly, on a new bed. Usually this is a movement from a soft to a harder bottom, and sometimes to a region of fresher water. At Perth Amboy, however, oysters shifted are placed further down the bay. It operates advantageously in two ways: by repressing the tendency to spawn, which is undesirable; and by giving them the benefit of a change of water and food. Moreover, on the sand they will tend to grow round and shapely beyond their ability to do so when crowded in the mud, while the fresher water will make them fatter. The actual result, nevertheless, is sometimes disappointing, particularly if there be no current over the new bed to bring a steady supply of fresh food.

The man who has only a few hundred bushels will do this "shifting", as it is termed, himself; but for the large planters it is usually done by a contractor, either for a lump sum or for an amount of pay based upon an estimate of the quantity, or at the rate of 10 to 15 cents per bushel, according to the density of the oyster-beds, and hence the time to be consumed. In either case the cost is about the same. One gentleman told me he paid \$1,300 to have 11,000 bushels shifted under the first-named arrangement. While this is going on the southern cargoes are being laid upon the beds, and at Keyport a score or more of negroes, from Norfolk, annually appear as laborers, returning, at the end of the work, to their homes.

GROWTH OF OYSTERS IN NEW YORK BAY.—The growth of oysters transplanted to these New York bay waters is reasonably rapid, though not as fast as occurs in the Great South bay of Long Island. The usual expectation is to leave the beds undisturbed for three years, then shift in the spring and market in the fall. As planting of seed occurs both spring and fall, the crop of every year is thus the first of a series of six. All "naturals", that is, local oysters, planted, will outgrow foreign seed, doubling in size in a single season. This, manifestly, is because they suffer no change of locality, and do not need to become acclimated. The oysters from the sound, however, have been used largely for European trade for the last two or three years, and have acquired a high reputation. These do not require to lie three years, since they are wanted of small size.

Captain Benjamin Decker, whom I have quoted before, relates that some years ago he had a strange experience in this direction: a bed of oysters, which he planted at Keyport, doubled their size in a single month! "I sold these oysters in the New York market," he says, "and they sold well. The shells were so thin you could see the light through them. They beat anything in the market. The growth was wonderful. I sowed them thin, and yet they choked one another. I should think at least half of them died from this cause."

SUMMER REST AND AUTUMN WORK IN KEYPORT AND VICINITY.—By the end of May all work upon the beds ceases, beyond taking up an occasional boat-load to supply the weak summer-demand. The condition of the beds is watched closely, however, by the anxious owners, since it is the midsummer months that determine whether the oysters will report themselves "good" in the fall, or the reverse; which means a profitable business, or the reverse. If the season is hot, equable, and reasonably calm, all is expected to go well. Heavy storms and great freshets in July and August, on the other hand, produce thin and poor oysters, which will not bring a good price. The ill-success of the beds along the Keyport and Raritan shores last year is attributed to this cause.

Early in September the business of taking up the oysters for market begins. This is done by tonging, from small boats, near which a sloop anchors upon the bed, in which the men are quickly carried out and home again, and easily transport their load. Thus the larger part of the harvest is gathered, until the oysters become scarce upon the ground. Then a dredge is thrown over from the sloop, which cruises back and forth across the ground, until it is wholly cleaned up. Tonging over the side of a skiff is hard enough work, and requires sturdy, broad-chested men; but dredging is a still more terrible strain upon the muscles, when it comes to dragging the heavy iron frame and bag up from the rough bottom, and lifting it and its load over the rail on to the deck of the vessel. Many of the newer and larger sloops are now provided with a windlass, specially adapted to dredging, which relieves the crews to a great extent of the old hand-over-hand back-breaking labor. Drag-rakes are also used very frequently on these grounds, having very long, limber handles.

"GIVING THE OYSTERS A DRINK."—A sloop-load of oysters—from 200 to 800 bushels, according to the size of the boat—having been secured, the owner's next step is to "give them a drink". This he does by throwing them overboard, for a short time, in the fresh or partially fresh waters of some creek. The Amboy and Staten Island men find this largely in the vicinity of Rahway, New Jersey, where they lay their cargoes on the shore or sometimes in floats. The work is largely done by men belonging there, who are paid in oysters, receiving a bushel for about two hours' helping, which is usually what each master requires of them. The Keyport men have a little creek running through the town, which is crowded with floats, skiffs, and the implements of work. It is a scene of extraordinary activity, which may be witnessed here in autumn every day, as the oysters are being culled and prepared for sale.

The object of this "drinking" is to allow the oyster to become cleansed and freshened in taste. Finding themselves once again in the water, the oysters all open, and, as the men say, "spit out" all the impurities which are to be found clinging to the edges of the mantle and gills of a sea-oyster, just within the shell, and they do this at once, so that usually a single tide is a long enough time to leave them in the fresh water. Moreover, imbibing

the fresh water causes them to change in color somewhat, making the flesh a purer white; and it bloats them into an appearance of extreme fatness, which is very appetizing. Most persons believe this to be a true increase of substance and weight, but it is no more than a puffing up.

PICKING AND CULLING.—Before the oysters are thrown into the fresh water they are picked over somewhat, and the worthless stuff is thrown upon the banks of the stream—dead oysters, periwinkles, conchs, stones, and much other useless matter. Another more particular sorting remains to be done after the stock is taken from the stream, and before being sent to the city. This consists in knocking bunches to pieces and assorting into the various sizes known to the trade, and is technically known as “culling”. All of the refuse-stuff resulting from these manipulations is heaped upon the bank, and is used to fill in low spots, or carted away to be burned into lime. Late in the fall this is terribly cold work. Nowadays the oysters are dipped out of the shallow water with forks, similar to the farmers’ dung-forks, and the men wear rubber-boots that reach to their waists, but the old oystermen remember very well the winter terrors of the time before rubber-boots were invented and when they picked up the oysters with their fingers.

WINTER GLEANINGS.—The main crop has been gathered by the time Christmas is near, but many scattered oysters yet remain, that have escaped both tongs and dredges. The grounds are then given up to the laborers, who have been employed, during the summer and fall, and under a new impulse these men go over the grounds again with tongs and dredge. They work on shares usually, returning to the owner of the beds one-half of the results, which makes a really handsome thing for the gleaners, whose work, in this way, lasts from two to three weeks, making three or four days a week, each man often clearing as his portion from four to five dollars a day. At any rate, such generally is the practice, with its results, at Keyport, New Jersey, “where for many years the principle of the good old biblical rule, of not forgetting the gleaners, is almost religiously observed in the last gathering of this harvest of the sea.”

NEW YORK OYSTER-LAWS.—At the principal ports of this oyster-region New York firms have agents who buy and pack oysters for shipment to the west, to Europe, to New York, or Philadelphia; city dealers also cruise about the beds in vessels and buy loads of stock from the various planters; and the planters themselves carry their stock to the New York market in their sloops, to be disposed of at the best advantage, or vie with one another in noisy rivalry in preparing the bivalves and getting them first to the steamboat for the city.

THE ALBANY OYSTER-MARKET FIFTY YEARS AGO.—A pleasing tradition has been preserved of the days long ago, before the oyster-business became organized into the commercial system, which now handles the enormous supply that finds its way into every county of every state in the Union. It is contained in the Rev. Samuel Lockwood’s articles upon American oysters, published in the *Popular Science Monthly* for 1874. One of the great markets for oystermen forty to fifty years ago was Albany, New York. The sloops would sail up the river, and sometimes forty of them, loaded to the rail, would lie at the wharves of that city disposing of their living cargoes. From Albany, which also derived a large amount of oysters and clams from Fairhaven, at the same time, they would be taken back into the country in wagons, over the Erie canal as far as Buffalo, or sent northward by stage to Lake Champlain. If unsuccessful in selling to good advantage at Albany, the shippers would sail down and peddle their stock through the towns along the banks. Out of this arose the systematic practice which Professor Lockwood describes in the following paragraphs:

Before the railroad days, our oyster-growers used early in the fall to canvass the villages on the Hudson river for orders, to be filled just before the river should be closed with ice. The meaning of this is, that these men committed themselves to supply oysters in the shell, with the guarantee that the bivalves thus supplied should not die before their time came. The oysters were actually kept alive during the greater part of the long winter. The fat bivalves were handled with some care, and were spread on the cellar-floor, the round or lower side down, so as not to allow the liquor to escape.

That such a life required a great change of capacity or habit in the bivalves is evident; and it needed a training, yes, an education, ere the oyster attained to such ability. And this was the way it was done: Beginning early in the fall, the cultivator of the oyster took up the fat bivalves from their bed where he had planted them, and laid them a little higher up on the shore, so that for a short time each day they were exposed out of the water. After a few days of this exposure by the retreating tide, they were moved a little higher still on the shore-line, which gave them a little longer exposure to the air at each low tide. And this process was continued, each remove resulting in a longer exposure. And with what results? Two very curious ones: inurement to exposure, and the inculcation of a provident habit of making preparation for the same. What! providence in an oyster? Yes, when he’s educated. When accustomed to this treatment, ere the tide retires, the oyster takes a good hard drink, and retains the same until the tide returns. Once, while waiting for the stage at a country hostelry, we overheard the following between two rustic practitioners at the bar: “Come, Swill, let’s take a drink!” “Well, I don’t know. Ain’t dry myself. Hows’ever, guess I will take a drink, for fear I *might* get dry!” With better philosophy on their side, these educated oysters, twice in every twenty-four hours, took their precautionary drink.

The French method of oyster-training is much more laborious. The adult bivalves are carefully spread out in the water, and periodical lessons are given to each one individually. Each oyster, on this occasion, receives a tap, not with a ferule, but with a small iron instrument. This causes the bivalve to close tightly. Finally the last day comes with its last premonitory tap. Its education thus finished, it takes passage, with its fellow-graduates, for Paris. As a result of its education, it knows how to keep its mouth shut when it enters society!

PRICES OF OYSTERS, PAST AND PRESENT.—The prices reported as received for oysters in 1810, did not greatly differ from the present figures; they were:

For the poorest.....	50 cents per bushel.
For “Cullens”.....	\$3 50 to \$5 00 per 1,000.
For “Big ones”.....	\$7 00 to \$10 00 per 1,000.
For “Extras”.....	\$15 00 to \$25 00 per 1,000.

Virginia oysters sold for about 20 per cent. less than the above-given, which were all "hard", in the parlance of the period.

During the war of the Rebellion, when the southern fields were cut off from the northern markets to a great extent, the Staten Island planters reaped a rich harvest. Their beds were unusually productive, and the prices were double what they now are, in many cases. At present the receipts are about the same as have prevailed for several years, except that the season of 1878-'79, following upon a period of financial depression, and characterized by misfortune in the growth of the mollusks, showed lower rates paid than ever before or since. Prices depend largely upon the quality of the different beds, and vary with localities. Virginia oysters from Prince's bay are considered the best. Of natives, those grown in the sound are favorites; these supplied a large part of the shipments to Europe in 1879-'80, and gave better satisfaction than any others sent. Perth Amboy and Keyport were the packing-points. The prices received by the planters for the different kinds of Staten Island oysters last year (1879) were from 10 to 20 per cent. less than the previous year, up to which time the price for a long time has averaged \$1 per bushel, taking all grades and sizes together. In 1878, one man told me his whole crop averaged him \$1 30 per bushel, but this was exceptionally good. In the fall and winter of 1879-'80, however, lots sold at \$1 were rare, and the average price of "Sounds" and the best "Prince's Bays" (natives) did not average over 80 or 90 cents, while Tottenville oysters, with few exceptions, failed to come up to this even, 75 to 80 cents being reported for the most part. This will no doubt revive shortly.

In Perth Amboy, for the European stock, \$2 to \$2 50 per barrel was paid by the shippers; but this was called a very poor price, and, it is well known, proved highly profitable to shippers. For other oysters from 60 to 80 cents a bushel was paid for medium stock, and from \$1 to \$1 25 for larger, of which not much was sold; but the average probably would not exceed 90 cents.

In Keyport, for "bushels", 40 cents, \$3 to \$3 50 per thousand for "culls", and \$6 to \$7 for "box" size. A large number of Keyport's oysters go by rail to Ocean Grove, Ocean Beach, Long Branch, and other summer resorts on the coast.

DRAWBACKS TO OYSTER-CULTIVATION.—The visible drawbacks to oyster-cultivation between the East river and Sandy Hook, are not very numerous, but likely to be unforeseen and significant when they occur. One misfortune, however, to which the last remark does not well apply, is the fact that the sewage and waste pollution of the factories of Jersey City have so corrupted the shallow water along the Bergen shore, called York bay, as to ruin those planting grounds. At present the only way in which they can be utilized by oyster-growers, is to raise there large seed, which shall be taken elsewhere and given a year's growth and purification. Whether this trouble is exaggerated or not, I cannot say from personal experiment.

"*Hairing up.*"—I was told by Captain Wood, of Pleasant Plains, Long Island, that his oysters nowadays "haired up", by which he meant that a growth of hydroids, and perhaps also of sea-weed, grew upon them to such an extent as to keep them poor. This might operate thus in two ways: a luxurious hydroid would both consume and tend to keep from entering its mouth a part of the mollusk's food-supply; and it might also form eddies, acting as an impediment to catch drifting matter, weeds, and the like, until the mollusks were partially buried and smothered. I believe, however, that the danger from this source is of little account; while some fishermen assured me that to have the red-beard, and gray-beard, *Sertularia argentea*, and several other hydroids and bryozoa, which pass under the general name of "scurf" and "yellow moss", appear plentifully on the beds, was a sure sign that the oysters were doing well.

Mussels.—A more serious cause of disquietude, and one I here met with for the first time, is the fastening of great quantities of young black mussels, *Modiola plicatula*, on the oyster-beds. This happened last year in certain parts of Prince's bay to a formidable extent. It is liable to occur also in the lower part of the East river, but I have heard no complaint from there. It is not my purpose in these chapters to do more than mention the enemies present at a particular point, reserving a fuller description of each for a special chapter. This nuisance varies somewhat with different years, and at Keyport, perhaps owing to favorable currents, seems not to happen at all.

Drums, skates, and rays.—A less constant though more openly destructive agent of evil is the drum-fish, *Pogonias chromis*, which is here at its worst, and once in a few years completely devastated many beds, picking up thousands of mollusks, crushing them in his powerful teeth, and dropping the fragments, heedless of mischief. Thirty years ago was the well-remembered drum-fish year, and since then only occasional forays have been committed by them.

The skates and the sting-ray—especially the latter—are a source of constant damage, the amount of which aggregates a large sum every year. The clever device, described in the chapter on the oyster's enemies, by which the drum-fish seem to have been frightened away, avails nothing in the case of the "stingaree", whose devastations seem unavoidable and of the most importance of all oyster-foes.

Starfishes and drills.—Starfish very rarely occur, and the periwinkles and conchs are of small account in doing harm, but in 1878 the drill, *Trosalpinx cinerea*, proved himself a great nuisance about East point, injuring many beds there beyond repair. Since that time, however, little has been seen of him.



INCLOSED DOCK FOR OYSTER-VESSELS AT PERTH AMBOY, N. J.



"THE CREEK" AT KEYPORT, N. J., WITH OYSTER-BOATS, SKIFFS, AND SCOWS.

Easterly gales.—Eastward gales are likely to move the bottom of Staten Island sound in an unfortunate manner, and every planter has his tale of beds lost by being buried under drifted sand, or swept out of existence. This kind of a wind is rare, however. Winters hard enough to kill the oysters have occurred, but not lately, except that in 1878-'79 cold weather, high winds, and low tides coming together, have exposed the Raritan beds and destroyed large portions of them. In the Raritan river, particularly at Perth Amboy, the oystermen are obliged to erect strong quadrangular slips or docks, inside which they may crowd with their sloops and oyster-boats and cull their oysters in peace, since the winter-sea in the harbor is likely to be too rough to permit work. This is an important item of expense to them. In this connection I may quote Mr. Samuel Lockwood's words, written in 1873:

It will be news to many to learn that the business of the oyster-producer is one of great risk. All is not gain to these industrious people, for often capital is sunk in the waters that is never taken up. Many years ago we remember the then small village of Keyport suffering a loss in one season of \$50,000. Even a severe storm, continued unusually long, has smothered the beds by agitation of the mud, for the oyster must keep its nib out of the bottom. But two seasons ago, in one of the branches of Shrewsbury river, a crop was almost entirely lost, the supposition being that it was poisoned by the washing from a new turnpike, in the construction of which a peculiar ferruginous earth had been used. Formerly the oyster thrived as a native as high up the North river as Peekskill, and probably its limit was not below fifty miles from the mouth of the river. They are now, however, exceedingly scarce, even as high as Croton. The belief exists that the railroad has destroyed them by the washing from the necessary working of the road, which is constantly finding its way to the river-bed. So long ago as 1851, Col. John P. Cruger, of Cruger's Landing, a very intelligent observer, called our attention to the fact of the mischief thus done.

And there are meteoric causes which affect the oyster. We have known an unusually severe winter to kill the bivalves in great numbers. And even the seed, in its transport from Virginia, has been destroyed—whole valuable cargoes—by foggy weather and adverse storms.

Vessels.—The Raritan planters are also troubled by vessels grounding upon their beds and ruining from 100 to 500 bushels at once. There are no authorized buoys or light-houses to point out the proper channel to strangers, and there is, I believe, no redress. The planters complained to me sharply concerning this matter, and thought that legal protection should be given them, but I did not learn precisely what they wanted from the federal government.

Thieves.—Another sort of trouble arises from the ubiquitous thief, who is said to flourish greatly in the neighborhood of Staten Island. In those waters which lie between the island and the New Jersey shore, there has always been contention and litigation, resulting in constant arrests and bad feeling back and forth, through alleged violations of state boundaries and the rights which each state reserves to its own citizens. One planter at Perth Amboy wrote me that "in spite of all vigilance and paying watchmen, we lose all around about 10 per cent. every year by thieves".

THE OYSTERMEN.—Notwithstanding these obstructions to perfect success, the oyster-interests of New York bay are the livelihood of a considerable number of people, though it is probable that the population at present supported by them is reduced by at least a quarter from the total of ten years ago. All the inhabitants of the southern half of Long Island may be called oystermen, since many of them have invested a little in the beds in some shape, or work more or less on hire for the regular growers. Exactly how many real planters there are on the island I could not ascertain in the time at my command; they are scattered everywhere, but chiefly live at Pleasant Plains, Tottenville, Rossville, and Chelsea. On the north shore live many New York merchants, like the Van Names, etc., who plant southern oysters almost entirely. Their capital, also, with that of many other New York dealers, whose names do not appear, aids a large number of outside planters who are, in fact, only managers of the under-water estates which they apparently own and operate. This is not derogatory to their personal worth or dignity, but only one of the methods of trade, shaped by peculiarities of the laws bearing upon the subject.

By the operations in oyster-culture in and about the various centers within the range of this chapter, I conclude the number of families wholly supported to be somewhat as follows:

	Families.
At Prince's bay, Staten Island.....	50
At Tottenville, Staten Island.....	75
Remainder of Staten Island.....	25
Perth Amboy.....	75
Keyport and south shore.....	400
Total.....	625

It must not be supposed that each one of the heads of these 625 families plants and harvests enough oysters to supply his expenses, not to say profits, every year. That would be true only of the minority. But each one owns a piece of ground and works on it to the extent of his means. At other times he hires his services to his richer neighbors, or digs and rakes clams. Each man owns a small boat, worth from \$20 to \$75, and the most of them have a sail-boat, which, if for practical use alone, will be worth from \$200 to \$500, but if intended to answer the larger purpose of dredging, carrying oysters to the city, and pleasure-excursions in summer, may be valued as high as \$2,000. The boats of all sorts hereabouts are of superior workmanship. The wages received by laborers, who require a certain degree of skill, range from \$2 to \$2 50 a day, the men bringing their own boat and tools. Twelve

and a half cents a bushel is the usual price paid in "catching up" for market. The seed-planting, spring and fall, the watching of the beds, and culling of the oysters on shore, are the chief requirements of work done on days' wages, for the shifting is chiefly done by contract.

THE OYSTER-FLEET.—The oyster-fleet between New York city and Sandy Hook is very large. Almost innumerable crafts, with trim sails, crowd the bay on working-days. The sail-boats used here are of good build, and often cost \$3,000, while an unusually good quality of clinker-built, shallow-draft keel-boats, called skiffs, worth from \$75 to \$125, are used. A third sort of small boat is flat-bottomed and straight-sided, like a small Connecticut sharpie; this is known as a bateau, and costs from \$15 to \$30. Two skiffs and a bateau may be counted for every regular oyster-sloop or cat-boat.

THE NET RESULTS.—The total product of Staten Island beds, so far as I could ascertain, is as follows, the time being the season of 1879-'80. This enumerates only the native oysters, since I could learn of only about 15,000 bushels a year of southern oysters planted at present around Staten Island, except those brought north by New York city dealers, and counted in the chapter devoted to the metropolis. The total product is:

	Bushels.
At Prince's bay	50,000
By Tottenville planters	55,000
By Chelsea planters.....	25,000
Total.....	130,000
Add to this:	
For Perth Amboy	100,000
For Keyport and South shore.....	25,000
Total.....	255,000
Southern oysters not counted for New York city planters	175,000
Grand total of all kinds	430,000

ESTIMATES IN RECAPITULATION:

	"Native."	"Virginia."	Families.
Perth Amboy	100,000	.....	75
Tottenville	55,000	10,000	75
Prince's bay	50,000	5,000	50
Chelsea	25,000	.....	25
Keyport	25,000	*160,000	400
	255,000	175,000	625

* Many more Virginia oysters are planted in Keyport, but the rest are owned and counted in New York city.

STATISTICAL RECAPITULATION FOR NEW YORK BAY:

Number of planters, wholesale dealers, and shippers.....	500
Extent of ground cultivated, about..... acres..	2,250
Number of vessels and sail-boats engaged, about.....	400
Value of same, with equipment.....	\$200,000
Number of men hired by planters or dealers.....	125
Annual earnings of same.....	\$62,500
Total number of families supported.....	625
Annual sales of—	
I. Native oysters	bushels.. 255,000
Value of same	\$250,000
II. Chesapeake "plants".....	bushels.. 175,000
Value of same	\$125,000
Total value of oysters sold annually.....	\$375,000

K. OYSTER-TRADE OF NEW YORK CITY.

40. HISTORICAL SKETCH OF THE OYSTER-TRADE OF NEW YORK CITY.

HISTORIC OYSTER-FIRMS.—Most of the New York oyster-firms are of long standing, and the same names appear which are conspicuous in the oyster-annals of City Island and Staten Island, for these two localities have supplied the most of them. Van Name, Houseman, Silsbee, Wright, Burbank, Boyle, Frazer, Woglom, Decker, and others, are examples. Many of the gentlemen now conducting the business under these names only succeeded their fathers and grandfathers, who established the trade they enjoy. The growth of the opportunities of business, however, has been very rapid, and has brought in many new men, conspicuous among whom are George H. Shaffer & Co., of Fulton market.

VAN KORTLANDT'S TREASURE-TROVE.—When the sage Van Kortlandt, surnamed Oloff the Dreamer, after his dreadful shipwreck in the goblin-haunted whirlpools of Hell Gate, had brought the remnant of his command to land on the southern end of Mana-hata, an island which divided the bosom of the bay, his first anxiety was for something to eat, for "Van Kortlandt was a devout trencherman". How he fared we learn from the veritable history of Diedrich Knickerbocker :

The stores which had been provided for the voyage by the good housewives of Communipaw were nearly exhausted, but, in casting his eyes about, the commodore beheld that the shore abounded with oysters. A great store of these was instantly collected ; a fire was made at the foot of a tree ; all hands fell to roasting and broiling and stewing and frying, and a sumptuous repast was soon set forth. This is thought to be the origin of those civic feasts with which, to the present day, all our public affairs are celebrated, and in which the oyster is ever sure to play an important part.

DUTCH OYSTERMEN OF NEW AMSTERDAM.—A historical retrospect of the oyster-business in New York city affords many interesting facts. In 1621 it was recorded in a letter to the old country that "very large oysters" were so abundant at New Amsterdam, that they could not be sold. "Oysters are very plenty in many places," asserted the traveler Von der Donk, in 1641. "Some of these are like the Colchester oysters, and are fit to be eaten raw ; others are very large, wherein pearls are frequently found, but as they are of a brownish color they are not valuable. The price for oysters is usually from eight to ten stivers per hundred." The inference is, that every man could easily gather for himself all he wanted. That a few years of this sort of thing greatly enhanced their value, however, is shown by the fact that in 1658, the Dutch council, in making an ordinance against the cutting of sods in and about the town, found it necessary also to enact a law forbidding "all persons from continuing to dig or dredge any oyster-shells on the East river or on the North river, between this city and the fresh water". This "fresh water" was the pond which is now occupied by the leather district of the city, of which Spruce street is the center.

The digging of shells was for the purpose of making into lime, and also for the purpose of paving the streets, and in the course of dredging for them great quantities of living oysters were wasted. Pearl street received its name because it was paved with oyster-shells, which the Dutch called "garlen", and is the only street in the city, Judge Daly tells me, that retains its original name, all the others having been changed by design or accident, during the subsequent English occupancy.

In those early days the trading-place for oysters, as well as fish generally, was the "Strand", near the market-place. This was then an inlet which had been newly constructed into a graft or canal, where the sloops and canoes had a fairly good harbor and place to do business. This old "graft" is now the wealthy and speculative Broad street. At least as late as 1675 Indians regularly brought oysters to sell at this place in their canoes.

A little later, in 1671, Arnoldus Montanus speaks of "oysters, some a foot long, containing pearls, but few of a brown color".

In 1679-'80, Jaspas Dankers and Peter Slyter made a visit to the colony, and wrote an elaborate account of it, under the title: *Journal of a Voyage to New York*. This has been republished by the Long Island Historical Society, and contains a description which I should be sorry to omit in this connection, so vivid and warm is the sense of homely hospitality it conveys. The passage to be quoted is the ensuing, and refers to their first landing in the country :

We proceeded on to *Gouanes* [Gowanus, now in Brooklyn], a place so-called, where we arrived in the evening at one of the best friends of Gerritt, named Symon * * *. We found a good fire, half way up the chimney, of clear oak and hickory, of which they made not the least scruple of burning profusely. We let it penetrate us thoroughly. There had been already thrown upon it, to be roasted, a pail full of *Gouanes* oysters, which are the best in the country. They are fully as good as those of England, and better than those we eat at Falmouth. I had to try some of them raw. They are large and full, some of them not less than a foot long, and they grow sometimes ten, twelve, and sixteen together, and are then like a piece of rock. Others are young and small. In consequence of the great quantities of them, everybody keeps the shells for the purpose of burning them into lime. They pickle the oysters in small casks and send them to Barbadoes and the other islands.

This will recall the similar statement, in 1689, that pickled oysters were an established article of export from Boston to the West Indies. A few years later we find Peter Kalm writing out a full account of this trade, quoted further on.

EARLY LAWS.—The law of 1715, quoted above, was the first legal enactment designed to protect the oyster-beds of the harbor, after the Dutch ordinance of 1658, heretofore quoted. It was instigated by the common people of the city, to whom these mollusks afforded a very important means of subsistence, both for themselves and as an article of sale to the well-to-do, for the classing of oysters among luxuries was the device of a far later day. The law of 1715 was limited, in its effect, to five years. For ten years after freedom, which amounted to license, was had for New Yorkers, and then came the protective law of 1730. In the colonial documents there is found a note under the record of this law, which explains its necessity, as follows :

There was an act of this kind formerly past in this province, during the continuance whereof the Oysters increased to that degree that the City of New York was constantly supplied in the proper season at easie rates, but since the expiration of it, the people being under no restraint, the Banks are almost destroyed. To preserve what is left, and to procure an increase is the design of this Act, which will be greatly to the advantage of this City, if it be duely observed.

That the theory of this preamble, if such it was, was not wrong, is shown by the testimony of Kalm, who wrote in 1748. Referring to the great quantities of fish in New York harbor, Kalm says :

Nor ought our vast plenty of Oysters to pass without particular Observation. In their Quality they are exceeded by those of no Country whatsoever. People of all Ranks amongst us in general prefer them to any other Kind of Food. Nor is any Thing wanting save a little of the filings of copper to render them equally relishing even to an English Palate, with the best from *Colchester*. They continue good Eight Months in the Year, and are for two Months longer the daily Food of our Poor. Their Beds are within view of the Town, and I am informed that an Oysterman industriously employed may clear Eight or Ten shillings a Day. Some Gentlemen, a few Years ago, were at the pains of computing the Value of the Shellfish to our Province in general. The Estimate was made with Judgment and Accuracy, and their Computation amounted to Ten Thousand Pounds per Annum. Their Increase and Consumption are since very much enhanced, and thus also their additional Value in Proportion. I confess it has often given me great Pleasure to reflect how many of my poor countrymen are comfortably supported by this Article, who without it could scarcely subsist, and for that Reason beg to be excused for the length of this Reflection on so humble a subject, tho' it might justly be urged, to the honour of our Oysters, that considered in another View they are serviceable both to our King and Country.

KALM ON ABUNDANCE OF OYSTERS IN 1748.—In another place Kalm returns to the subject in a way for which we ought to be grateful, for information upon our theme is rarely to be had from the early writers. He says :

ABOUT New York they find innumerable quantities of excellent oysters, and there are few places which have oysters of such an exquisite taste, and of so great a size: they are pickled and sent to the West Indies and other places; which is done in the following manner: As soon as the oysters are caught, their shells are opened and the fish washed clean; some water is then poured into a pot, the oysters are put into it, and they must boil for a while; the pot is then taken off from the fire again, the oysters taken out and put upon a dish, till they are somewhat dry; then you take some mace, allspice, black pepper and as much vinegar as you think is sufficient to give a sourish taste. All this is mixed with half the liquor in which the oysters were boiled, and put over the fire again. While you boil it, great care is to be taken in scumming off the thick foam; at last the whole pickle is poured into a glass or earthen vessel, the oysters are put to it, and the vessel is well stopp'd to keep out the air. In this manner oysters will keep for years together, and may be sent to the most distant parts of the world.

THE merchants here buy up great quantities of oysters about this time, pickle them in the above-mentioned manner, and send them to the *West Indies*: by which they frequently make a considerable profit: for the oysters, which cost them five shillings of their currency, they commonly sell for a pistole, or about six times as much as they gave for them; and sometimes they get even more: the oysters which are thus pickled have a very fine flavor. The following is another way of preserving oysters: they are taken out of the shells, fried with butter, put into a glass or earthen vessel with the melted butter over them, so that they are quite covered with it, and no air can get to them. Oysters prepared in this manner have likewise an agreeable taste, and are exported to the *West Indies*, and other parts.

OYSTERS are here reckoned very wholesome; some people assured us, that they had not felt the least inconvenience after eating a considerable quantity of them. It is likewise a common rule here, that oysters are best in those months which have an *r* in their name, such as *September, October, etc.*; but that they are not so good in other months; however, there are poor people, who live all the year long upon nothing but oysters with bread.

THE sea near *New York*, affords annually the greatest quantity of oysters. They are found chiefly in a muddy ground, where they lie in the slime, and are not so frequent in a sandy bottom: a rocky and a stony bottom is seldom found here. The oyster-shells are gathered in great heaps, and burnt into lime, which by some people is made use of in building houses, but is not reckoned so good as that made of limestone. On our journey to *New York*, we saw high heaps of oyster-shells near the farm-houses, upon the sea shore; and about *New York* we observed the people had carried them upon the fields, which were sown with wheat. However, they were entire and not crushed.

THE *Indians*, who inhabited the coast before the arrival of the *Europeans*, have made oysters and other shell fish their chief food; and at present, whenever they come to salt water, where oysters are to be got, they are very active in catching them, and sell them in great quantities to other *Indians*, who live higher up the country: for this reason you see immense numbers of oyster and muscle shells piled up near such places, where you are certain that the *Indians* formerly built their huts. This circumstance ought to make us cautious in maintaining, that in all places on the sea shore, or higher up in the country, where such heaps of shells are to be met with, the latter have lain there ever since the time that those places were overflowed by the sea.

OYSTERS IN NEW YORK IN 1755-68.—An intelligent writer gives a good article on fish and oysters, which is found in *The Independent Reflector*, November 22, 1753, a few years after Kalm:

Tho' we abound in no one kind of fish sufficient for a staple, yet such is our happiness in this article, that not one of the colonies affords a fish-market of such a plentiful variety as ours. Boston has none but sea-fish, and of those Philadelphia is entirely destitute, being only furnished with the fish of a fresh-water river. New York is sufficiently supplied with both sorts. Nor ought our vast plenty of oysters to pass without particular observation; in their quality, etc.

Oysters were still sold from vessels at Broad street, though the ancient canal was gone, up nearly if not quite to Revolutionary days, and perhaps later. In 1763 I find they are given as worth two shillings a bushel in New York, clams at the same time selling for ninepence per hundred. The favorites were "Blue Points" and "Sounds." The

most of them were eaten raw. A "stew" was an expensive luxury then, and the fancy styles of cooking in vogue now hardly heard of. Most of the venders were colored men; and the only oyster eating-houses, little cellars under the sidewalk, stalls in the markets—particularly the old Catherine market—or a little movable stand on a wharf.

A PICTURE BY WASHINGTON IRVING.—Washington Irving, in his *Knickerbocker's History*, describing a scene in New York harbor in 1804, says that in the universal repose of the afternoon "the fleet of canoes at anchor between Gibbet island and Communipaw slumbered on their rakes, and suffered the innocent oysters to lie for a while unmolested in the soft mud of their native banks".

NEW YORK MARKET IN 1825-'30 AND 1845.—Even as late as 1825-'30 the whole city supplied only custom enough for one wholesale establishment, according to the information kindly given me by Mr. Thomas DeVoe, whose historical knowledge in respect to New York city is widely known. Benjamin Story at that time kept a provision store at No. 64 Barclay street, and in the fall used to stow away in his cellar from two to five hundred bushels of oysters, which he would sell during the winter to the few eating-stands in Washington market or to grocers. Mr. DeVoe told me that the report at that time was, that Story fed his stock and so kept them alive; but how often, or with what pabulum, he could not say. Prices at that time, DeVoe remembered, were about two shillings and sixpence to three shillings (30 to 37 cents) a bushel on the boats which came to the city wharves; but Story sold his at from \$1 to \$1 25 a hundred in bad weather, when boats could not bring any.

In Watson's *Annals*, 1845, I find the following paragraph:

Mr. Brower * * * remembered well when abundance of the largest Blue Point oysters could be bought opened to your hand for 2s. a hundred, such as would now [1846] bring three or four dollars.

NEW YORK MARKETS IN 1853.—In the spring of 1853 there appeared in the *New York Herald* a series of articles on this trade in the metropolis, which bore the impress of accuracy to a greater degree than is usual in such communications. It asserted that then the oyster-trade might be called only thirty years old, yet that there were a thousand vessels, of from 45 to 200 tons, engaged in winter in supplying the dealers in Oliver slip and other depots with Virginia oysters. The value of these vessels, on an average, was \$3,000 each. This statement must, of course, have included all bringing southern oysters to any portion of New York bay, and, at best, seems exaggerated. "The crew," continues the account of these vessels, "is composed generally of four hands and the cook, and the monthly wages given to each person varies from \$12 to \$30 * * *. Unlike the fishermen of Fulton market, they do not own shares in the boats upon which they are employed."

The account continues:

The amount received for Virginia oysters, sold by the dealers in Oliver slip alone, is estimated at \$250,000 a year. This, however, is not more than one-third of the quantity disposed of in the vicinity of Catherine market; for the space in the slip is so limited that the business of the dealers is greatly retarded and cramped. In consequence of this the principal supply is furnished direct from the boats to the retail-dealers throughout the city. About \$500,000 worth of all kinds of Virginia oysters are sold by the boats, which, added to the sales of the dealers, make a total of three-quarters of a million of dollars. This is an immense amount of money, but it is not more than one-eighth part of the value of all the oysters sold during the year in this city.*

During the months of December, January, February, and March about \$500,000 worth are sold from the boats at Coenties slip. There are no scows or oyster-stands at this place, on account of the transient character of the trade there, and the dealers are consequently obliged to sell them off the boats. There are some days when from 20 to 30 vessels are in dock together, and * * * the wharf is thronged with wagons waiting to receive their loads, while the hands on the boats are straining every nerve to supply the incessant demands of customers. The business of the day commences about six o'clock in the morning, and continues until four in the afternoon.

Of East river oysters alone about \$500,000 worth is sold during the year in Oliver slip. The supply comes from Bridgeport, Norwalk, Greenwich, Stamford, Darien, Sawpits, City island, and a few other places along the western shore; and from Northport, Oyster bay, Lloyd's harbor, Huntingdon, Cold Spring, and Cow bay on the southern side. The largest proportion come from City island, where there are extensive artificial and natural beds, which furnish some of the best oysters obtained in the East river.

The reporter then mentions that of the 100 boats employed in carrying East river oysters to Oliver slip in 1853, 25 belonged to City island, where 100 families were supported by this industry. "The whole amount of property invested in the oyster-trade with this island," he states, "including the boats of the oystermen and of the dealers, the value of the beds, etc., is estimated at \$1,000,000. And this is not more than one-third of the whole amount invested in the entire trade of the East river."

The same writer mentioned that the annual sales of a single dealer in East river stock amounted in 1852 to \$100,000; and complained that the conveniences offered by the city to the business at Oliver slip was very inadequate, although a fee of \$75 a year was paid as scow-wharfage. He enumerated nine scows there then, valued at about \$4,000, total. These scows were 30 by 12 feet in dimensions, and would hold from 1,000 to 1,500 bushels each. Out of these scows, he says, is sold yearly about \$500,000 worth of oysters, exclusive of the amount bought from boats direct, which dealers estimate at \$1,000,000. "This estimate is derived from a calculation of the number of boats arriving during each year, and their capacity."

At Washington market, according to the same chronicle, there were at this time twelve scows, having a total value of about \$15,000. They had not even the scanty wharf accommodations vouchsafed at Oliver slip, but lay exposed so that they were knocked about by every high wind with great force, and damage was done which now

* Here, again, I should say the estimate was large—two or three times too high, at least.—E. I.

and then amounted to total wreck, and always caused bitter complaints against the city. The total sales in and about Washington market were estimated at \$3,000,000 annually, which, again, I must beg the reader to regard as an overestimate.

"It is only within the last five or six years," says this writer, "that the dealers commenced shipping in the shell, and at present a most extensive trade is carried on with Cincinnati, St. Louis, and several other western cities. Before this they were sent in kegs hermetically sealed * * * as far as California * * *. Pickled oysters are sent to every part of the United States by our dealers, and immense quantities are bought for shipment by vessels."

The recapitulation with which these newspaper reports closed is annexed:

Number of boats of all sizes (50 to 250 tons) in the Virginia oyster-trade.....	1,000
In the East and North river trade	200
In the Shrewsbury trade.....	20
In the Blue Point and sound trade.....	100
In the York bay trade.....	200
Total.....	1,520
<hr/>	
Sales of Virginia oysters, including those planted in Prince's bay.....	\$3,000,000
East and North river oysters	1,500,000
Shrewsbury oysters	200,000
Blue Point and Sound oysters	200,000
York bay oysters.....	300,000
Total sales.....	5,200,000

OYSTER PANICS IN 1839 AND 1855.—In 1839 a law was passed prohibiting the sale of oysters in New York from May 1 to September 1. This law became a dead letter, but was about to be enforced by Mayor Henry Wood in 1855, when the oystermen, alarmed, urged its modification, saying that when the law was framed little or no transplanting was done; that transplanted oysters (from Virginia) did not spawn, and therefore were not harmful, even if all milky oysters were to be regarded so, the correctness of which view several dealers denied with an intelligence in advance of their hearers. The discussion waxed warm, and in the spring of 1856 the board of health had hearings before them upon the matter, in which certain interesting facts came out. It was stated that there were nearly 800 persons in New York (no doubt including the whole tributary neighborhood) who at that time imported oysters from Virginia, employing 200 vessels—a number much nearer the truth than the "1,000 vessels" of the *Herald's* story. All the summer oysters sold in the city were southern; all agreed they were perfectly healthy. The counsel for the oystermen read a statement, in which he asserted that in Clinton market alone oysters were sold as follows: 1853, \$885,000; 1854, \$914,000. "Add other markets, and the trade involved a yearly capital of over \$5,000,000 in New York city."

DeVoe's *Market Assistant* contains the ensuing account of the notorious "oyster riots":

An unusual excitement, or rather an "oyster panic", occurred in New York city in October, 1855, which prevailed against the use of oysters as an article of food for several weeks. Several highly-esteemed citizens died very suddenly by cholera, which it was thought was occasioned by eating diseased oysters. Various causes were assigned for their poisonous quality; some attributed it to drought; others, that the oysters had been taken up during their spawning-time, and thus become diseased. The same complaint and fatal instances existed at Baltimore, Alexandria, Georgetown, and other places.

Dr. James R. Chilton, a noted chemist, after making a chemical examination of them, says: "It is not an unusual circumstance that oysters and other shellfish, when eaten after having been kept long during the warm season, will produce serious illness resembling cholera; but no such ill-effects would be likely to arise when they are received fresh from our waters."

Several years ago oysters were seldom seen for sale in their general spawning-season; it was not only against the law, as it is now [1863], but the people would not buy or have them in their possession. An ordinance was passed in 1839 which reads as follows: "No person shall bring into the city of New York, or have in his or her possession, in the said city, any oysters, between the first day of May and the first day of September, in any year, under penalty of \$5 for any quantity not exceeding one hundred, and the further penalty of \$2 for every hundred."

FULTON AND CATHERINE MARKETS IN 1855.—This discussion brought out many special articles in the daily press of the city, which are now of historical interest and large credibility. The *Tribune* of June 24, 1855, contained the following, in respect to Catherine market:

Next to the meat-trade, a more extensive business is done in oysters and clams than in any other article of food in the market. The stands, of which there are five, are situated at the southerly side of the street, occupying the entire front of the fish-market. Each dealer sells on an average about \$100 worth of all kinds every day, making a total of \$3,000 a week. The fish are generally sold out of the shell, and a large proportion are cooked.

The account concludes with a table crediting Catherine market with yearly sales of oysters and clams of \$156,000 out of a total meat, fish, and produce business of \$524,000. Another account in the *Herald* says \$140,000 worth of mollusks were sold there in one year, four-fifths of which are oysters.

In November, 1855, the *Tribune* "wrote up" Fulton market, and described eight stands devoted to the sale of shellfish, the total annual sales of which aggregated \$200,000, of which about one-sixth was for clams, etc.

"The trade in oysters," said this account, "is retail, and not more than one-tenth are sold in the shell. Some shipments are made to Liverpool during the winter-season by the Cunard steamers; but the quantity disposed of in this way is very limited, not exceeding eight barrels a month. There is only one company which exports oysters, and they sent more than \$20,000 worth last year to California. The same company pickled in one week 15,000. As the oysters are not sold in the shell, a large number of persons are employed in opening them. This is a business by itself, and the persons engaged in it are paid at the rate of about 50 cents a thousand. Some, who are well practiced in the art, can open 3,000 in one day, but 2,500 is considered a good day's work. Nearly all the oysters sold in this market are obtained at Oliver slip, near Catherine market, which is the principal rendezvous of the oyster-boats. No adequate conception can, however, be formed of the extent of the oyster-trade in this city from the business done in the markets, for immense quantities are bought from the boats without ever passing through the hands of the dealers."

The number of retailers in the city, at this time, was placed at 5,000, all of whom would lose a large measure of support if a prohibition of oyster-selling during the summer months were enforced. There was one feature, however, of the trade heartily condemned, but unfortunately not extirpated. I refer to the ruffians who, in the most dirty way, peddle oysters from an old wagon at one cent each. Their furniture consists of stentorian lungs, from which the most ear-splitting cries disturb the peace of every street and the temper of all the denizens, a pail of nasty water, a soda-water bottle of vinegar and another of a ferocious compound called pepper-sauce, and a box of salt, pepper, and street-dust mixed. Buying and selling only the cheapest oysters in the dirtiest way, they offer many spoiled ones—very likely to be productive of disease, and otherwise engender and minister to ill-health.

OYSTER-BOOTHS.—Only a grade higher are the fixed street stands for opening oysters to eat, of which a clever description appeared some years ago in the *New York Evening Telegram*, in the following language:

All along the [East] river front are places, rude huts, paralytic shanties, where oysters are sold at a penny apiece. You can stand on the outside and fish them up from the shells that are passed through the window to a ledge, or you can go in and have a 10-cent stew behind the red-hot stove. A man with a check-d jumper on attends you and juggles the porter bottles containing catsup in so artistic a manner, that the thought of his being a base-ball player minus a position, will not be "put out". The frequenters of these *al fresco* oyster-houses are longshoremen, truckmen, stevedores, sailors, and others of that ilk, and a very large bowl of oyster soup, not stew, can be obtained for 5 cents.

MARKETS IN 1861.—It will be observed that in all these accounts the city markets are mentioned as the wholesale depots for shellfish. It is only within the last twenty years that Broome street and West Tenth have become the headquarters of oyster-dealings. When Lieutenant De Broca was here in 1861, he found that the "two most important markets for the wholesale trade in these mollusks are Catherine market, on the East river, and another at the foot of Spring street, on the Hudson river. As to the retail sales, they are made in all the markets of the city indiscriminately, in the oyster-houses, and in markets intended especially for the sale of fish". Then follows a description of the "floating-houses, constructed on rafts", which were the same then as now. Eleven at Catherine market and twenty-three on the opposite side of the river are enumerated. He continues:

These floating-houses possess one great advantage, which is, that the oysters can be preserved in them alive for several days during the winter-season, however low the temperature may be; and also in summer during the greatest heat, since the part under water is always cool. The oysters, or clams, placed in baskets containing about a bushel, are stored in the cellar and attic of the oyster-boat. In the room are placed only specimens of the different qualities for sale, from which samples purchasers make their choice. Here, too, all the packing which the necessities of the trade require is done.

Although there are always a great many oysters in these establishments, they never remain more than a few days, and arrangements are made with the plantations for constant and regular supplies. The number of boats of all kinds employed by the merchants and the planters of the bay, including those engaged in fishing for the oysters and clams, is estimated at 15,000.

PRICES IN THE PAST.—Prices of oysters in New York in the past, at least for half a century, do not seem to have greatly differed from those at present, save that then, as now, periods of excessive storm or other unfortunate contingency would produce a momentary scarcity, which would cause a sudden and temporary increase in price. Such a "famine" occurred in January, 1857. Quotations from files of newspapers, courteously opened to me by Thomas F. DeVoe, since 1850, show that for all sorts and grades of oysters in general sale the price at wholesale ran from 35 cents (rarely so low) to \$2 per hundred. The large majority of quotations gave "cullens" at 35 to 40 cents; "boxes" at 62½ cents to \$1, and "extras" at \$1 25 to \$2. An inferior grade to all, sometimes sold as "bushels", brought 50 cents. More recently (1876) the newspaper market reports give the following prices for oysters in Fulton and Washington markets in midwinter:

	Per 100.
Saddle-Rocks	\$1 75 to \$3 50
East Rivers	1 00 to 2 00
Blue Points	1 00 to 1 50
Prince's Bays	1 00 to 1 75
Virginias	1 00 to 1 75

These were all, however, grades above the average quality sold.

DEMAND AND SUPPLY, PAST AND PRESENT.—The history of the great city's progress in availing itself of this important article of food has thus been sketched. From being the common food of the poor man, so plenteous and vulgar that no feast ever saw its name upon the *menu*, the oyster became only a luxury for the well-to-do, and the prime feature of holiday banquets. Recovering from the scarcity which had brought this change about, by means of the artificial cultivation of immense quantities, oysters a second time have become abundant as an article of food, enjoyed alike by rich and poor. Those who live in the interior or abroad can hardly appreciate how extensive is the demand and supply in the coast cities. "Oysters pickled, stewed, baked, roasted, fried, and scalloped; oysters made into soups, patties, and puddings; oysters with condiments and without condiments; oysters for breakfast, dinner, and supper; oysters without stint or limit, fresh as the pure air, and almost as abundant, are daily offered to the palates of the Manhattanese, and appreciated with all the gratitude which such a bounty of nature ought to inspire."

41. THE OYSTER-TRADE OF NEW YORK IN 1880.

LOCATION OF THE OYSTER-BUSINESS.—The oyster-business of the city of New York, as at present conducted, is confined almost exclusively to two localities, the trades of which are to a certain extent distinct. One of these centers is at the foot of Broome street, East river, and the other at the foot of West Tenth street, North river, nearly opposite. The method of business at each is substantially the same, the difference consisting in the character of the oysters handled. In addition to this, a few firms are engaged at wholesale in Fulton market, and three firms near Washington market import oysters, opened, from the south. This includes all of the original wholesale and shipping business in the city—and the statistics of it, though represented by large figures, and though it took much time to obtain them, are not complicated.

SCOWS AND BARGES.—All of the dealers on the East and North rivers occupy floating places of business known as "scows", "oyster-boats", or "barges", being flat-bottomed boats, made with unusual strength and of the most durable materials, and which closely resemble the conventional "Noah's Ark" of the toy-shops, and the Sunday school picture-books, except that they have flat roofs.

The size of these scows varies, but fair dimensions are these :

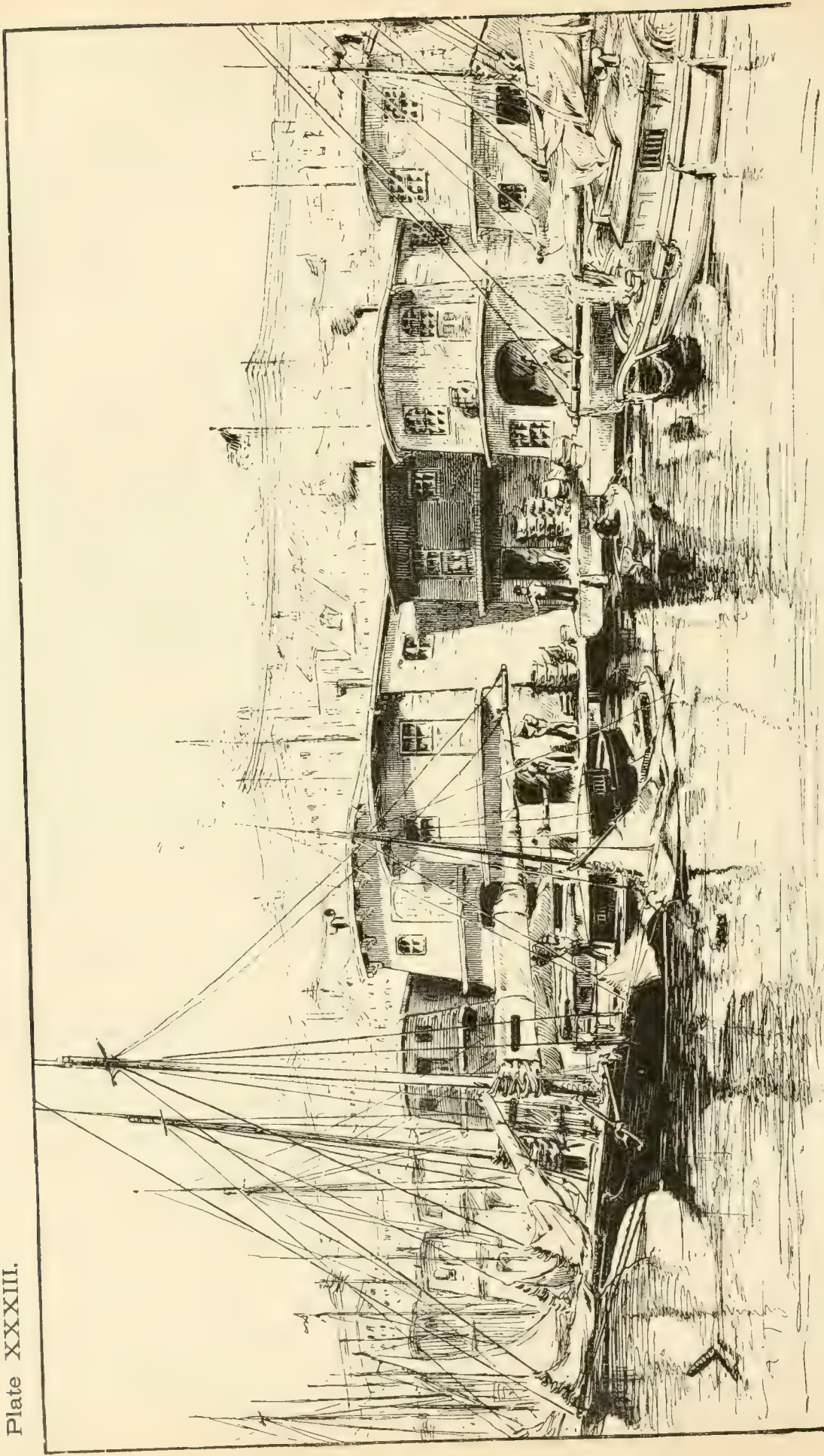
	Feet.		Feet.
Length of hull.....	75	Height of first story or deck	11
Width	24	Height of attic.....	9
Depth of hold.....	6		

The deep hold, well-floored, serves as a cellar, cool in summer and warm in winter; oysters will never freeze there when the hatches are closed. Over the whole craft, flush with the outside, is built a house, two stories in height, as I have indicated. The floor of the first story is the deck of the scow. This is the general business apartment, and gives room for storage, the opening of oysters, and transaction of business. Above is a loft where are stored barrels, baskets, and machinery. In the rear, usually—sometimes in the front end—is fitted up an office. The daily capacity of such a barge is about 700 bushels.

These scows are securely moored, side by side, to the wharf, or rather to the water-wall of the city, and are reached by broad swinging platforms, which allow them to rise and fall with the tide. At the rear end, therefore, they can always be closely approached by the sloops and boats which bring to their owners their stock. Such a barge is worth from \$1,500 to \$4,000, and, with an annual overhauling and caulking, will last as long as a man is likely to need it. There are 30 of these barges, representing at present, a value of \$75,000. To these barges at the foot of Broome street come the oysters from East river and Long Island beds; also somewhat from Staten Island and Virginia, but to a small extent compared with the west-side business in these two classes.

CHARACTER OF THE TRADE. Three sorts of trade are carried on, as follows: 1. Some dealers are also planters and sell their own oysters; 2. Dealers buy from planters and sell; 3. Dealers sell on commission.

The planting of oysters by the New York dealers is almost wholly by partnership methods, and the statistics of the amounts they raise are credited to the totals at the point where the oysters are produced. New York furnishes a large part of the capital which operates the beds in all parts of the neighborhood, from Keyport, New Jersey, to Norwalk, Connecticut. It is very rare, however, that this planting is done in the capitalist's name, and it would be idle, and the cause of the greatest confusion, to try to ascertain to just what extent the score of oystermen in New York produced native oysters, apart from the share which country capital had in it. The arrangement between the New York man of money and his rural partner is usually this: The former furnishes the needed money, the latter does all the labor, and the cost of taking up and the profits are equally divided. The reason why the capitalist's name does not appear, which would redound to his credit as an extensive operator, is, that the beds are usually in Connecticut or in New Jersey, while he is a citizen of New York, and in both those states the law forbids a non-inhabitant to plant oysters. The same law holds even in respect to towns, so that a man must live immediately at his beds if he intends to work them himself. But, of course, no legislation can forbid partnership or borrowing money, or hiring out one's services, even if the other party concerned be not a citizen of the state or township.



OYSTER-BARGES AT THE FOOT OF WEST TENTH STREET, NORTH RIVER, NEW YORK CITY.

Under this system the country partner reports to the census what amount he raised and sold, saying nothing about where his means came from—which is something the inquirer did not care to know. It only remains to ask the city man the number of oysters that pass through his hands, without question as to what part of these were raised out of his money—a question it would be almost, or quite, impossible for him to answer. Nor could he tell what these cost him, since a part of the investment which has been made long ago, is known to have been lost, a part remains ungathered on the beds—always an incalculable quantity, for accident may destroy all of it—and the harvest comes in by piece-meal. He cannot tell what these oysters have been worth precisely. He only knows, in a general way, whether his ventures in a certain place have been profitable or not.

A large proportion of the oysters handled by these New York firms, however, are bought from planters who own beds on the Connecticut or Long Island shore, in Prince's bay, Staten Island sound, or elsewhere. The owner may load up his sloop and bring his crop to the city to dispose of to him who will pay best; or the dealer may send out his own sloops to the producing-grounds, and with his business-card painted all over the mainsail, cruise about until he has bought a cargo at a satisfactory price. The more usual method, however, is to have it understood beforehand that certain dealers will take all the oysters certain planters can raise. Often money is advanced upon this understanding, or other help given, so that there is a closer business-relation than ordinary between the buyers and the planters—an intimacy (and confusion in the matter of statistics) to which the extensive partnership system lends itself.

The third method—of sales on commission—explains itself. It is not extensively followed, since the planters do not have faith in it, and the dealers do not care to encourage it.

Some dealers are shippers wholly, others find their whole custom in the city and suburbs. The former require less men and dispose of larger packages at each order; the latter require many trucks and delivery carts, though most of their customers themselves come after their supplies. I believe the shipping trade is generally thought more desirable.

EXTENT OF NEW YORK OYSTER-TRADE IN 1880.—The procuring of statistics of the amount of oysters handled in New York city was a matter of slow and painstaking inquiry. It was difficult, to begin with, to make the dealers understand the full purport of my inquiries, even when, as too frequently occurred on the east side, there was no surly indifference or active opposition to my investigations. Few of the oyster-dealers keep track of their sales, much less of the amount, in bushels or by the thousand, of the stock which passes through their hands into the city retail-trade, or out into the country. I desired to keep the northern distinct from the southern oysters, and here began another difficulty, and so on. It is with an apologetic feeling, therefore, that I venture upon the publication of these totals, which are founded only upon careful estimates of the annual transactions at the present time of each firm. Round numbers had to be used everywhere, and the whole matter is an approximation. I believe, nevertheless, although it falls far short of all previous estimates, that it is more nearly correct than any account of the wholesale-trade ever ventured upon heretofore, since it is supported by inherent probability, and by comparison with other statistics; for example, the reported total of the oysters produced at the beds which find their market at New York.

The quantities of oysters handled each year in the city of New York, then, are approximately stated in the following figures:

Southern, in shell.....	1,065,000 bushels.
Northern (natives), in shell.....	1,634,000 bushels.
Opened, from the south.....	600,000 gallons.
By count, in shell, at 250 to the bushel.....	765,000,000

The selling value of these oysters may be estimated as—

Of southern.....	\$800,000
Of northern.....	1,500,000
Of opened.....	458,700
Total.....	2,758,700

SCENES AT THE BARGES.—The scene at the barges on both rivers, during the busy months of autumn and winter, is a very lively one. The sloops, very trim craft, bringing oysters to be sold, will sometimes lie a dozen deep opposite the barges, with plank walks across their decks from the outer ones to the shore. The captain and crew attend to the getting up of the cargo out of the hold and putting it into baskets, sorting it at the same time. In the case of East river and Staten Island oysters, they are sold by the hundred or the thousand, as a rule, and must all be counted. An expert man will count them accurately as fast as they can be carried ashore. Long Island stock is generally sold by the "basket", this measure holding somewhat less than a bushel; but some dealers compel the sloops to measure by baskets furnished them, which hold a full bushel, or a trifle over. Even then no great measure is given, for care is taken not to shake the contents down. Virginia oysters may be measured by the basket, but are paid for by the cargo or fraction of a cargo, except where, as in the case of Staten Island planters, southern oysters, having laid a few months in Prince's bay or the sound, are brought to the city to be sold.

A newspaper account, written ten years ago, depicted the scene graphically, and it is still unchanged:

When the wind changes, the fleet comes up the bay, and then there is a busy scene in the neighborhood of pier No. 54. The dock and its approaches are covered with cartmen, wagons and horses, stevedores, and oyster-dealers. The vessels are fastened to the wharf by means of strong hawsers, and the hatches are off fore and aft. In the hold are men filling baskets rapidly, and others stand on the deck, rail, and pier-string, ready to pass them to the cart being loaded. All is rush, bustle, and trade, flavored with copious dashes of profanity. In front of the scow-warehouses are men continually employed on these days, filling barrels with oysters and heading them up. Inside of the scows dozens of men are opening, while others can them ready for transmission by rail to Canada, country hotels, and restaurants. But the city trade creates the hurry visible on every side. All day long, until the cargoes, which are always bespoken, are landed, the work goes on, and when they are discharged the vessels are sent away immediately for more.

POLICY OF THE DEALERS IN BUYING.—One dealer discoursed to me knowingly upon the best policy of buying, according to his long experience in the East river, as follows:

I sell only superior stock, which will average, all through, from \$1 to \$1 50 a basket. There are three sizes, "extras," "box," and "cullen". Cullens sell for four to five dollars a thousand. Six months' more growth makes boxes of them, numbering about 150 to the basket, when they sell for seven or eight dollars. After that the growth is so slow that it requires eighteen months longer to make extras out of them, but they are then worth fifteen to twenty dollars a thousand; the extras used to bring fifty dollars a thousand. This long waiting makes it more profitable to sell the two smaller grades, the most profit being in the best quality of box-oysters. All of the foregoing refers to East river "plants". In Rockaway oysters the dealer can make the most by selling them small, because the growth is rapid. Seed need lie there only from four to six months, whereas the same seed would have to lie on an East river bed from two to three years to attain the same size. Hence in Rockaway stock the dealer turns his money quickly. The prospects of business are good, because a scarcity of oysters is coming, which will raise the price.

Another dealer, who sells only oysters of his own raising, writes:

In planting natural seed-oysters (*i. e.*, natives) in northern waters, it is necessary that they lie at least three years to attain growth sufficient to have them run, by count, one-third "box" and two-thirds "culls". We plant each spring and fall, and therefore make at least eight plantings before the first crop of that series is taken up.

OYSTER-CARRIERS.—The carrying of oysters from the vessels into the barges affords employment to a distinct class of men, known as "carriers". There are from 25 to 40 of these on each river. They do not work on salary, but get 10 cents a thousand for the oysters carried, reckoning seven small and four large baskets to the thousand. This seems very small wages, but I was assured that they averaged from \$25 to \$30 a week during half the year. They are paid by the owners of the oysters sold.

OPENING OYSTERS.—The opening of oysters by the trade in New York city is not systematically carried on, as at Providence, Fair Haven, and in the south, and scarcely any is done until after the holidays, all the trade previous to that being in the shell. I doubt if more than 100 or 150 men are ever employed at once in the whole city in opening for the wholesale-trade. All the openers are men chiefly drawn from the ranks of longshoremen, and those who in summer get their living as deck-hands on steamboats and by other marine occupations. The rate of pay is 10 cents a thousand, at which rate about \$3 a day is regularly made when work is plentiful, and even as high as \$6 50 has been earned on a spurt. The openers are ignorant men, and, with the carriers, form a much "harder" class than those who are regularly employed to help about the barges, form the crews of the sloops, or do the work required at the planting beds. The oysters opened are mainly "Virginias", but also some "natives"—mainly from Staten Island beds. These are kept separate, at least by the most reputable dealers, and are of various qualities and many prices, ranging last year from 65 cents to \$1 40 per gallon.

PICKLING AND PACKING.—Beyond the pickling of an inconsiderable quantity by various dealers, and nowhere in a large way, I could not learn of any "packing" of cooked oysters in New York. It has been tried more than once, I believe, but the competition of Baltimore and Norfolk, where the facilities of doing it cheaply are greater, stands against success in New York. This competition is exercised, also, in the way of offering in this market oysters which have been opened at Baltimore, Norfolk, Crisfield, or elsewhere in the Chesapeake district. This trade, and its influence upon the general business of the north, has been fully discussed in the chapter upon Boston, and need not be rediscussed here.

RECEIPTS OF OPENED OYSTERS.—There are two principal firms in New York devoted to the importing of opened oysters, and their combined receipts amounted to perhaps 500,000 gallons during the winter of 1879-'80. A large portion of this amount, however, was consigned through to points in New England, chiefly to the city of Boston. My memoranda from these dealers give an estimate of 335,000 gallons as the consumption of the city and its suburbs, much of which was re-exported by express to the interior towns of New York and western New England. The prices of these oysters were as follows in the spring of 1880: Standard, 55 to 65 cents; medium, 80 to 90 cents; select, \$1 25. The proportion in which they were sold was, five gallons of the "standards" to ten of "mediums", and ten of "standards" to one of "selects". Perhaps, then, an average price of 80 cents would produce a fair result in dollars, in estimating the value of the receipts, which would thus amount to about \$268,000. This trade is increasing, and gives better satisfaction in general in New York than in Boston, both because the stock itself seems generally of better quality, and because the shorter distance and superior accommodations in transit bring the oysters here in better condition. The reshipments are very widely scattered through the country, especially northward. Occasionally, however, orders come from the distant west. In February of 1879, for example, G. E. Maltby & Co. filled

an order from Prescott, Arizona, which deserves notice. A man desired some of their choice bivalves for the entertainment of his friends. When they got the order, and learned how much the expressage would cost, they hesitated. In answer to their telegram of inquiry, they were told to send them along. There were twelve gallons sent. It took them fourteen days to reach their destination. The expressage came to \$96 25. The telegrams cost some \$30. The oysters reached their destination without delay, and in excellent condition. Opened oysters have also been sent to Great Britain, and gave good satisfaction there. Long transportation, without harm, has been made possible by various improved and patented contrivances for refrigeration, in the shape of barrels, cans, and smaller packages.

THE RETAIL OYSTER-TRADE.—An attempt to ascertain some of the statistics of the retail-trade in oysters—the eating-saloon business—proved very unsatisfactory. I got the names of about 250 oyster-houses, and dispatched to each a circular asking the kinds and amount of oysters, clams, and scallops used, number of persons employed, wages paid, and capital invested. Of these 250 circulars, only about one-tenth came back, and these, I believe, did not represent an average of the whole, since few or none of the establishments of large size reported themselves, and in many cases the questions seem to have been misunderstood.

In general, it may be said that in the cooking of oysters the southern kinds are used, because these are cheapest, a special price being charged for a “stew” of northern oysters. For fried oysters, on the other hand, which require to be of larger size to make a show, the “box” size is used, and these are generally “Sound” or “East River” oysters. Oysters sold to be eaten raw may be anything and everything of respectable size; but the old brand names, “Saddle-Rock,” “Shrewsbury,” “Sound” “Blue Point,” “Keyport,” etc., the popularity of which was won long ago, are still attached. I suppose, for example, that twenty times as many “Shrewsbury” oysters are sold every season in New York as are raised each year in that river.

The largest oyster-saloons have always been in Fulton market, and have a world-wide reputation. Now they are so well rivaled by up-town establishments, that much of their prestige has disappeared.

As to how many persons are concerned in the retail oyster-business of the city, only a mere guess is possible, since a very large proportion of them are temporarily engaged, or have their business so inextricably mixed with the liquor-trade, or the business of selling fish and general provisions, that it is out of the question to define it separately with any exactness. Twenty-five years ago, when the “oyster-riots” attracted attention to the matter, the number of persons supported by the restaurant-trade in oysters was estimated at 5,000. Whether it is not double that at this time it is impossible to say; but I consider it safe to say that 5,000 families, at least, find their chief or exclusive support in selling or preparing the mollusks for immediate consumption in the metropolis and its closely adjacent cities.

The wages vary immensely, depending on employer, sex, age and capacity of the employed, amount of working-time, kind of work, etc. Women receive from three to six dollars per week; boys and men from four to twenty dollars. A correct average is almost impossible, and a total approximate summation of the wages paid out in the course of a year in the retail-trade is impossible. Of course this information might be accumulated, but the time allowed by the Superintendent of Census for this investigation, did not admit of such study of the retail-trade as would have been necessary in order to estimate its total values.

THE OYSTER-FLEET OF 1879.—The following is a list of vessels engaged in the oyster-business in 1879, and hailing from the custom-house of New York:

UNDER TWENTY TONS.

Name.	Tons.	Name.	Tons.	Name.	Tons.
Arrow	7.25	Cupid	14.87	Edgar Barnard	16.42
Ansley Bedell	7.13	Continental	7.68	Etta	10.69
Ally	7.32	Catharine W. Burbank	16.82	Elizabeth Rowe	7.13
Adelaide	11.29	Celia Ward	6.37	Euphemia	18.39
Alice	5.74	Carrie	7.58	Emma	5.49
Alarm	5.74	Cyrus F. Pell	15.87	Eliza Snedker	5.90
Alonzo E. Smith	18.98	Daniel E. Egbert	17.96	Eliza Rhodes	13.35
Amity	7.47	David Crowell	12.43	Edna	7.09
Alert	15.87	D. Bennett	12.42	Eliza and Jane	9.08
Am. L. Barnes	15.20	D. Joline	13.18	First	19.89
Amice	7.50	Delphinia	11.66	Fannie Scofield	7.07
Army	9.12	Dolphin	6.28	Fawn	10.13
Antoinette	5.11	Elizabeth J. Wright	19.19	Flaunt	5.39
Barnet Jones	18.00	Express	7.32	Fear Not	5.57
Blanche	18.95	Ella Fleecer	13.23	Flag	7.92
Belle	7.90	E. C. Page	8.07	Frank Hopkins	8.73
Barmer	10.54	Emmogene	11.83	Favorite	8.89
Blue Rock	10.00	Ella Wesley	12.41	Flying Cloud	9.48
Cornelius Cole	10.79	E. R. V. Wright	10.64	Fannie Fern	5.79
Crystal Fountain	8.10	Edith Thurber	9.09	Georgiana	19.07
B. B. Alger	19.41	Emma	7.58	George B. Wood	7.28
Charles Wall	8.79	Emily Robbin	15.54	Georgiana	5.11

Name.	Tons.	Name.	Tons.	Name.	Tons.
General Taylor	9.84	Jennie McFarland	9.10	Plymouth Rock	11.37
General Putman	11.60	John J. Moffott	6.20	Robert H. Coles	10.33
Golden Rule	6.40	Kattie	16.85	Syble	7.64
George D. Allen	15.81	Katie Wood	12.95	Sempronia	16.74
George F. Rogers	11.92	Kate Wade	10.15	Sarah M. Rogers	6.03
George P. Putman	8.37	Katie	13.08	Samuel P. Billar	16.59
Howard Harrison	11.48	Katy Did	10.00	Sarah E. Miller	8.95
Helena	11.90	Leader	13.22	Stella	19.22
Henry Miller	9.52	Lottie Elwood	14.84	Sidney Dorlon	8.32
Harmon Sierves	12.96	Laura Frances	7.46	Teazer	14.20
Harp	13.15	Louisa	7.36	Three Brothers	6.23
Hickory Bud	9.81	Lillie	9.11	Tillie	7.22
Hope	7.93	Lewis Weakes	7.14	Thomas Collins	13.50
Harriet Elizabeth	11.05	Leona	9.04	Thomas C. Barnes	9.13
Henry Clay	10.02	L. J. Dayton	12.07	Two Elises	6.47
Hattie Jenks	10.68	Little Kate	6.22	Trimmer	9.78
Izaak Walton	11.85	Lydia Van Name	12.37	Two Brothers	6.35
Isora	7.36	Lizzie Pearl	6.21	Uncas	10.27
Idlewild	15.45	Moonlight	11.80	Undine	10.01
Imogene	14.39	Minor	8.35	Vesta	6.92
Imperia	19.25	Millard F. Housman	11.94	Victorine	11.37
James H. Larkin	10.24	Marietta	11.64	Viola May	13.52
James Campbell	8.20	Minnie Van Name	16.08	Wm. H. Hoyt	10.52
John P. Evans	12.63	Mary Elizabeth	13.99	Willie	16.66
Jacob A. Apply	5.70	May Flower	7.35	Willow Bark	11.30
John Florence	7.79	Minnie and Irwin	14.13	Walter S. Lamance	16.23
John Manning	13.42	Mnsic	7.42	Wm. H. Shamott	5.45
Janie Baker	6.04	Mermetora	9.48	Wm. H. Lissenden	7.16
Josephine	10.07	May Elizabeth	5.45	W. M. Negus	11.68
James K. Polk	6.43	Nellie Frank	8.66	Wm. Hillman	15.05
J. Wood	13.70	Nellie C. Powell	19.01	Wm. H. Merseau	11.16
Joseph Francis	15.64	Only Daughter	5.90	Wm. H. Phillips	10.04
James Henry	5.22	Paragon	16.18	Wm. Chard	9.91
Jennie C. Benedict	10.05	Pacific	19.11	Willard	10.85
John Wright	13.04	Pride of the Wave	10.05	Water Lilly	16.25
John T. Capman	10.21	Peruvian	18.96	Wave	15.17
Jennie	8.75	Peerless	5.79	Well Spring	11.12
Jane and Elizabeth	11.89				

VESSELS OVER TWENTY TONS.

Name.	Tons.	Name.	Tons.	Name.	Tons.
Joshua Lerines	80.97	Harriet M. Laskey	22.14	Captain	22.80
Cornelius C. Jones	20.36	Elizabeth Jones	22.44	Last One	20.07
Elizabeth Ann	22.76	Christiana	39.94	Gustavus A. Ratz	22.41
Agnes	49.86	Josie Reeves	45.35	Sophia Van Name	20.62
Harriet Dart	21.13	Sylvan Glen	21.65	Caroline Augusta	21.92
Mamie Higgins	77.49	Van Rensselear	22.41		

These vessels are classified as coasters, but took out a special fishing license, in order to avoid hospital dues and some other inconveniences. The customs-authorities have now decided that oystering is not fishing within the meaning of the law, and vessels engaged in this trade no longer take out a license. Each license was good for one year, and cost 45 cents, thus yielding to the New York custom last year \$82 80. Even if chartered for a single voyage a license was required. It is evident to me, however, that either the list is defective or vessels went without licenses, since I have a note of many additional schooners which ran to Virginia, among them the following:

Name.	Tons.	Name.	Tons.	Name.	Tons.
H. W. Race	80.40	Excel	40.52	Wm. Young	67.81
Jacob I. Housman	89.26	Harry Doremus	48.23	R. Mason	50.98
Robert Center	68.41	Wm. H. Van Name	97.04	Barnett Jones	92.91
Minnie Still	58.13	David Carl	124.95	Mary Emma	74.39
Mary Parker	34.32	Wm. Mazyiek	75.62	S. E. Barnes	44.12
Amelia	71.41	Wm. McGee	85.99	Sidney Dorlon	36.03
Sophia Behrmann	49.43				

Also the steam-propeller Minnie and Irvin.

The jurisdiction of New York extends southward to Port Johnson, New Jersey; eastward to Patchogue, on the south shore of Long Island, and to Sag Harbor on the north side; and northward to Troy and Albany. In this large area a very much larger number of sloops than 177 are used in oyster-operations, but only so many are permitted or accustomed to bring cargoes of oysters to market.

THE EUROPEAN EXPORT-TRADE.—For many years the captains and passengers of steamers sailing from New

York to Liverpool have been accustomed to take with them a barrel or two of oysters in the shell, to be eaten on the voyage. Passengers did the same, and occasionally an American living in England would have them sent over to him as a treat. In 1861, Lieutenant De Broca succeeded in shipping safely a large consignment, by way of England, to the French Acclimatization Society in Paris. With these facts as a guiding suggestion, about ten years ago Mr. George H. Shaffer, of Fulton market, New York, requested an intelligent friend of his, who was going to England upon business, to try to introduce American oysters into the English market, and sent over a dozen barrels as an experiment. They retained their freshness, were landed in good condition, and speedily sold. The agent telegraphed Mr. Shaffer to forward a larger consignment, which also was sold advantageously, and a regular trade was established. Mr. Shaffer, however, enjoyed a monopoly of it, and the large profits, which at first accrued, only a short time, for his competitors were wide awake, and also began shipping to Europe, so that almost at a bound the exportation of oysters reached its full strength as a profitable business—that is, about as many were sent as there are now—all the foreign markets will bear.

The kind of oyster required for export is such as has not found favor in this country, where the “Saddle-Rock” and “Shrewsbury” are lauded above all others. The native European bivalve is small, rarely exceeding the size of a silver dollar, and is more popular than the American oyster. The English, with whom most of our trade is conducted, do not consider anything larger good to eat, and therefore we were obliged to accommodate this taste or prejudice, if we wanted to find ready sale. The oysters sent abroad, therefore, are all single (since they are to be eaten on the half-shell, and not cooked), small, and round; they are selected from the “cullens” or smallest of the three classes into which our oysters are usually assorted, and have received the trade appellation of “London stock”.

It is a much more fortunate thing for us that the foreign taste is for small oysters than for large ones, since, hitherto, there has been a slow market and cheap price for cullens, which now find a ready sale, if clean and of good shape. It enables a man to turn his money quickly by selling his stock before it has lain more than a year in the water, and also to avoid the ever-present hazard of total loss by some storm or other of the many accidents to which oyster-beds are always subject. On the other hand, I have heard many persons complain, with some justice, that the export business had been decidedly harmful to the general interests of the oyster-trade, because it took away from the beds great quantities of young, which had not yet had time to spawn, as they would do if allowed to remain enough longer to make them of sufficient size for the home trade. This was cutting off not only the present, but the future of the oyster-beds which supplied London stock; and, as the harm to one bed was indirectly harm to all its neighbors, the general good of the planters was imperiled.

While this argument, which may be condensed into the ancient simile of killing the goose that lays the golden egg, is perhaps good for limited areas drawn upon with extraordinary persistence for the foreign market (Blue Point, for example), I do not consider that in general it overbalances the greater benefits derived. Nor do I apprehend, after a careful examination of the matter, that the European demand—even though doubled—is likely to overtax and ruin any American oyster-beds which are properly watched and scientifically operated.

Because the oysters, native and cultivated, which are grown at the eastern end of the Great South bay, on the south shore of Long Island, best fulfilled the conditions, they were the first to be exported to England, and have most largely, perhaps, entered into the trade. They are known both at home and abroad as “Blue Points”, and acquired a reputation in England superior to all others, up to the season of 1879, when there was a falling off in their quality and a consequent loss of esteem.

Besides the “Blue Points”, great quantities of oysters from the East river (particularly Rowayton, Norwalk, and Bridgeport), have been shipped, chiefly through J. & J. Ellsworth; a less number from Rockaway and Fire island; and large quantities from Staten Island waters, under the brand of “Sounds”. These last became the favorites abroad during the past season, the “East Rivers” coming second, and the unfortunate “Blue Points” third; and, inasmuch as they cost less than either of the other brands, money was made upon them liberally, while no one who forwarded “Blue Points” received much if any profit, and many shippers lost money.

The London stock having been picked out by the planter, is purchased by the shipper on the ground, where he sends his boats to buy daily, or keeps a permanent agent and packer. He culls it a second time, discarding about one-fourth, so that it is estimated that four bushels of oysters are caught for every barrel exported, since the barrels (second-hand flour barrels) hold scantily three bushels. The useless residue is not wasted, but thrown back upon the packer’s own bed to grow farther. The number of oysters in a barrel varies from twelve hundred to two thousand; the more there are the better the English retail-buyer likes it, since he sells them by count. This has had the effect of a steady reduction in the size of the oysters sent, until now much smaller stock is sent than at first, and more ground is given the grumblers than ever for their complaints against this line of business; but the limit has probably been reached in this direction.

In packing the oysters they are placed as snugly in the barrel as possible, and well shaken down. Attention is paid, also, to placing the oyster with the deep shell down, so that the liquor shall not so readily escape. Some kind-hearted persons were greatly distressed, a few years ago, at the supposed suffering which the mollusks

underwent in their close quarters and long seclusion from the world while on the passage; they loudly demanded that holes should be left in each barrel and the contents deluged with fresh water daily, and that a plentiful supply of bran should be mixed with them to serve as food during the trip! This was an astonishing example of Berghism run wild, and did more credit to the hearts than the heads of the philanthropists, who were so concerned in the welfare of their bivalvular brethren.

The length of a voyage to Europe in cold weather is no feat worth mentioning to a well-constituted oyster. In Prince Edward island I found it to be the common practice for citizens to purchase fifteen or twenty bushels of oysters, pile them in their cellars between layers of sea weed, and use them gradually all winter, finding the last ones alive and well in the spring. This used to be the universal custom in New York before restaurants came in fashion. Southern oysters en route from Chesapeake bay to Boston and Portland are frequently a month out of water, yet do not suffer, and grow well enough when returned to the water, though it is so different a latitude. Stock is frequently kept several weeks in the holds of the "arks" in New York, or in the cellars of wholesale depots, waiting for profitable sale. One gentleman assured me that he kept a quantity of "Blue Points" 107 days in his cellar, losing but a few of them, and these are not generally considered so hardy as some other sorts—those from the East river, for instance. The hardiness of the "Sounds" is well shown in the article upon the oyster-beds of New York bay, in relating the old custom of peddling them up the Hudson river in the fall.

Packed so as to prevent injurious jarring, and stowed in the extreme forward part of the vessel, where they keep cool—the score or so of barrels of oysters smashed when the Arizona collided with an iceberg, found it really chilly!—the mollusks therefore find it a pleasant experience rather than a cruel hardship to cross the Atlantic. No time is lost in getting the oysters, when packed, into the steamer, and many are taken in sloops directly from the producing points to the steamer's wharf, and thus escape the bother and expense of a second or third handling in New York.

Some American firms have regular agents abroad who care for and dispose of the oysters sent to them. In other cases they are consigned by the shippers to commission merchants on the other side. Liverpool has been the great receiving point for Great Britain, because it was the nearest port. It was found that the extra time required, and the port charges on cargoes sent direct to London by steamer, more than overbalanced the slight saving effected in freight over those forwarded by rail from Liverpool. The amount of oysters sent each week, though not large, has sometimes been more than could be disposed of before the next shipment arrived. To provide against loss in this contingency, the largest dealers own spaces of sea-bottom, where the surplusage is thrown overboard to keep in good condition and drawn upon as required. Some thousands of barrels are sent annually, which are intended to lie and grow there from one to three years. American oysters laid down thus in foreign waters have never been known to spawn, so far as I could learn, but the conditions have never been favorable; and no experiment, that I am aware of, has been tried, to ascertain whether seed-oysters from the United States, properly planted, would not grow into good health, emit spawn, and establish their race upon the European coasts. I see no reason why such an experiment should not prove entirely successful. It is said that the English beds are becoming so depopulated as practically to have become worthless. The eighth edition of the *Encyclopædia Britannica*, speaking briefly of oysters (vol. xv, p. 348), under "Mollusca", says that only about 30,000 bushels of "natives", or oysters from artificial beds, and about 100,000 bushels of "sea-oysters", are annually sent to the London market. This seems extremely small, but the English people have not yet learned to regard the bivalves as anything more than a luxury, and heretofore they have always been beyond the purses of any but the wealthy. The demand, however, is increasing through the cheapening of this excellent food, and the acquired habit of eating and enjoying it. Nevertheless, it is easy to overstock the European market, and no little harm has happened to consignments, with dead loss to the owners, through being delayed too long before being sold, in consequence of an oversupply. This happened more frequently some years ago than it now does.

One large shipper gave it to me as his belief, that London could not use more than 500 barrels a week, at the present time, nor the whole United Kingdom consume more than 3,000 barrels. Occasionally this year the market has been so crowded that sales at 5 shillings a barrel have been made, to avoid total loss. On the other hand, it is not always easy to obtain supplies in New York for the European trade, in midwinter, with necessary promptness, in which event those planters who are able to run into New York good stock realize large profits, and the agents in Europe make handsome returns to their principals. The winter of 1879-'80 was so mild and "open" a one that this difficulty was not experienced, but previously it has been an important element in the trade.

The prices received for American oysters sent abroad have been very various, ranging the past year from 5 to 40 shillings a barrel. Leaving out the various deductions necessary, it is considered fair to estimate \$5 to be the average cash returned to this country for each barrel. At this rate the stated total of 63,300 barrels (about 175,000 bushels) would net the United States no less than \$316,500 in gold, an amount which would by no other means be brought into our pockets, and which enriches the country by so much, since the value exchanged for it does not, in any degree, impoverish the country, but is a product of labor which would not otherwise be employed, and the disposal of a product not otherwise to be used.

Comparing this with the exportations in previous years, it will be seen that there is no loss, but a rapid gain. A statement of the value of oysters exported from the United States from 1864 to 1879, inclusive, reads as follows:

1864.....	\$85,089	1872.....	\$173,711
1865.....	122,169	1873.....	243,723
1866.....	200,409	1874.....	223,733
1867.....	181,271	1875.....	170,277
1868.....	121,946	1876.....	214,196
1869.....	89,266	1877.....	431,230
1870.....	134,804	1878.....	393,061
1871.....	168,122	1879.....	453,306

The different customs-districts from which these exportations were, are as follows:

Alaska.....	\$7	New Orleans.....	\$103
Baltimore.....	44,871	New York.....	*302,732
Bath, Me.....	9	Oswegatchie, N. Y.....	12,278
Boston.....	2,278	Paso del Norte, Tex.....	9
Brazos de Santiago.....	265	Passamaquoddy, Me.....	712
Buffalo, N. Y.....	41,289	Philadelphia.....	9,468
Cape Vincent, N. Y.....	4,210	Portland and Falmouth, Me.....	5,224
Castine, Me.....	6	Puget Sound, Wash.....	1,673
Champlain, N. Y.....	11,680	Saluria, Tex.....	26
Chicago, Ill.....	74	San Francisco, Cal.....	4,157
Corpus Christi, Tex.....	4	Saint John, Fla.....	20
Detroit.....	1,746	Vermont.....	4,556
Duluth.....	62		
Genesee, N. Y.....	573		453,097
Minnesota.....	5,065		

Of these almost exactly one-quarter were sent to Canada, leaving about \$360,000 worth to be sent to Europe, and, in trifling quantity, to Mexico and the East Indies. Dismissing these latter, it is interesting to inquire somewhat into the statistics of our exportations to Great Britain and the Continent. The number of shipments in 1879, between November 1 and May 1, were:

To Liverpool.....	27	To Havre.....	9
To Hamburg.....	18	To Glasgow.....	9
To Bremen.....	7	To Bristol.....	5
To London.....	11	To Cardiff.....	1

This gives an average shipment to Great Britain of 2,161.5 barrels; to Germany and France of 86 barrels. The date of the largest shipment was December 6, 3,558 barrels. The amount shipped from New York was 59,565 barrels, and the value returned by the New York custom-house, \$315,933, which gives an average valuation per barrel of \$5.30. These shipments were distributed, in consigning, as follows:

To Liverpool.....	Barrels.	Bushels.
To Liverpool.....	59,777 × 3 =	179,331
To Hamburg.....	2,321 × 3 =	6,963
To Bremen.....	331 × 3 =	993
To London.....	328 × 3 =	984
To Havre.....	268 × 3 =	804
To Glasgow.....	200 × 3 =	600
To Bristol.....	70 × 3 =	210
To Cardiff.....	5 × 3 =	15
Total.....	63,300 × 3 =	189,900

At an average of 1,200 oysters in a barrel, this shows the total shipment by count to have been nearly 76,000,000. This average of 1,200 is too low, no doubt, as a multiplier, but is on the safe side; moreover, it will "sum up" a deficiency in putting not quite three bushels into some of the barrels. Taken altogether, this figure (76,000,000) is inside the truth, and a fair estimate. This year (1879-'80) was, however, a poor year for the oyster-exporting trade in the north, because of the mildness of the weather. Oysters could be got in the greatest abundance all the winter through, and glutted the market. Sometimes, on account of ice, there will be a scarcity of stock at a suitable time for shipping.

The general opinion among New York men is, that the European demand is going to increase steadily, while there will not be an overplus of stock here, since the East river beds are slowly failing and are more and more required to furnish a seed-supply. The shippers are, therefore, hopeful of profitable prices in future.

*The books of the custom-house in New York place this figure at \$315,933.

Since writing the above I have been favored by Cortis & Freeborn, freight brokers, New York, with a statement of the exports for 1880-'81, as follows. It will be seen that it shows a slight increase over the previous season:

STATEMENT OF AMOUNT OF OYSTERS EXPORTED TO EUROPE FROM NEW YORK, BETWEEN OCTOBER 9, 1880, AND MAY 14, 1881—ONE SEASON.

Date.	To Liver-pool.	Various ports.	Total.	Date.	To Liver-pool.	Various ports.	Total.
	<i>Barrels.</i>				<i>Barrels.</i>		
October 9.....	298	4	302	February 5.....	838	10	848
16.....	652	20	672	12.....	1,012	43	1,055
23.....	1,288	6	1,294	19.....	1,087	40	1,127
30.....	1,930	78	2,008	26.....	1,179	35	1,214
November 6.....	2,420	100	2,520	March 5.....	915		915
13.....	2,622	140	2,762	12.....	1,601	25	1,626
20.....	2,444	76	2,520	19.....	2,183	46	2,229
27.....	1,817	431	2,248	26.....	4,172	131	4,303
December 4.....	2,454	250	2,704	April 2.....	4,056		4,056
11.....	2,932	194	3,126	9.....	3,368	54	3,422
18.....	2,001	219	2,220	16.....	3,967	25	3,992
25.....	2,380	184	2,564	23.....	4,216	100	4,316
January 1.....	1,601	9	1,610	30.....	4,094	64	4,158
8.....	2,120	77	2,197	May 9.....	1,441		1,441
15.....	2,740	36	2,776	14.....	53		53
22.....	2,322	99	2,421				
29.....	1,937	132	2,069				
				Total.....	68,140	2,628	70,768

L. COAST OF NEW JERSEY.

42. OYSTER-INDUSTRIES OF THE NEW JERSEY "BAYS".

TOPOGRAPHY.—The coast of New Jersey, south of Sandy Hook, like that of Long Island, and for similar reasons, forms a favorable region for oyster-growth. Long, desolate beaches stand without, and between them and the mainland stretch great salt lagoons, protected from the sea and receiving a constant supply of fresh water into their shallow and marshy basins. These "bays" extend in almost unbroken continuance from the southern line of Monmouth county to Cape May, while in Monmouth county itself there are several indentations of the otherwise abrupt coast-line, which afford the oyster-grower an opportunity to practice his profession.

OYSTER-LEGISLATION IN NEW JERSEY.—But before proceeding to a particular description of these points, a recapitulation of the statutes of New Jersey (already alluded to under the heading "New York Bay"), which are of general application to the oyster-interests of the state, may prove of interest. They are substantially as appended, according to the revision of 1847, the latest authorized, "Title XVI, Fisheries, Chapter 8":

I. Forbids raking on any oyster-bed, or gathering any oysters or shells, or offering any oysters for sale, between May 1 and September 1, in Bergen, Essex, Middlesex, Monmouth, Cape May, Salem, and Gloucester counties; between July 1 and September 1, in Hudson, Union, and Cumberland counties; and between May 1 and October 1, in Burlington, Atlantic, Ocean, and Cape May counties. In case of violation, whether oysters be taken or not, the offender shall pay \$10 for each offense; but persons may at any time take and sell oysters from their private planted beds. In Cumberland county, moreover, it is forbidden any person to take oysters in any manner on Sunday, or between 8 p. m. and 4 a. m., under liability to imprisonment and a fine of from \$50 to \$500.

II. No person, residing within or without the state, shall rake for or gather oysters in any waters of the state, with a dredge or any sort of instrument answering the purposes of a dredge, under penalty of \$50 fine; provided that this and the sixth section shall not apply, so far as regards persons residing in the state, to the Delaware bay, except within Burlington county.

III. Justices of the peace shall issue warrants, and constables arrest those violating the preceding sections.

IV. Forbids selling or offering for sale oysters in this state, between May 1 and September 1, except that in Cape May county the time is extended to October 1; provided, that owners of planted oysters may take up and sell at any time. Penalty, \$5 fine.

[There seems to be an inconsistency between this and § I.]

V. Forbids gathering oysters in this state to be made into lime or to be used in the manufacture of iron. Penalty, \$50 fine.

VI. No vessel or craft of any sort permitted even to carry an oyster-dredge, or anything to be used for that purpose, under penalty of \$50 fine.

VII. No one who has not been an actual resident or inhabitant of the state for six months, may rake or gather clams, oysters, or shellfish, for himself or employer, in any waters of the state. Violation of this law is a misdemeanor, punishable by imprisonment, or fine not exceeding \$150, or both, with forfeiture of boat and all apparatus. Resisting an officer engaged in enforcing this statute, subjects each person implicated to an added fine of \$30.

IX. Makes it lawful for "any person owning marsh or meadow in this state, within the boundaries of which there shall be creeks, ditches, or ponds, where oysters grow or will grow, and where such creeks or ditches do not lead to any public landing, to lay or plant clams or oysters therein, * * * and for the preservation of which to erect a fence, hang or affix gates or locks across said creeks or ditches, to prevent any person or persons from entering the same".

Sec. 12. If any unauthorized person be found with a boat inside any fence or gate as aforesaid, where clams or oysters have been planted, or shall break down any such fence or boundaries, he shall be liable for every offense to imprisonment of not more than six months, or to a fine not to exceed \$100, or both; provided, that the free navigation of no thoroughfare or channel may be obstructed.

X. No persons, under any pretense whatever, shall take away "from any natural oyster-banks or beds in this state, any old shells, other than such as cannot be removed or separated from the oysters without injuring the same; and all such shells shall be culled and separated from the oysters and thrown back again upon the said natural banks or beds". Penalty, fine of \$10 and forfeiture of offending boat and tools. But this does not prohibit persons taking shells from their own private beds.

Many statutes exist in addition to this, which have only a local application, and hence are quoted at the points where they are in force. It would seem difficult to enforce these laws upon reading them; but the reader must take into account the extreme jealousy which causes every man to watch his neighbor as a cat would watch a mouse, if not hoping to find him derelict, at least resolved to catch him, expose him, and so thin the ranks of rivalry as well as share the reward. Every oysterman is thus as good as a special constable, and the law takes care of itself. The attention to the laws, however, varies in different parts of the state, and entirely different constructions are put upon statutes in different counties.

SHREWSBURY.—The most northern of the indentations of the northern coast of New Jersey, to which I have alluded, is that just at the heel of Sandy Hook, and at the base of the Navesink Highlands, comprising the Navesink and Shrewsbury rivers. Shrewsbury is one of the oldest oyster-regions in the neighborhood of New York, and its product has always enjoyed a high reputation in her markets.

In 1853 the *Herald's* review of the oyster-interests in the vicinity of New York, heretofore quoted from the files of Mr. Thomas De Voe, contained paragraphs relating to Shrewsbury, which are so interesting that I quote them at length:

The number of men engaged in the oyster-fisheries at Shrewsbury is computed at 250. Of these more than one-half are employed in transplanting from the natural beds in Newark bay to the artificial beds on the coast of Shrewsbury.

Shrewsbury oysters are said to be inferior even to those procured from the best beds of the East river. Their flavor is a little more pungent; they have a yellowish tint, and the shell is generally whiter. They are a smaller oyster, but in proportion to their size, they contain more meat. The peculiar color, by which they may be easily distinguished from all other kinds, is doubtless imparted to them by the nature of the bottom of the river. The beds cover an extent of two or three miles, and are owned exclusively by the farmers along the banks of the Shrewsbury; and the beds extend across the river, which is between two and three hundred yards wide. When the tide recedes the oysters are exposed to view, and may be gathered with an ordinary pitchfork. The operation of "tonging" is only necessary with those that lie in the bed of the river, and therefore comparatively few boats are required. The larger part of those sent to New York are transported by steamboat. The farmers employ persons to take them up at low tide and send them to market to be sold, on their own account. In some few instances they enter into a sort of partnership with oystermen owning sail-boats, who obtain one-half the profits in consideration of taking them from the beds with tongs and carrying them to the city.

There are two branches of the river in which they are planted, but those procured from the beds in the southern branch command the higher price. The bottom of the river is covered with a rich black mud, to the depth of from 4 to 6 feet, and it is this which gives the oyster its yellow color and peculiar flavor.

An oyster-bed there is almost as valuable as a gold mine, less injurious to health, and easier to work. Their owners are not only well-to-do in the world, but are considered by those in the trade wealthy. They are not required to pay any tax for their privileges, and there is very little risk attending their business, compared to that to which others are subject. About \$200,000 worth are sold during the year, and this amount is inadequate to the demand. There is no possibility of an increase in the supply, however, for the only part of the river capable of growing them is already laid out in beds, and its productive powers are now taxed to their fullest extent.

The trade in Shrewsbury oysters differs very materially from all others; there are less oystermen engaged in it, in consequence of a large portion being sent to this city by steamers in place of sloops and other sail-boats. The capital invested in it is perhaps less, in proportion to the article, than that invested in the East river and Virginia trades, and the profits are more considerable.

Shrewsbury never possessed any natural beds of oysters, and its celebrated stock always was, and still is, raised from transplanted young, obtained now largely in Keyport. "At present," wrote Professor Lockwood, in 1873, "the 'Shrewsbury' is accounted by many as the emperor of the bivalves, and will fetch in market at wholesale from \$1 50 to \$3 50 a hundred." But for several years their production has grown less and less, and probably ten times as many reputed "Shrewsburies" were sold in the markets as annually came out of that river. During the winter of 1879-'80 only about 20,000 bushels were harvested, by about 15 planters. About one-third of these are northern

oysters, mainly bought at Keyport, and transplanted to Shrewsbury river, where they will grow in two years to a large size. These oysters chiefly go to supply Long Branch, which, a dealer informed me, used from his depot alone 125,000 oysters and 40,000 clams each season. The two largest hotels consume 25,000 oysters each, weekly. In early days a special law was passed applying to these waters, as follows:

It shall not be lawful for any person or persons to rake * * * or carry away any oysters other than by wading in and picking up by hand the same, within the following bounds, in the river commonly called * * * the North or Navesink, lying within the county of Monmouth, * * * above a direct line from the store-house of Eseek White, on the Shrewsbury side of the river, to the dwelling-house of Thomas Layton, on the Middletown side of the river aforesaid. Penalty, \$10 fine for each offense.

There is also a law extant against erecting stakes, or any other means of using "wares" or fyke-nets for taking fish on the bottom of Shrewsbury river where oysters are planted.

SHARK RIVER AND ITS LOCAL LAWS.—The next point southward that concerns us is Shark river. It was once thought that this bay would be exceedingly productive, and there was really a considerable industry, which gave rise to enactments in the legislature as follows, being the amended statute of 1870, revising the previous laws of 1861:

This law (1) authorized the board of chosen freeholders of Monmouth county to occupy, during twenty years, for oyster culture, Shark river, within the following boundaries: Beginning at low-water mark at Search point, in the township of Ocean, and running thence in a straight line to Bukey's point in the township of Wale; thence down the shore at low-water mark to a stake standing on low-water mark and on a line with the east end of James W. White's dwelling-house; thence northerly and on a straight line to a stake standing at low-water mark on the west side of Long point opposite Yellow bank, in the township of Ocean; thence up the shore of said river at low-water mark to the beginning.

II. The board of freeholders shall appoint commissioners, holding office one year, to survey and subdivide the above space of river into two-acre lots for oyster-culture; but no individual shall own more than two acres, and no company more than five.

SEC. 3. These lots shall be rented at public auction, to the highest bidder, for from one to five years, the sum bid to be paid annually and secured to the commissioners. None but citizens may hold ground. The commissioners may renew a lease for five to ten years, but at a rate not less than previously paid.

III. Makes it the duty of the commissioners to enforce the protective laws, and to collect and devote to the school fund the rents due and penalties assessed; they must also make a sworn report to the board of freeholders.

In 1877 about 200 lots were said to be leased, at an average rental of \$2 a year, and many persons were employed; but at present the business has declined, and only enough remains to supply the local consumption in summer at Ocean Beach and other neighboring summer hotels.

BARNEGAT BAY.—Beyond Shark river no oysters exist or are cultivated until Barnegat bay is reached, where, in its broad waters, an immense and ancient industry of this kind is followed.

Here, as at other points, the Indians had been wont to come, generation after generation, in search of shellfish. This is attested by the remarkable heaps of shells left as monuments of their feasts, and which are again worthy of special description.

The natural beds in Barnegat bay begin about three miles above the village of Barnegat, with an occasional "strike" a little lower down, and extend for about ten miles northward, with a width of about two miles. They are known as the Cedar Creek grounds. The bottom here is gravelly and more or less sprinkled with dead shells, and this is one of the great sources of seed for all the coast southward. Boats also come in considerable numbers from the Raritan, Staten Island, and Blue Point districts, but less now than formerly. From this part of the bay came the once famous "Log Creeks". These beds are reported to be constantly losing strength. The carelessness or entire neglect in culling the seed taken away, returns so few shells to the water that the cultch upon which spawn may rest is growing very scarce. This is suicidal to the whole community, but selfish greed prevails every season over prudence. Laws designed to protect these beds are inoperative to a great extent, except that a stranger will feel their force if he attempts to tong in the summer, as the natives permit themselves to do, or tries to carry away oysters so small that more than 350 of them will be needed to fill a bushel. This last is an almost forgotten law of the three shore counties, Ocean, Burlington, and Atlantic.

A second large ground for gathering oyster-seed is what is called the Gravellings, a shoal of gravel occupying a space several miles square in the mouth of Mullica river. This is the name the river had of old, and still goes by, among the local sailors; but on the late maps I find no such name, the water meant being denominated Great bay, and forming the expanded outlet of Wading river, Atsion river, and several creeks. Egress into the ocean is had through "New" inlet, which opens between "Old" and Brigantine inlets; the three passages, with their dividing, sedgy islands, separating Brigantine beach from Long beach, which is unbroken, save by Barnegat inlet, all the way northward to Squan.

The "Gravellings" extend up the Mullica river from the head of Great bay for six or eight miles, to just above the mouth of Bass river, and produce seed regularly every year, though in varying abundance.

The seed from the Cedar Creek beds is preferred, however, by the West creek and Manahawken planters, as it seems to live and grow into better shape on the local beds. The Gravellings are thus raked chiefly by planters to

the southward. There seems no diminution in the quantity to be gathered there from year to year, although enormous quantities of cultch are taken away at each seed-gathering, and nothing returned.

Planting was long ago—perhaps fifty years—well under way in this region, and formerly, perhaps, was more widely followed than at present, but no more successfully. Leaving out of view the attempts just begun to foster the interest at Forked river, Barnegat is the northernmost place in this district where oyster-culture is followed. To aid and protect this industry these laws were long ago made by the legislature, as annexed:

1. *Be it enacted* * * * , That it shall be lawful for any person, being a citizen of the state of New Jersey, and resident of the county of Ocean, within the boundaries hereinafter described for the purpose, to stake off any quantity of land covered with water, not exceeding two acres, marking the boundaries thereof by stakes or other marks, plainly visible to persons navigating the waters so occupied, to plant oysters; *provided*, that the share-owners shall have the right and preference to stake off as far as their deeds allow, by running their lines for that purpose.

2. *And be it enacted*, That the boundaries within which land may be so staked off and occupied shall be as follows: Beginning at Cedar Creek point at low-water mark on the west bank of Barnegat bay, along said bank to the south line of Ocean county, running off 300 yards distant from the shore.

3. *And be it enacted*, That oysters within the boundaries of all said waters shall be the private, personal property of the persons so occupying said land * * * ; and any person who shall * * * injure or carry away the same, while said boundaries are so marked, shall be guilty of larceny * * * and shall forfeit * * * all the implements used for taking the same * * * .

It would seem as though this language was plain enough to protect the interests of any one who availed himself of the privileges alluded to under its promise. However, there does not exist the public sentiment to secure the execution of the law. No man is willing to risk his money in planting, when he has no surety that he will be able to reap any reward for his outlay. Hence, oyster-raising at Barnegat, where there are hundreds of acres of perfectly good but idle bottom, and plenty of capital ready to be thus employed, has dwindled, until the entire crop last season was reported at less than 8,000 bushels, all of which was consumed locally. As this small crop was divided among forty or fifty growers, one can easily see that nothing of a business is carried on here.

The sentiment of the town opposes any change which shall protect individual planting. Night-thieves and foggy-day oystermen, therefore, control and ruin the oyster-interests, making it so risky to plant that men of means will not put their money into it. Without some betterment, oyster-planting must continue to be a failure here as a business, though thousands of acres of good bottom remain unutilized, where both native and southern seed would grow to great advantage and a most profitable industry, employing steadily all the now idle laboring element of the shore-towns, here and northward.

To show how profitable oyster-planting may be here, Captain Cox told me that some years ago he laid down a lot of young oysters which cost him \$13. After two years he procured a man to take up and sell all that were upon the beds, giving his agent one-half. The returns to him were \$57, his agent taking the like amount, showing an increase of about 1,000 per cent. In addition to this, a dozen or fifteen bushels were eaten by each of the two families.

The experiment of "shelling" has been made with great success, and it is said that any one might reasonably expect to get 100 bushels of seed from 20 bushels of stool laid down anywhere in the upper half of the bay. Popular construction, however, makes such cultch-beds "natural ground", and everybody will go and rake. It has even occurred that a man's oysters taken off his private bed and placed on staked ground in a creek to "freshen", have been raided upon by thieves, and though he could prove the facts he was unable to recover in local courts.

MANAHAWKEN, TUCKERTON, AND VICINITY.—To the south of Barnegat a different sentiment prevails, and at Manahawken, West Creek, Tuckerton, and intermediate villages, live a large number of oyster-planters who have beds opposite their homes to a considerable extent, and also down in Great bay, below the islands, almost meeting the Absecon men, and associating with the planters at Bass river and Port Republic.

The West Creek and Manahawken men, as I have said, get the most of their seed at Cedar creek. The precise number of planters, large and small, it was difficult to ascertain. I was assured, however, that two-thirds of all the men in the town were directly engaged, which would give to Manahawken about 125 and to West Creek about 100 planters, a considerable portion of whom get all the money they ever see out of the oysters they catch and plant for themselves or other people. Most of them are married, and it is safe to say that at least 200 families in the two villages derive their support from this industry. Their best planting-grounds are off Horse point.

Tuckerton, according to the late census, had about 1,800 inhabitants. A thousand of these, it is certain, if not more, live by means of the oyster- and clam-fisheries, with little outside resources. It is the one industry which keeps the town going, for little else is possible; and it is undoubtedly true that the area of bay-bottom devoted to this work is much more productive than any equal area of adjacent sandy and pine-covered shore. At Tuckerton and northward, therefore, from 2,000 to 2,500 people get their support out of oyster-culture. On the Mullica river are two other settlements, Bass River and Port Republic, which will add from five to seven hundred more. All of these men get the main part of their seed early in the fall at the mouth of the Mullica. During all day of September 30, and during the night, schooners, sloops, cat boats, sail-scows, trim yachts, and shapeless, ragged tubs, have gathered there, chosen a spot out of what was left of the space, and anchored. Once the anchor down, no movement elsewhere could be made. Each sail-craft towed behind it one or two small scows termed "garveys", and had upon its deck one or more small skiffs, or those ingenious ducking-boats, peculiar to this region, called "dinkies".

It is a common thing for the first of October's results to show 100 or 150 bushels of seed to the man, on the most favorable ground. If the owners keep all this seed for their own use, two days will generally load their vessel and send them to their planting beds, after which they may return or may go elsewhere. If they prefer to sell it to the larger planters, who are all ready to buy, they were paid, this year and last, 10 cents per bushel. The second day yields more poorly, and at the end of a week 12 or 15 bushels to the man is considered a good day's work. To compensate for scarcity, 15 cents is paid by buyers. This seed consists almost wholly of the growth of the year, or at least of the previous year, and cannot be separated from the shells to which it is attached. The careless culling which is done, therefore, gives little back. On the upper part of the river-grounds, however, the spawn grows upon the gravel of the bottom, and there are few shells. There are also brought up a few marketable oysters, that have escaped heretofore until they have attained a considerable size. Though very finely flavored, these large natural oysters are not of good appearance, and bring only 60 to 80 cents a bushel in market.

STATISTICS OF BARNEGAT, TUCKERTON, ETC.—Oysters in these waters grow only moderately fast, and must lie three or four years before being taken to market. From Tuckerton large quantities are sold to Atlantic City men, who fatten them on the sand-bars and sell them the same season. The best of all the oysters at present are said to come from in front of Horse point, Manahawken, bringing considerably more money than the others. They are planted more thinly there than in Tuckerton bay, which is said to make the profitable difference. Prices in 1879-'80 were \$3 for large and \$2 for small sizes, per 1,000, for Tuckerton plants, while Manahawken's stock brought a large advance upon this.

This year (1880) has proved very good for this district, both in abundance of seed and in the quality of the planted stock which is now (October, 1880) being sent to market. The summer of 1879 was a poor one for growth and prices, and much of the seed died, so that the crop which was gathered in 1879-'80, and reported upon for my use, is not considered as high as before, or probably up to this year's product. The statistics are as follows:

Oysters raised for market, 1879-'80.

	Bushels.
In Barnegat.....	3,000
In Manahawken.....	5,000
In West Creek.....	30,000
In Tuckerton.....	30,000
In Bass River.....	10,000
In Port Republic.....	10,000
Total.....	88,000

Families supported.

In Tuckerton.....	200 to 250
In West Creek and Manahawken.....	175 to 200
In Bass River.....	50 to 75
In Port Republic.....	50 to 75
Total.....	475 to 600

Number of sail-vessels, about 500; value of same, about \$125,000.

Number of small boats, about 750; value of same, \$7,500 to \$10,000.

The list of vessels reported by Mr. George W. Mathis, collector at Tuckerton, New Jersey, as registered in this district and employed in the oyster- or clam-fishery, reads as follows:

Name.	Tons.	Name.	Tons.	Name.	Tons.
Sarepta.....	5.02	Louis D. Senat.....	9.04	Henrietta J.....	7.35
Hero.....	5.17	I Wonder.....	9.66	Mary Grey.....	15.96
William H. Mills.....	11.83	Lidie Jones.....	12.37	Rhoda and Jane.....	6.57
Golden Feather.....	6.91	General J. L. Selfridge.....	21.36	Alice Ridgway.....	5.49
H-10-W-8.....	5.04	Sunbeam.....	22.16	Dart.....	5.11
Maggie Bell.....	12.83	Four Brothers.....	11.34	Kate Becker.....	17.3
Laura V. Stiles.....	5.78	John A. Parks.....	10.73		

ABSECON AND VICINITY.—Reed's bay, Little bay, Absecon bay, and the other thoroughfares through the salt marshes behind Brigantine beach, afford good opportunities for growing oysters, and have long been utilized. In the neighborhood of the town of Absecon there are said to be one hundred men, part farmers, part fishermen, who regularly plant oysters and supply the market. Only a very few of these, however, devote their main time to it. It was to meet the case of these inclosed and almost dooryard waters, that section 14 of the revised statute relating to oysters was made, which enacts that persons owning flats or coves along the shores of the tide-waters between Great Egg Harbor and Little Egg Harbor, Atlantic county, inclusive of the shores of the rivers that lie within that county, may mark out ground by stakes of a prescribed size and number, for the planting of oysters or clams, but no stakes can be set beyond ordinary low-water mark. Section 16 also applies to Burlington county, but seems to add nothing to section 14. These planters get their seed (small) by going after it in their own sloops to Barnegat bay, the Gravellings, or Egg Harbor. It is put down in shallow water, on a soft bottom, and allowed three

years' growth. This brings it to "box" size, and no oysters are sold from Absecon less than this size. Until last year the price was \$8 a thousand, but last year some lots were sold as low as \$6, because not up to the usual quality. The shipments are all made by rail to Philadelphia, and sold there on commission, a system which has lately given rise to much complaint on account of alleged frauds.

In addition to the northern oysters, bred as I have described, other stock is also brought from Virginia and given a season's growth. The total raised for market during the past, however, of both kinds, by Absecon planters, would not exceed 20,000 bushels, three-fourths of which were from the Chesapeake. This would hardly represent an average crop, since many planters preferred to let their oysters lie to selling them at so poor prices.

ATLANTIC CITY.—At Atlantic City there are three firms of oyster-planters and dealers, consisting of five men. They deal more or less in fish and provisions also. The oysters handled at present consist of southern stock (six or seven thousand bushels), which do well here, if they can be procured in good order. Besides this about 18,000 bushels of full-grown, marketable oysters are bought at Absecon and Barnegat and laid down here on a hard bottom, in shallow water, where the beds go dry at low tide, simply for summer use in the large seaside hotels which make Atlantic City famous. It is probably not fair to count these in statistics of production.

At Brigantine beach there is a similar industry, selling at Atlantic City, but not of much account, and hardly to be reckoned as a point of original production.

LAKE'S BAY.—Just behind the island upon which Atlantic City is built, and to the southward, is an extensive sheet of inclosed water known as Lake's bay, which is continued southward in numerous channels through the salt-marshes behind Absecon beach, until it reaches the inlet and mouth of Great Egg Harbor river. Along the shore of this bay are various villages that carry on extensive operations in oyster-culture, and have done so for many years. I refer to Pleasantville, Smith's Landing, Bakersville, Leedsville, and Somer's Point. The best part of the bay is said to be what are called the "muddy beds", directly in front of Smith's Landing, and about a quarter of a mile distant. The advantage of these beds is said to lie in the fact, that the drainings from the "platforms" flow over them at low tide, giving them a bath of fresh water twice daily. Much damage occurs here, however, whenever northwest gales occur, the soft mud in the marshes being loosened and drifted off into the bay to settle on the beds. The only enemy of the oyster reported here as of much consequence, is the *Urosalpinx*, called by the natives "snail-bore"; these mollusks become very troublesome some years, but had not occurred in great numbers during the season of my visit (1880).

LAKE'S BAY PLATFORMS.—The "platforms" to which I have alluded, are in some cases nothing better than a mere plank floor, set in the bank in such a way that a boat-load of oysters, which are always extremely muddy and foul when first taken from the beds, may be floated alongside at high tide, and the oysters shoveled overboard upon it. The receding tide leaves this bare, and at the same time opens sluice gates, which allow a stream of fresh water from the land to cover the oysters, under the genial influence of which they rid themselves of the distasteful brine contained within their shells, and also puff out their forms to an appearance of fatness very pleasing to the epicure.

Frequently, however, an elaboration of the platform is constructed, which is worthy of special note. The bank is dug into and piles are driven, until a floor can be laid at a proper level below high-water mark. Over this a tight shed is built, sometimes 75 feet long by 25 feet wide, and of considerable height. On one side of this shed a canal is dug, into which a boat may run, and its cargo is easily shoveled through large openings in the side of the shed on to the floor within. On the opposite side of the shed, both within and without, run floors or stages above the reach of high water, where the oysters can be piled after freshening, packed in barrels and loaded on boats or drays for shipment. When the tide goes down it leaves the oysters upon the platform within the shed nearly bare, a depth of 8 or 10 inches of water being retained by a footboard at the seaward end of the shed. An arrangement of sluices now admits the fresh water, and the freshening begins. Over the space devoted to the platform or vat, at a sufficient height to let a man stand underneath to shovel up the oysters for packing, in which work he uses a dung-fork, is a broad shelf or garret, where barrels, baskets, boat-gear, and other small property can be safely stowed, since the whole shed, platform, oysters, and all, can be locked up. I have given an illustration of one of these houses at Smith's Landing.

SHIPMENTS OF OYSTERS FROM LAKE'S BAY TO PHILADELPHIA.—From these settlements on Lake's bay two lines of railway run to Philadelphia, side by side. One is the Camden and Atlantic, and the other the Philadelphia and Atlantic City (narrow gauge). Since the recent completion of this latter road, all the Lake's bay oysters have been sent by its line, which offered superior advantages; and as none go to Philadelphia (the almost exclusive market) by any other means, the railway's account of transportation of oysters may be accepted as supplying the statistics of the annual product of the region. The agent at Pleasantville gave me the figures for the season of 1879-'80, which are as follows:

Oysters sent to Philadelphia.

624 car-loads, at 70 barrels	barrels..	43,680
43,680 barrels, at about 3 bushels to 1 barrel	bushels..	130,000
43,680 barrels, at 500 oysters to 1 barrel	oysters ..	21,840,000
43,680 barrels, at 240 pounds to 1 barrel	pounds..	10,483,200
43,680 barrels, at 26 cents freight		\$11,356.80

These oysters were sent by from 100 to 120 shippers, which represent the number of planters. There are from 50 to 75 men in addition, who are hired, and so getting a living out of the oyster-interests here. The narrow-gauge railway company proposes to run a line, which may be finished by the time this report is published, down the bay shore to Somer's Point, Beesley's Point, and Ocean City. This will furnish so many additional facilities for shipping, doing away with the present necessity of hauling the oysters by team from one to seven miles to the station, that a large increase of oyster-production is anticipated. Many new men are engaging in planting, and the expectation seems well founded.

Although I have reckoned all the shipments in the table printed above in barrels, yet in fact the use of sacks of gunny-cloth is common here. The sacks, I was told, cost from 8 to 9 cents, and will last for ten or fifteen trips, if they can be got back from the consignee in Philadelphia. Barrels are cheaper, since they can be bought at 10 cents apiece, in Philadelphia and Atlantic City, where the summer hotels consume enormous quantities of imported flour, and they will generally be returned for several trips. Two sacks are counted to the barrel, or 250 oysters to the sack.

The prices received for Lake's bay oysters last season averaged 40 cents, at which rate the total value of the crop, which may be very closely estimated at 130,000 bushels, would come to \$52,000. Divided among 100 planters this would give an average income of about \$520.

OSTER-FLEET OF SOMER'S POINT DISTRICT.—I counted at Smith's Landing about 33 pretty good sail-boats and about 50 garvies, etc. I judge from inquiries, that this was one-third of all owned between the railway and Somer's Point, and that \$200 apiece would be a large average estimate for the value of the sail-boats. Many of them devote much of their time, in summer, to raking clams from the extensive grounds at the lower end of the bay. In the custom-house of this district, situated at Somer's Point, I find reported as registered on July 1, 1880, 59 vessels engaged in oystering and clamming, as follows:

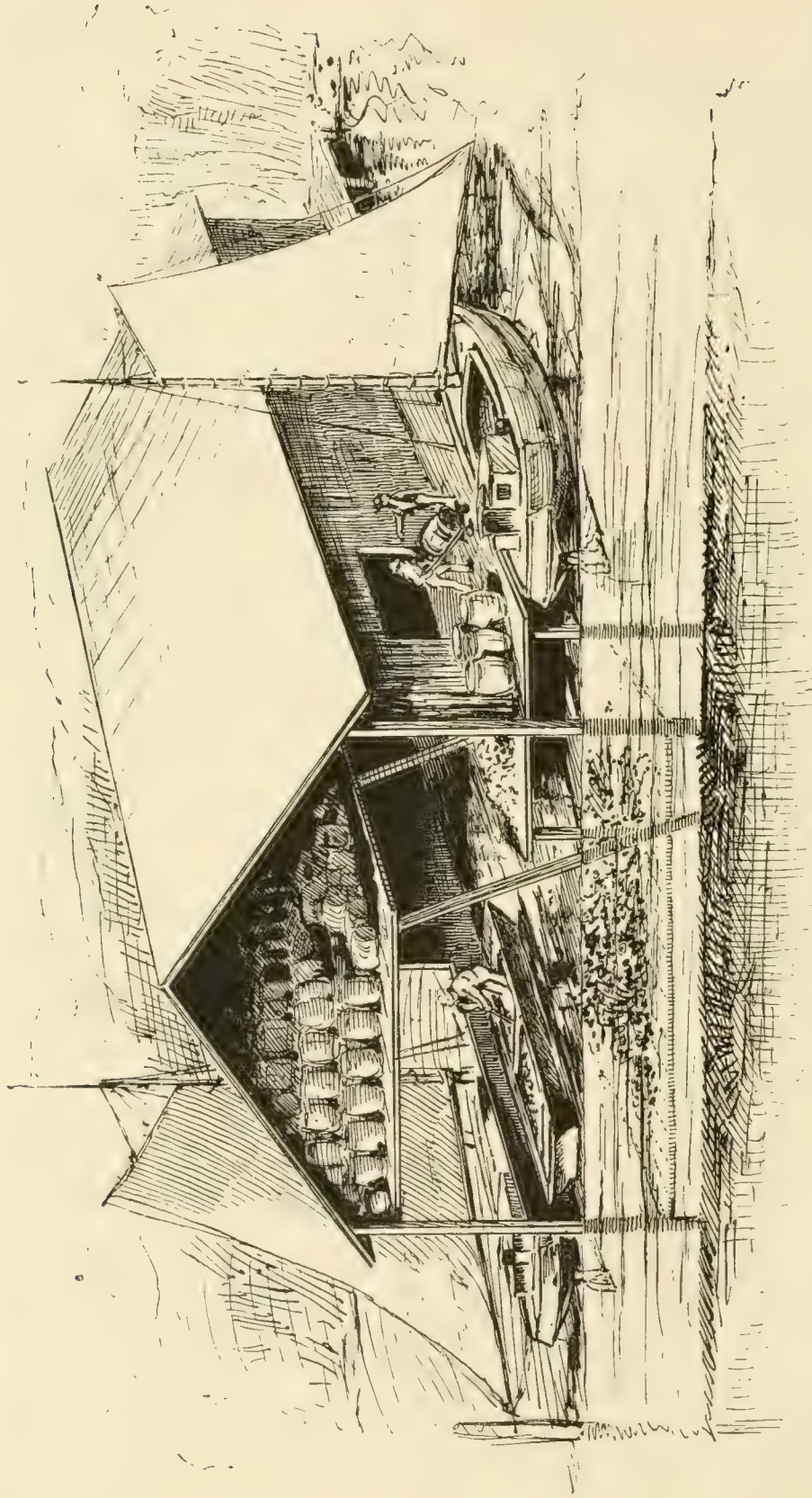
Name.	Tons.	Name.	Tons.	Name.	Tons.
A. Robinson	30.87	Mary Ella	28.92	L. C. Wallace	16.61
Alfred C. Harmer	22.25	R. B. Leeds	34.79	Lela	9.17
Belle	20.24	Susan Leach	22.00	Linnie Norcross	8.50
C. P. Hoffman	41.75	Two Sisters	26.48	Little Sallie	13.90
Charles Lawrence	21.50	Wallace M. French	23.19	Lizzie	7.28
Cordelia R. Price	42.30	Alert	7.46	Maggie Sutphen	16.48
Deceiver	22.64	Andrew Luffbarry	9.67	Major Anderson	17.51
Estella	40.25	Belle	11.93	Malcom	5.63
George S. Courtney	25.15	Charles Haight	14.70	Margaret Ann	8.51
H. M. Somers	31.23	Dan Sooy	15.49	Manetta Sheldon	9.35
Hattie J.	30.03	Ella M.	15.49	Nautilus	10.95
Henry J. May	25.42	Emily Smith	13.09	Ocean Star	12.69
J. A. Chamberlin	61.25	Express	7.32	Rhoda S.	18.05
J. G. Crate	43.32	Golden Light	16.00	S. M. Daugherty	10.99
J. & C. Merritt	35.41	Hunter	14.02	U. S. Grant	8.47
James W. Lee	20.88	Idelwild	9.73	Uncle Dan	11.49
John Auna	29.36	J. F. Knapp	16.24	Volant	7.44
Joseph	31.70	Ioetta	12.60	William Albert	6.22
Margaret A. Amelia	23.85	John Wesley	15.76	Wonder	7.49
Mary Disston	33.18	Julia A. Reid	11.41	Total	1,165.60

The collector of the district, Mr. Thomas E. Morris, adds: "In addition to the above there are some hundreds of small boats, under five tons, engaged in catching clams and oysters in this district, of which I can give no account." I should say that about \$75,000 would represent the total value of all the floating property, large and small, devoted to the shellfisheries in this neighborhood, which includes the coast of Burlington and Atlantic counties, but is practically restricted to Lake's bay and Great Egg Harbor.

GREAT EGG HARBOR AND DENNIS.—Having crossed the Great Egg Harbor river, you find yourself in Cape May county, and still among oystermen.

The Great Egg Harbor river and bay, with its tributary, the Tuckahoe river, contain large and ancient seed-beds, which supply a large part of this coast with all the seed transplanted. These beds have been greatly extended in area since they began to be tonged, and do not seem greatly to suffer in consequence of the yearly raids made upon them. In the Great Egg Harbor river several men have, within a few years, undertaken to raise young oysters by planting culch (shells) and catching spawn. They do not use this themselves, but when it is a year old sell it to planters, who paid this year about 40 cents a bushel. There is no difficulty in securing such a supply of spawn every season. The abundance of seed-oysters in this bay formerly is proverbial. I was assured by more than one person, that years ago it was the custom, at the beginning of the season, to anchor a scow upon the ground and not move all day. Continuous tonging in one spot, from sunrise to sunset, would not exhaust the bottom. The seed lay several inches deep, apparently, and from 100 to 200 bushels could be caught by one man in a single day. Now the seed is far thinner, but the beds are spread over a largely increased area, due to incessant tonging.

Adjoining Great Egg Harbor and the neighboring coast is Upper township. South of it lies Dennis, which stretches across to the Delaware bay, and is bounded southerly by Townsend's inlet. My information in respect to both is chiefly from Mr. Peter Watkins, a shipper, and one of the largest planters in the district.



A LAKE'S BAY SHIPPING-HOUSE AND "PLATFORM" FOR FRESHENING OYSTERS, SMITH'S LANDING, LAKE'S BAY, NEW JERSEY.

Dennis township contains Dennis creek and West creek on its Delaware side, both of which abound in a natural growth of oysters every year, and in neither of which, consequently, is there any planting, more than perhaps a little desultory "laying out" in tributary creeks for private use. The laws of 1857 forbade dredging for oysters in Dennis creek, and forbade any taking of oysters from natural beds there "to be sold outside of Cape May county", with an especial injunction against non-residents. The natural oysters caught there grow in the mud, in a crowded condition, and hence are long, slender, and strap-shaped. They get the name "Stuckups" in consequence. Their shells are weak and thin, because of an absence of carbonate of lime in the soil of the surrounding region. The water here is very fresh; but the best of the full-grown oysters are annually peddled about the neighborhood, and regarded as of superior quality as a fresh oyster.

The business, then, of this district, comprised in these two townships, lies in the sounds and thoroughfares on the eastern shore, between the mainland and the outer (Peck's and Ludlam's) beaches. The bottoms of these sounds are muddy—some tough, some soft—except upon the bars, which are hard sand. The ordinary depth at low water is less than two feet, while the bars go dry every tide. Oysters are planted in both places, but chiefly on the mud. The seed used all the way from Townsend's inlet to Great Egg Harbor, is for the most part gathered in that harbor and its rivers. The price varies greatly. Planters used to give 45 cents a bushel, and got a heaping half-barrel for measure. In 1879 they paid 37 cents, measured in a scant basket, and this year the price has been 40 cents on the grounds, with 5 to 7 cents freight to be added. This is the year-old and larger clean seed, known locally as "plants"; the small "blisters" being little used here, since they never do well, nine-tenths of them failing to survive the winter.

Nearly every man who lives along the shore is more or less concerned in the oyster-planting, yet as a regular business it is hardly more than ten years old. My informant counted 30 planters along the eastern water-front of the two townships, but not all of them depend upon oystering for even a majority of the support of their families. There are none, indeed, but who also conduct a farm; many are concerned in the fisheries, others employed half the year at the life-saving stations, and another portion spend the summer-leisure in raking clams. A large crop is not, therefore, to be expected from this coast, and it is estimated as follows:

Two planters raise 1,500 bushels.....	3,000
Four planters raise 600 bushels.....	2,400
Twenty-four planters raise 300 bushels.....	7,200
	12,600

The planting of southern stock has not, as a rule, been profitable in this district. It is considered better policy to wait longer for the more hardy but slow-growing Egg Harbor plants, than to risk the easily killed, tender but more rapidly-matured, Chesapeake. Although the original expense of planting the northern oysters is largely in excess of that of the southern stock, the price received is larger in market at the end, and the risk of loss far less. Yet every few years some adventurous spirit makes a success of his southern importations, and wins very large profits. This chance is alluring, and a thousand or fifteen hundred bushels are brought up every year from Virginia.

All of the oysters raised here go to Philadelphia by rail. They are prepared for market by the usual freshening on platforms at ebb-tide, and bring high prices. This season (1880) from \$4 25 to \$5 a barrel have been received by the shippers, who paid the small planters \$3 30 at the shore, or \$3 50 delivered in barrels at the railway station. The freight into the city is 40 cents, with an added 10 cents for cartage.

EARLY OYSTER-BUSINESS OF CAPE MAY COUNTY.—Before the railway was put here all the oysters (chiefly natural growth) were sent to Philadelphia and New York by water. From the diary of Jacob Spicer, quoted in Dr. Maurice Beesley's *Early History of Cape May County* (Geol. Surv. of N. J., 1857), occurs the following item:

There is at least ten boats belonging to the county which carry oysters; and admit they make three trips fall and three trips spring, each, and carry 100 bushels each trip, that makes 6,000 bushels, at what they neat 2s. per bushel, £600.

Six hundred pounds sterling was about \$3,000; now the annual resources of the county in oysters approach \$60,000 in value, and the shipping involved on the ocean shore of the county alone, consisting of a dozen small vessels in the Chesapeake carrying-trade, and perhaps 40 sail-boats for local service on the beds, are worth not less than \$30,000. A portion of this wealth, however, remains to be accounted for.

OYSTER-FLEET OF THE BRIDGETOWN DISTRICT.—The custom-house of the district is at Bridgeton, and the collector has taken the trouble to furnish me with a complete list of the vessels oystering and registered in his office in 1880. The district comprises all the coast from the Tuckahoe river, Cape May county, around to Alloway's creek, in Salem county, and the list is as annexed:

OYSTER-VESSELS REGISTERED AT BRIDGETON.

SCHOONERS.

Name.	Tons.	Name.	Tons.	Name.	Tons.
A. S. Mulford.....	21.84	Arctic.....	31.32	D. C. Adams.....	29.59
Alice C. Ogden.....	34.39	Calvin Dilks.....	25.62	D. P. Mulford.....	27.00
Alice M. Ridgway.....	26.08	Caroline H. Mears.....	32.06	Dove.....	22.20
Almedia.....	21.51	Cashier.....	24.49	E. Fowler.....	33.85
Annie C. Moore.....	27.27	Charter.....	22.64	Edna M. Lore.....	33.71
Anna Mary Newcomb.....	29.11	Cecelia B. Sheppard.....	29.98	Elanora.....	33.23
Amanda B. Lore.....	21.30	Dawning Light.....	22.67	Elizabeth B.....	21.78

SCHOONERS—continued.

Name.	Tons.	Name.	Tons.	Name.	Tons.
Ellsworth	26.36	Laura Parsons	24.59	R. S. Burney	24.96
Equal Rights	25.25	Lizzie M. Weaver	33.42	Richard B. Jones	23.97
Falcon	21.28	Mary A. Rogers	24.03	Richard Vaux	24.63
G. Gandy	29.11	Mary F. Sheppard	32.06	Sallie and Ceola	32.00
G. W. Crist	21.81	Mary H. Lake	31.83	Samuel P. Dutton	20.99
General McClellan	23.81	Mary W. Mears	34.12	Senator	24.75
General Palmer	26.42	Mary A. Hand	33.55	Snow Flake	35.24
Harriet Smith	27.46	Mary & Margaret	21.34	State Rights	23.18
Hannah and Ida	40.68	Marcus L. Godfrey	24.17	Sarah Elizabeth	26.00
Hattie R. Johnson	29.13	Mattie L. Ford	32.20	S. C. Kemble	25.15
Ida Marts	24.98	Messenger	23.34	T. B. Husted	27.08
Irene A. B. Crawford	20.86	Milton R. Studams	59.59	T. O. Ladow	24.86
J. B. Taulane	25.16	Nettie and Lena	31.89	Tidal Wave	30.66
Jacob Rivell	35.61	North Star	20.10	Village Belle	28.26
James H. Nixon	32.27	Prize	28.61	Volant	26.28
Jennie R. Fow	25.84	R. Blackman	29.98	White Wing	22.76
Julia B.	25.96	R. D. Bateman	29.51	William C. Lore	31.85

Most of these vessels are new, and cost \$5,000 each. A present valuation of all, however, would reduce that amount to an average of \$2,000, which would make the total \$144,000.

SLOOPS AND SCHOONERS UNDER TWENTY TONS.

Name.	Tons.	Name.	Tons.	Name.	Tons.
Acasta	13.97	Ida	7.77	Melvina	11.89
A. Hulings	8.31	Ida Florence	9.61	Morris R. Lee	6.33
Advance	6.55	Ida May	11.62	Nellie	11.93
Addy Lee	6.62	James D. Godfrey	15.95	Nip Cat	7.53
Alice M	14.65	James W. Nale	6.63	Northern Light	18.69
Amanda & David	13.99	James Howard	11.51	Only Son	8.22
Anna B.	7.90	Jacob B. Lee	6.50	Oregon	12.98
Anna M	10.44	Jesse L. Rutter	6.24	Passport	11.37
Annie N. Carey	8.24	John P. Prifold	19.59	Pathway	18.08
Annie Neary	9.36	J. Lippincott	19.33	Polka	16.57
Annie M.	5.11	Joseph J. Dughan	6.28	Pilot	8.43
Arctic	11.46	Kate and Melissa	13.73	R. D. Mitchell	7.30
Bay Queen	19.48	Kate and Sarah	15.29	Ray	10.82
Belle	16.56	Laurel	15.66	Rattlesnake	6.37
Bell Sage	10.10	Leader	7.84	Rebecca	16.13
Black Dart	7.30	Leader	14.85	Rebecca	6.17
Callena	12.62	Lillie D	17.21	Richard Silsbee	7.48
Charles T. Sheppard	14.98	Little Giant	9.03	Ringgold	19.38
Charlie Smith	18.52	Little Harry	6.64	Rollin S	12.03
Caroline	17.81	Little Moses	5.70	Sarah Cox	11.43
Carrie M. Edwards	6.55	Linnet	5.82	Sarah Jane	9.82
Clara	14.07	Lizzie Liber	14.63	Sarah Jane	9.52
Collax	11.05	Lorell H. Sharp	7.85	Sarah Sullivan	16.22
Cygnet	14.72	Lucy P	10.96	Sarah & Hannah	18.24
Daniel F	14.81	Lucy	14.47	Sea Flower	8.98
Daniel B. Harris	14.96	Lucy Turner	16.27	Samuel Hanners	10.45
Detector	17.08	Lydia B	14.84	Sharp Shooter	6.11
Dove	9.43	Lydia and Sylva	15.83	Spencer C	8.47
Echo	6.13	Lucy Hopkins	9.50	Star of the West	18.94
Ella C	8.36	M. P. Ogden	10.50	Star Light	5.24
Ella D	14.05	M. and W. Robinson	13.73	Sun	16.19
Ellen H. Weeb	9.58	Madora & Emma	8.98	Sue	9.62
Eliza Carlisle	6.74	Maggie D.	9.85	Trader	12.56
Elmira H. Lake	9.95	Mary E. Davis	7.39	Trade Wind	6.32
Emily R. Green	14.04	Magnolia	16.97	Trimmer	7.63
Emily and Rebecca	10.79	Mary A. Bickley	13.23	Thomas R. Berry	9.98
Franklin S.	18.67	Mary & Phebe	11.61	Two Friends	9.92
G. H. Vauseiver	13.72	Mary & Eliza	10.19	Tryphenia	16.99
George L. Broom	17.90	Mary Ella	7.61	Union	18.88
George & Morton	16.67	Mary & Emma	19.54	United States	15.72
Glide	9.63	Mary & Ellen	6.61	Vandalia	19.82
Golden Feather	7.57	Mary Fans	6.76	Vigilance	5.76
H. Schellinger	11.30	Maria & Francis	16.67	Victory	10.69
Hannah M. Bell	6.30	Mary Ann	19.55	War Eagle	7.11
Harry C	7.97	Martha R.	7.89	William A. Brooks	13.61
Harriet Eluser	12.03	Martha C. Campbell	15.25	William B. Foster	9.56
Hattie B.	5.56	Margaret Hall	9.43	William Stevenson	16.05
Henry and Howard	14.31	Mattie Holly	8.04	William Vanneman	10.31
Henry S. Lutts	10.08				

Many of these vessels are old and of less value than they once were. They are all of remarkably pretty model, however, and completeness of equipment. Experts assured me, that for those over ten tons (of which there are 81) an average value of \$600 would be a fair estimate. This would yield \$48,600. Probably the sum of \$30,000 would cover the remainder. The discrepancy of 38 between this list and that of the oyster-association in the Delaware, described on a subsequent page, is due to the fact that many of the association vessels are registered elsewhere. Of boats less than five tons, and unregistered, there are probably 100 used in the district for oystering and clamming, and their value would add perhaps \$20,000 to the figures above, making a total of nearly \$100,000 invested in floating property by the Cape May and Delaware oystermen.

MIDDLE AND VICINITY.—Next below the district represented by Mr. Watkins' statements, foregoing, comes the township named "Middle", where I happily supplemented my own observations by the intelligent statistics of Mr. Edward Hand. This district includes a great extent of sounds and thoroughfares upon its seaward shore, and there are also opportunities for oyster-growing along the western coast. The general characteristics of ground and methods of planting do not differ from those above. In this district there are enumerated about 83 planters, three-fourths of whom may be said to support their families in this way. This is more completely true than in Dennis township, because the business here is more extensive, takes more time, and yields larger results.

The Bay shore is occupied by 14 planters, all of whom use exclusively southern oysters. They are brought as "seed" (small) almost entirely from Hog island, and (of somewhat better quality) from Chincoteague. These men own ten sloops, of from 30 to 60 tons burden each, which are used wholly in bringing oysters by the outside passage from the South, not only for their own use, but also to supply the men on the eastern shore and below them, and also to carry to Cape May or Philadelphia their own harvest, since the ocean-side men ship their crop by rail.

On the sea-shore nine-tenths of all the oysters raised are of small southern seed, the rest being plants secured in the marshes about home (only about 4,000 bushels of this will be saved a year all the way from Townsend's inlet to Cape May) and in Great Egg Harbor. It will be seen by this, that the planters of this district have a different idea of the profits in southern stock from those of Dennis. This arises from the fact, that they find their chief market in supplying the summer hotels and population of Cape May, and can sell an oyster of inferior quality to those raised in Dennis, all of which go to Philadelphia for "prime" trade. The argument of the "Middle" men is this: Last year (1879) we could buy Chesapeake seed at 18 cents, which became fit for market in two years. For northern seed, at the same time, we had to pay 42 cents first cost and freight, and had to wait three years for it to grow, all the time at the risk of destruction by ice. The selling-price of the two will not differ at the end in favor of the northern stock more than \$1 25 a barrel. A glance shows how much more profit lies in the southern stock. One planter, a year ago, bought tolerably large southern seed at 38 cents a bushel. They are doing well, and he expects that eighteen months after putting them down he will sell them for \$4 50 per barrel. Granting that he takes up as many bushels as he put down (highly probable), he will make \$1 42 per bushel profit.

Of the planters in this township—

26 sell a present average of 1,000 bushels a year	26,000
67 sell a present average of 250 bushels a year	16,750
Total annual crop	42,750

The planters get \$1 per bushel at the shore for their oysters this season, many selling on contracts previously made with shippers to take their whole crop. A few send to market themselves. About one-fourth or one-third of this crop goes to Cape May; the rest (chiefly from Delaware shore) is sent to Philadelphia.

STATISTICAL RECAPITULATION FOR NEW JERSEY (OCEAN SHORE):

Number of planters and shippers	855
Extent of ground cultivated	1,300 acres..
Value of shore-property	\$75,000
Number of vessels and sail-boats engaged	675
Value of same, including small boats, etc	\$270,000
Number of men hired by planters and dealers	150
Annual earnings of same	\$60,000
Total number of families supported	900
Annual sales of—	
I. Native oysters	bushels.. 250,000
Value of same	\$250,000
II. Chesapeake "plants"	bushels.. 77,500
Value of same	\$60,000
Total value of oysters sold annually	\$310,000

M. DELAWARE BAY.

43. NEW JERSEY AND DELAWARE SHORES OF DELAWARE BAY.

EARLY HISTORY.—The oysters of Delaware bay were prized by the earliest settlers, and there are frequent allusions to this resource in the early narratives. Thomas Campanius Holm, chaplain to Governor Printz, in 1642, for instance, mentions "various kinds of shellfish, as oysters, lobsters, sea and land turtles, cockles and muscles". Speaking of Delaware bay, more particularly, he says:

There are oyster banks and an oyster strand all the way to Bomptie's Hook [now Bombay Hook] on both sides of the river; these oysters are so very large that the meat alone is of the size of our oysters, shell and all.

MAURICE COVE: TOPOGRAPHY AND CHARACTERISTICS.—The center of the present oyster-industry in the Delaware bay and river, on the New Jersey shore, is at Maurice cove, in Cumberland county, which is reached by the Cumberland and Maurice river railroad from Bridgeton. This shore is bordered all the way by extensive marshes, through which innumerable small creeks find their way from the interior, and which contain many open places called "ponds". Throughout these creeks and ponds, in the tide-ways and along the edges of the sedge-plats and islands, oysters have always grown in great profusion. In addition to this the bottom of the bay and of the Delaware river, from Cape May beach clear up to and a little above Colhansey point, at the southern end of Salem county, a distance of not less than 50 miles, is everywhere spotted with oyster-beds. The same is true of the opposite (western) shore, which will be considered in another chapter. These oyster-beds are not confined to the shallow waters near shore, or to the sedge-plats, but are apparently scattered over the whole bottom of the bay. Even the ship-channel, 90 fathoms deep, contains them, as experimental dragging shows. How this might have been a century ago I know not; but such is the present condition. In *Watson's Annals of Philadelphia*, 1843, I find some interesting facts stated in regard to this district. Mr. Watson says:

Having been at some pains to learn something of the present and past state of our oyster-beds in the bay, I have arrived at sundry conclusions, such as these: that our fields of oysters, notwithstanding their constant delivery, are actually on the increase, and have been augmenting in extent and quality for the last thirty and forty years. This fact, strange to the mind of many, is said to be imputable to the great use of the dredging-machines, which, by dragging over a greater surface, clears the beds of impediments, and trails the oysters beyond their natural position, and thus increases the boundaries of the field. These dredges are great iron rakes, attached to the vessel by iron chains, and which trail through the oyster-beds while the vessel is moving over them by the force of the wind in her sails. In this way many more oysters are dragged and loosened from the mud than the rake will take up, and thus are left free to propagate another future supply.

It is said to be a false kindness to oysters to let them alone, as they did in New York to their famous "Blue Points", by a protecting law, which served only to have them so covered with mud as to actually destroy them.

An old oysterman informed me, as an instance of the increase of oyster-beds, that he used to visit a little one, thirty years ago, of one to two hundred feet long, and growing, known as the *new bed*. There is a field of size, also beds of size, off Benj. Davis' point, and Maurice river, New Jersey, and off Mahant's river, Delaware side. Since the formation of the Breakwater, lobsters and black-fish have come there in quantities. By and by we may expect much increase of them there. It is discovered to be a fact, in all the ponds found in the sedge marshes lining the two shores of the Delaware, that in them are found the best oysters, and that in one of them called the Ditch, which is an artificial canal cut into the marsh, fine oysters are always to be fished out. It has been remarked by my informant, and corroborated by others, that although oysters are found in salt-water, they will not bear to be removed to water which is salter. Experiments have been made of hanging a basket of bay oysters over the vessel's side exposed to the salter sea-water, and they have been found to die in twelve hours. Hence the necessity of planting them in waters less salt, or at least not salter than their native beds. Those caught after a copious rain are said to be much finer than those taken from the same place before the rain.

The oyster is of a tenacious nature, attaching its gelatinous substance to almost all bodies with which it comes in contact—such as wood, iron, or stone. When they are found attached to glass bottles, they are always found much fatter for it.

Those who make a business of transplanting come early in the season, and carry them away in their boats to the *inland waters* about Egg Harbor, etc., from whence they are taken in the fall quite fat, and carried overland to the city market and sold as Egg Harbor oysters.

Not all of this quotation may be wholly relevant, but there is so much in it that I have thought it no harm to give it all.

SPECIAL LEGISLATION PREVIOUS TO 1856.—So important had the oyster-fisheries in this region become thirty years ago, that they were the subject of much special legislation, which appears in the revised statutes of 1856. These laws are substantially as follows:

SECTION 1. Authorizes the board of chosen freeholders of Cumberland county to occupy for twenty years, for the use hereinafter stated, Maurice river cove within the following boundaries: "Beginning at low-water mark, directly opposite East point, in the township of Maurice river, Cumberland county, and running thence a south course to the main ship channel; thence by a straight line to low-water mark, directly opposite to Egg Island point, in the township of Downe, in said county, and thence by low-water mark the several courses and distances of the shore bordering on the said cove, and covering the mouths of the several streams that empty into said cove, to the place of beginning." But the "natural oyster-beds in Maurice river cove or Delaware bay, known severally as the East point beds, Andrews' ditch beds, the Pepper beds, and the Ballast beds, and the beds that fall bare at low tide, shall not be occupied for planting oysters, nor dredged upon, nor shall oysters be taken from the said beds, nor from any of the rivers or creeks of Cumberland county, for the purpose of planting (but all citizens of this state shall have free access to them to catch oysters for their own use)", under heavy penalties for violation.

SEC. 2. Authorizes the board of chosen freeholders of Cumberland county to appoint one or more persons, holding office for one year, to stake off the said cove and make a survey and map of the shores and land covered with water, a copy of which shall be filed in the

county clerk's office, and "to lay off and cause to be marked by stakes such subdivisions of said cove, not exceeding ten acres each, as in their discretion shall seem best designed to promote the planting and growth of oysters; *provided*, the navigation of said cove be in no wise obstructed thereby; *provided*, that no person shall own more than ten acres, and no company more than thirty acres."

SEC. 3. And it shall be lawful for the said commissioners, after subdividing the said cove, as aforesaid, to lease the same at public vendue to the highest bidders, for not less than one nor more than five years; the bidders shall in all cases be citizens of the state, and shall pay the sum bid annually during the term of the lease. Upon the payment or securing the payment of this annual rent, the bidder shall be entitled to the exclusive use of the designated land for the purpose of planting oysters during the term specified in the lease.

SEC. 4. Makes the penalty for trespassing upon or removing oysters from the leased oyster-lots, without written permission of the owner, liability to treble damages; for second offense fine not exceeding \$100, imprisonment for 60 days, or both.

SEC. 5. Enjoins upon the commissioners the enforcing of penalties and forfeitures against non-resident offenders and the collection of rents due; after paying needful expenses and receiving compensation awarded by the board of chosen freeholders, the residue of money collected shall be applied to the public school fund.

SEC. 6. The commissioners shall make an annual report, under oath, of their proceedings and money transactions.

SEC. 7. Excepts all natural beds from the operation of this law, which took effect April 1, 1857.

SUPPLEMENTS.

SEC. 8. Every boat or vessel lawfully catching, planting, and growing oysters on the flats and grounds of Delaware bay and Maurice river cove, adjoining the counties of Cumberland and Cape May, shall be assessed annually \$5 upon all boats and vessels not exceeding five tons, and \$1 per ton, custom-house measurement, upon all boats and vessels exceeding ten tons. This assessment to be paid by the master of the vessel to the collector of the oyster-fund, between March 1 and May 1 of each year.

SEC. 9. Appoints G. Compton special officer, to enforce the law, at a salary of \$500 per year.

SEC. 10. Provides that the said special officer shall occupy an office at Port Norris, where complaints of the violation of the oyster-laws may be made. This officer may "arrest any person or persons found stealing oysters in Maurice river cove or Delaware bay, or from the banks in Maurice river, or in any of the rivers or creeks of Cumberland county; and any person or persons convicted of such offense shall, for every bushel of oysters found in his or their possession, pay the sum of \$1 50, and shall also, for every such offense, forfeit and pay the sum of \$100. It shall be the duty of all citizens, when called upon, to aid the special officer in making seizures or arrests, and any citizen, or captain, or commander of sail- or steam-vessel who refuses said aid shall pay \$50 fine.

SEC. 11. Appoints a collector of the oyster-fund of Maurice river cove, who shall assess and collect all dues from vessels; shall issue certified licenses, holding force for one year, to all captains of boats and vessels who shall pay the taxes heretofore required, permitting them to engage in catching or planting oysters; shall refuse licenses to all boats or vessels not complying with the conditions of this act; shall pay the salary and expenses incurred by the special officer; and shall himself receive for this service 5 per centum of all moneys he collects.

SEC. 12. The collector shall keep true records of his transactions, record all licenses, etc., and furnish bonds in \$2,000 for the faithful performance of these duties.

SEC. 13. Every captain, upon taking out the beforementioned license, shall take oath that he will at all times diligently aid in the enforcement of the laws of New Jersey for the preservation of clams and oysters, and will promptly report to the special officer any knowledge of any violation of said laws; and any captain refusing to take out said license and make said oath, shall forfeit his right to catch or plant oysters in Delaware bay or Maurice river cove, and if found doing so shall incur the penalties of a trespasser as heretofore prescribed.

SEC. 14. The proceeds of all property seized and sold shall be paid to the collector for the benefit of the oyster-fund. (As a rule, one-half of all fines are similarly appropriated.)

SEC. 15. All persons growing oysters in Maurice river cove are authorized to meet annually on the first Tuesday of March, at Port Norris, and, having organized into a meeting, they may elect by ballot a special officer and a collector, to serve for one year ensuing, at a salary which may then be fixed; and shall elect an auditing committee of five members, whose duty it shall be to examine and audit the accounts and vouchers of the collector of the oyster-fund, and report upon them at each annual meeting. This meeting is also authorized, by the consent of two-thirds of those present and entitled to vote, to raise a tax of \$1 per ton per annum upon all boats of over five tons measurement, in addition to the tax heretofore imposed by this act; said additional tax to be imposed for one year only at a time, and not to be continued except by consent of two-thirds of the voters at a subsequent meeting.

SEC. 16. Whenever, at the end of a fiscal year, the oyster-fund, after expenses are paid, shall exceed \$2,000, the collector shall pay the same to the state treasurer, to be applied to the support of the schools of the state.

SEC. 17. Forbids catching oysters "in Maurice river cove, or on any planting-ground in Delaware bay", between sunset and sunrise, under penalty of \$50.

SEC. 18. Enacts that every boat or vessel lawfully catching or planting oysters in Delaware bay, to which a license is given (as heretofore), "shall wear in the middle of the mainsail, * * * a number painted in black, 18 inches long, and to be designated by the license".

SEC. 19. Superseded by act of 1880.

SEC. 20. Makes it lawful for any person who has been a resident of the state for six months to make a written application to the clerk of the court of common pleas of the county in this state, where the applicant resides, for a certificate setting forth that the applicant is a resident (as above), is not engaged in planting oysters or clams, but desires to rake shellfish within the waters of this state from the natural beds in Delaware bay, and designating the boat which he intends to make use of.

SEC. 21. The clerk aforesaid having satisfied himself of the truth of the applicant's statements, shall thereupon issue to him a certificate stating the facts as above.

SEC. 22. Upon presentation of this certificate to the oyster-fund collector of Cumberland county, it shall be the duty of that officer to issue to the applicant, without charge, except for fees, a license to gather clams, oysters, and shellfish upon the natural beds in Maurice river cove and Delaware bay, on board the boat named in the license.

SEC. 23. Stipulates small fees.

SEC. 24. Nothing herein shall affect the force of section 1 of the act of 1846.

THE OYSTERMEN'S ASSOCIATION: SPECIAL LICENSES.—Under this law an association of oystermen was formed and is still in existence. Each year the board of twelve directors, of whom Mr. Daniel Howell is president, fixes the rate of taxation upon the vessels in the association, which is deemed needful to cover the expenses of the

association. The chief outlay and main object of the association and fund, is the providing of a watch-boat and police crew, which shall watch the beds in the cove against thieves and arrest all boats that do not show, by a number in the middle of the mainsail, that they have a license. Last year (1879) from 227 boats licensed, about \$2,000 was collected by Mr. Benjamin Campbell, the collector at Port Norris. This year (1880) the fee is 50 cents per ton, custom-house measurement, and the total fees will amount to more than before, since 255 boats are already licensed.

The license given by the association reads as follows :

Special license, No. —.

By authority of the state of New Jersey :

_____ of _____ county, state of New Jersey, having paid the sum of _____ dollars, license is hereby granted to the said _____ to catch, plant, and grow oysters in Delaware bay and Maurice river cove, in the state of New Jersey, one year from date, in conformity with the provisions of an act of the legislature of New Jersey, entitled "An act for the better enforcement in Maurice river cove and Delaware bay of the act entitled 'An act for the preservation of clams and oysters', approved April fourteenth, eighteen hundred and forty-six, and the supplements thereto", which act was approved March twenty-first, eighteen hundred and seventy-one. This license is to be used by the said _____ as captain or commander of the _____ called the _____, of _____, state of New Jersey, of _____ tons burden, and numbered _____ in the middle of the mainsail.

Given under my hand and seal of office, at _____ this _____ day of _____ eighteen hundred and eighty _____.

_____. [L. S.]

Annexed to the counterpart of this license, which is filed in the office of the collector, is a printed oath, by which the captain swears that he will obey and help enforce the laws of the state for the protection of the oyster-fisheries, upon all occasions.

The obligations of living up to these regulations are avoided by many irresponsible boat-owners, who, rather than pay the assessment and enter the association, prefer to take their chances of arrest, and forfeit whatever advantages the association may have to offer. The watch-boat is therefore kept busy looking after home delinquents, rather than thieves from abroad. The captain of this watch-boat receives \$130 a month pay, and provides his own crew out of it. He carries three to five men, but in case of any emergency calls upon anybody at hand to render help, and he is bound to obey.

In the case of the oyster-boats controlled wholly at home, it is a general rule that the men go on shares. The vessel takes one-third of all receipts and the crew divide the rest, paying the captain's "grub bill" in addition. If each man makes \$500 a year by this arrangement, he does very well. The crews are made up of residents of the state, at least of residents of six months' standing. When a crew is hired, the wages are from \$20 to \$40 a month and board.

As usual, where the oyster-business has become of great dimensions and planting is carried on on a large scale, there are a number of persons who are, to a greater or less extent, deprived of real or imaginary benefits and privileges which they enjoyed under a more primitive condition of things. From the inclosed river and ponds, and also from the outside waters of the bay southward of Egg island, large numbers of large-sized and sweet oysters have always been taken and sent to market or peddled through the neighborhood. When planting-beds were so greatly increased in Maurice river cove, the shore people found that the diligent search for young oysters through the marshes, and the persistent dredging during three-fourths of the year, were sensibly diminishing the supply of marketable oysters attainable by the small open boats. Of these there are fifty or more owned along shore. They are too small to come under the association's tax; do not belong to planters, but are owned by men who live near the shore, and gain a large part of their livelihood by tonging and hand-dredging. These people, owing to misfortune or improvidence, are too poor to plant; but can do well if they are allowed to catch all the year round in the southern part of the bay, where all the oysters taken are of marketable size. For the protection of this class, therefore, against any possible rapacity of more fortunate and powerful neighbors, the legislature this year passed a law which gives general satisfaction. This makes it unlawful "to catch oysters from any of the natural beds in Delaware bay, north of a line bearing southwest from the mouth of Sow and Pigs creek, in the county of Cumberland, from the last day of June in each year to the first day of April in the succeeding year, and no oysters shall be caught south of said line for the purpose of planting at any season of the year; and any person offending against either of the provisions of this section shall be deemed guilty of a misdemeanor". Punishments are a fine of \$100, or imprisonment, with forfeiture of the craft and all its furniture.

OYSTERS AND OYSTERING AT MAURICE COVE.—A large part of the oysters sold from Maurice cove are of natural growth and do not become improved by transplanting. Many of them do not even require to be freshened on the "board-banks" before being taken to market. This is the case with those obtained off Egg island. These excellent wild oysters are dredged from all depths, six to eight fathoms of line being the ordinary amount used, however. Successful dredging has been done, however, in all parts of the southern half of Delaware bay, even in mid-channel, where the water is more than 500 feet deep. This deep dredging is unprofitable, however, and not practiced; but that oysters exist there has been shown by experiment, as I was positively assured by Daniel T. Howell, esq., of Mauricetown, who gave me many interesting notes upon this region.

While the dredging for natural oysters can only be done by the large boats properly fitted with improved windlasses and deep-water apparatus, large quantities of seed are furnished the planters from the creeks and

marshes, by men who pick them up or tong them, using small boats. This seed varies according to locality. In Dividing creek and southward it is very poor, with thin shells, and is used to be replanted in inclosed ponds. From the Maurice river and northward better seed is brought, and good, natural-growth oysters are tonged up and sold to wagoners, who peddle them through all the southwestern counties of the state at from 50 cents to \$1 a bushel. One man in Maurice town, who worked alone and in an open boat, is said to have sold between five and six thousand dollars' worth of this stock in a single season, recently.

The limit of natural growth northward on the New Jersey shore of Delaware bay, is a little above Cohansey point. All along the shore from here to Cape May the growth is solid, but out in the middle they grow in isolated patches. All the northernmost beds are useful only as seed, and the protective law hitherto quoted was made in the interest of about 1,000 families, who find their support in oystering along shore. This estimate of the number of families supported is probably too low, and is derived from a pretty exact estimate of the number of men employed in the vessels, obtained by the following survey:

In planting on the Jersey shore of Delaware bay, or, in other words, in Maurice cove, it is entirely fair to estimate 300 boats engaged, since 255 are registered, and about fifty, under five tons, are regularly working unregistered, though all these do not plant, while there are several others of large size which defy or neglect registration. Most of these 300 boats are of good model and excellent build, as has already been hinted. Some exceed 40 tons in burden, and an average value of \$1,000, big and little, is not too high. This would give \$300,000 as the total worth of the fleet on the western shore.

Now in planting native seed in the spring, for no southern seed of consequence is put on the eastern shore, each of these 300 vessels will put down 20 deck loads of seed; at 400 bushels to the deck load, this sums up 24,000,000 as the amount planted, in 6,000 trips.

These planting operations, and the subsequent marketing of the crop, cause the employment in these 300 vessels as crews, during ten months every year, of no less than 1,500 men, at five to each craft. All these are required by law to be citizens of New Jersey. They receive an average of \$25 a month and board as wages; and since it is impossible to separate those who work on shares, from those who accept a salary—something which is incessantly changing—it is safe to calculate as though all were hired. Fifteen hundred men at \$25 a month, for ten months, gives the sum of \$375,000 annually expended as wages by the owners of the Maurice cove beds. In addition to this the board of the crews, at the rate of about \$40 a month in each vessel, aggregates \$120,000. The cost of repairs upon a vessel engaged in such a work as these are, and of their size, will be stated low at \$300 a year for the first five or ten years; I believe it to be more. At that rate \$90,000 a year, in cash, is paid out for "running expenses".

If you should ask one of these planters how his crop compares with the amount of seed he put down, probably you would be told he could not tell. From much study of the matter, I believe the following statement to represent nearly the truth:

To bring the oysters raised on the Jersey shore of Delaware bay to market, each one of those 300 boats makes ten trips a season, and on each trip brings 500 bushels. This is an average estimate, but it is so far below the line of safety, in my opinion, that to the total I propose to add 17,000 bushels, in order to get a "round" figure. Multiplying 3,000 trips (300 boats by 10) into 500 bushels a trip, gives 1,500,000 bushels as the total of oysters that are sent to the Philadelphia market by water from Maurice cove. By rail, as I have said, came 83,000 in 1879; but in 1880 this was reported increased, and to it may be safely added 17,000, making an even 100,000, or 1,600,000 bushels as the total product.

Now what is this worth? I have used, heretofore, in general calculations, a dollar as representing a bushel. It will hold from the Delaware capes to Boston. See how near an actual calculation brings it here. All the west Jersey oysters that go to market are either "primes" (first quality) or "cullens" (second), and in the ratio of one of the former to two of the latter. The ordinary price for cullens has been 80 cents, and of primes \$1 50; adding and dividing gives \$1,033 as the average value. This, remember, is the amount paid to the planters, and, consequently, distributed to a great extent at home in New Jersey, but not wholly, for a large part of the ownership of the oysters is held in Philadelphia. Summarizing the foregoing produces the following tabulation:

Number of vessels	300
Value of same	\$300,000
Number of boats	800
Number of men employed	1,600
Wages (\$375,000) and board (\$120,000)	\$495,000
Amount of seed planted	2,400,000 bushels..
Amount of crop raised	1,600,000 bushels..
Value of same	\$1,600,000
Amount of ground necessary	6,000 acres...
Probable actual value	\$50,000

WESTERN SHORE OF DELAWARE BAY.—Let us now cross over to the western shore of Delaware bay, which is equally suitable with the eastern, and has long been employed in planting oysters. The business now is on the increase, but it is chiefly in the hands of Philadelphia firms.

The natural beds of oysters—"rock-oysters" is the local term—are confined practically to the shore between the mouth of Mahon river and Bombay hook. Though formerly far more productive, probably, than now, it is from an area of little, if any, greater width than Philadelphia, and the states of Pennsylvania and Delaware generally, have always obtained their oysters. Not forgetting this great food-resource, in advertising the advantages of his colony, the astute William Penn wrote, in 1683 :

Of fhell-fifh, we have oyfters, crabs, coccles, conchs, and mufoles; fome oyfters fix inches long, and one fort of coccles as big as the ftewing oyfters. They make a rich broth.

In Smith's *History of New Jersey* is quoted a manuscript from the *British Museum*, and written in 1669, which notes:

Two leagues from Cape Cornelius, on the west side of the river [the Delaware], near its mouth, there is a certain creek called the Høeren Kill. * * * There are two small islands in it, the first very small, the last about half a league in circumference. * * * The two islands are surrounded with a muddy ground, in which there grows the best sort of oysters, which said ground begins near the first island, for the mouth of the channel has a sandy bottom, being also very deep, and therefore there are no oysters there.

The locality of this is evidently Lewes-Town, at the mouth of the bay. Somewhat later, under date of October 8, 1745, Kalm records that "the shore of Pennsylvania has a great quantity of the finest oysters. * * * They come from that part of the shore which is near the mouth of the river Delaware". Three years later Kalm writes :

Aged people * * * complained here [Philadelphia] and everywhere of the decrease of fifh. Old people asserted the fame in regard to oyfters at *New York*; for though they are still taken in considerable quantity, and are as big and as delicious as can be wifhed, yet all the oyfter-catchers own that the number diminifhes greatly every year; the most natural caufe of it is probably the immoderate catching of them at all times of the year.

Only portions of this bottom, which extend over about 16 miles, are now productive when dredged, however, and Capt. D. C. Montgomery, whose experience is very large, considers that 500 acres would probably cover the total area of "oyster-rock" in the whole distance. These beds are not now as productive as formerly, and are not spreading to any extent. This is considered due to the excessive working of them in both spring and fall, combined with absence of any dredging in early summer. They are thus allowed to become covered with drifted matter, and coated with slime for several weeks prior to the spawning season (July), and are thus in no condition to catch and save the floating young. As a consequence the greater part of the northern-born seed used is imported from outside waters. South of a line drawn eastward from Mahon river the law (of 1871) recognizes no natural beds, "except such as may not be more than three feet below the surface at an ordinary low water".

DELAWARE OYSTER-LAWS.—The laws regulating oyster and clam catching and cultivation on this Delaware shore are voluminous, and I quote them with particular care, as annexed :

STATE OF DELAWARE—DIGEST OF 1873—CHAP. 55.

SECTION 1. Forbids any person not a citizen of the state to take oysters or clams or terrapins in the waters of the bay without having a license, which license shall be granted at a cost of \$50 by a county clerk of the peace, and shall be good for one year for the boat named. Violation of this section shall be a misdemeanor, fined \$50, and the boat and tackle shall be detained for trial before any justice of the peace. Powers are given to sheriffs to seize, and penalties for resistance of process are decreed at length.

SEC. 2. Makes it unlawful for any person not a citizen of the state to take oysters, clams, or terrapins from any "river, creek, or pond within this state, and put them on board of any boat or vessel not wholly belonging to and owned by citizens of this state". Penalties for violation as in section 1.

SEC. 3. All oysters caught in any such river, creek, or pond (except Misspillion or Murderkill creeks), shall be culled at the place where they are caught; and the young and refuse oysters there deposited.

SEC. 4. Forbids taking away from any river, creek, or pond (except Delaware and Indian river), more than 20 bushels of oysters or clams at one time; and no vessel in any waters of this state shall be loaded from any vessels authorized by this section to carry 20 bushels or less.

SEC. 5. It shall be unlawful for any person to take oysters from any river, creek, or pond in this state, between April 30 and September 1, or at any time to be planted anywhere else in or out of the state, or to use a dredge there. Violation incurs fines and confiscation of vehicle and oysters obtained.

SEC. 6. Prohibits selling more than five bushels of oysters from Misspillion creek to be taken out of the state.

SEC. 7. Any citizen of the state may appropriate to his own use not exceeding an acre of bottom for planting oysters, and, having marked the same by stakes or other visible boundaries, and planted oysters therein, it shall be unlawful for any other person to take oysters therein growing, under penalty of forfeiting \$50 to the owner of such plantation. But no place shall be so appropriated where oysters are growing, or so as to impede navigation; nor shall more than 40 feet square of Lewes creek be appropriated by any person.

SEC. 8. Forbids laying out or bedding oysters on the flats, shore, or bank of any stream.

SEC. 9. Protects terrapin eggs.

CHAP. 551.

SECTION 1. Every person or company engaged in the business of opening oysters in this state for exportation, amounting to more than \$500, shall take out a license.

SEC. 2. This license shall be granted by a clerk of the peace for \$30, good for one year.

SECS. 3 to 7. Instructions to officers, etc.

LAWS OF 1871—CHAP. 9.

SECTION 1. All oyster-plantations, not exceeding 15 acres, heretofore made in Delaware bay, shall be deemed the possession of the respective planters of them, and the oysters thereon shall be their private property, on condition that rent shall be paid as hereinafter provided, beginning May 1, 1871.

SEC. 2. Any person may appropriate not exceeding 15 acres of the free bottom of Delaware bay, south of Reedy island and west of Blake's channel, for planting oysters, which shall be properly designated by stakes. This ground, and the oysters planted thereon, shall be private property. "But before any one shall avail himself of this privilege he shall apply, in writing, to the said collector for a license for that purpose, and pay to said collector the sum of \$25 as the fee and price therefor, and also the sum of \$3 per ton (custom-house measurement) for the vessel to be employed in the business of planting. The said license shall last only for one year. * * * The privilege granted by this, and the first section, shall not embrace any portion of the bottom which is a natural oyster-bed, and has been hitherto used and worked as such, nor shall it be extended beyond the mere right to plant oysters and hold them as property."

SEC. 3. No person not a resident of the state, or a regularly licensed planter, shall dredge or otherwise take oysters from any public oyster-bed of this state; penalty, \$100 for each day's offense and forfeiture of all boats and tackle. "The fee for license to dredge the public beds shall be \$3 per ton (custom-house measurement), * * * but such license shall not be taken to authorize the planting of oysters."

SEC. 4. "The different plantations shall be treated as numbered in the order in which the licenses to plant are issued under this act, and the boat or vessel used * * * shall wear that number painted in black, at least 18 inches long, in the middle of her mainsail." And also "shall wear, in the middle of her mainsail, a Roman letter painted in black, 18 inches long, to be designated in the license".

SEC. 5. For the purpose of protecting the oyster-beds in the bay, and those who plant oysters under this act, the collector of license-fees is instructed to purchase or hire out of the money collected a suitable "watch-boat", manned by a captain and two men. She shall be employed night and day from March 1 to September 1, or longer, and may call upon any other boat's crew to help her as a *posse comitatus*, in the enforcement of this act against trespassers. The proceedings to be taken subsequent to arrest and upon conviction, with disposal of fines, are fully stated.

SECS. 6, 7, 8. Instructions to captain of watch-boat as to powers and duties, and statement of form of proceedings against offenders, and penalties for those who resist the police.

SEC. 9. Forbids *any one* dredging in July or August, or on Sunday, or between sunset and sunrise.

SEC. 10. Taking of oysters from another's plantations is designated to be larceny, and punished accordingly.

SEC. 11. Forbids depositing oysters in any streams in this state and taking them up in July or August, except with tongs.

SEC. 12. An oath is required of every person taking out a license, that he will not violate or allow his vessel to be used in violation of this act.

SEC. 13. A license applies to only one vessel, whose name must be stated therein.

SEC. 14. The governor shall furnish suitable licenses in blank to the collector.

SEC. 15. The collector shall be appointed by the governor of the state; he shall take oath of office and give penal surety.

SEC. 16. The duty of the collector shall be to enforce this act; when so engaged the watch-boat shall be under his orders, and he is clothed with all needful powers.

SEC. 17. Creates a new justice of the peace at Little Creek Landing, Kent county, specially to administer this law.

SEC. 18. Compensation of collector fixed at 5 per cent. of moneys collected, not to exceed \$1,000; of captain of watch-boat, \$80 per month; and of crew, \$40 per month each, they finding their own board, to be paid out of funds collected.

SEC. 19. Moneys collected to be for the use of the state, except what is needed for expenses under the act.

SEC. 20. Publication of the act.

SEC. 21. In case of the use of a boat of only two tons burden, the license shall cost only \$25.

LAWS OF 1875.

SECTION 1. Instructs all oyster-boats acting under Delaware laws not only to cease their occupation, but to be taken "within the land" at or before sunset, and the captain of the watch-boat must enforce this. A signal for retiring shall be given from the watch-boat; and when that is shown there shall be an end, until sunrise next day (not Sunday), of all work upon the oyster-plantations or upon the public beds. Such signal shall be the lowering of the watch-boat's flag. This flag shall be of navy-blue bunting, six feet by four in length, with a diamond of white in the center, having a diameter of two feet between the points farthest apart. She shall always wear it at her maintopmast head during the working hours, and she shall never leave the planting-grounds, but shall cruise up and down the same, if the wind will allow, except when she is compelled, by floating ice, severe stress of weather, accident, or want of repairs or supplies, from remaining in the bay, it being the design of passing this act, as it was of passing prior acts, that honest parties who plant oysters under the shield of the state authority, shall be protected in the rights which were intended or are hereby meant to be secured to them; and that offenders against such authority shall be brought to condign punishment.

SECS. 2, 3. Prescribes as penalties for violation of section 1, annulment of license, forfeiture of boat and equipment, and refusal of license for two years succeeding the offense. The exact method of procedure before the court, in executing trial and penalties, is set forth at length.

SEC. 4. Where a plantation license has been issued and a plantation appropriated, and the fee for any year is in arrear, no right to dredge or dispose of said plantation shall exist until all the back fees are paid up, and no sale or disposal of an oyster-plantation, or right to dredge it, or plant upon it, shall be valid until first approved by the collector, who shall not give his approval if, in his judgment, it will be prejudicial to the interests of the state, or of planters whose plantations lie in the neighborhood.

SEC. 5. No boat whatever shall be allowed to work, until her owner has complied with the law in regard to wearing her number, of legal dimensions, upon her mainsail; and if she attempt to do so she shall be seized by the collector or captain of the watch-boat, and held until her number is painted upon her sail.

SEC. 6. It shall be the duty of the person for the time being in charge of the watch-boat, to report at once to the collector all violations * * *, and a failure to do so shall be a forfeiture of any wages that may be due him; and further, he shall not be allowed any longer to have charge of the watch-boat, and his place therein shall be vacant * * *. The possession or having the care and management of any oyster-boat shall, for the purposes of this act, be deemed and taken to be conclusive proof of ownership * * *, and all persons on board of her at the time of such violation, shall be deemed and taken to be principal offenders, and be dealt with accordingly.

SEC. 7. It shall be the duty of the collector and the captain of the watch-boat to see that the name of any boat employed in planting or dredging for oysters, is plainly painted on her stern, and failure to do this, or a concealment of the name, shall be punished by annulment of license and a refusal of license ever after.

SEC. 8. It shall be the further duty of the collector and captain to ascertain, at least once every month, and keep a record thereof, the name of the owner of every boat employed in the oyster-business, and those on board of her shall give it to him, and the name given shall be taken to be the true name of such owner, who shall be held * * * an accessory before the fact to any violation * * * of this or the aforesaid acts, and liable accordingly. In case refusal be made to furnish the name of the owner, or there should be reason to believe that the true name is not given, it shall be the duty of those officers, respectively, to immediately take the boat itself into his

custody, and detain her until the proper and right name be furnished; and to that end he shall have power to call upon and require, as he may in every other case of necessity, the sheriff of the county to aid him, which sheriff may employ any force or means whatever for that purpose.

SECS. 9 and 10. No license to plant oysters shall be granted, until the applicant shall furnish the collector with a statement of the boat or boats to be employed by him in the business, giving separate name and tonnage, and the name of the owner and the persons who are to work her.

SEC. 11. The state treasurer shall require from the collector * * * information, on the first day of June and September, of each year, of the names and residences of all persons having license to plant oysters or dredge for them, and the names of the boats used in the business.

SEC. 12. When the captain of the watch-boat has knowledge of a violation of any of the provisions of this, or the other acts with which this is connected, he shall proceed immediately to seize the boat or boats employed in such violation, and hold her or them in his custody, until the collector has proceeded to enforce the provisions of this and the other of said acts.

SEC. 13. Neither the captain of the watch-boat, nor any of her crew, shall receive any pay for time not actually and actively spent in the discharge of the duties required by this act, and the act to which this is a supplement, but such time shall be deducted in the computation of their wages.

SEC. 14. The captain and crew of the watch-boat shall be practical seamen, and part of their duty shall be to keep the boat, her apparel, tackle, and furniture, in good repair and condition, and this without extra charge; and no repairs involving extra expense, shall be made without the concurrence of both the collector and captain, and then only such as are authorized by law.

SEC. 15. The collector shall issue no license, nor permit any boat to dredge, until the price or fee for said license has been actually paid, and the collector violating this provision shall not only be responsible for said license fee, but shall, in addition thereto, forfeit a like sum to the state.

SEC. 16. The collector shall keep a true, accurate list of all licenses issued by him, giving the name of every boat and captain thereof, respectively, with the amount paid for each license, which list he shall publish in at least one newspaper in Dover, the first week in April and October each year.

SEC. 17. The collector shall keep a separate account, in the Farmers' bank at Dover, of all moneys received by him for license issued, and shall deposit weekly all moneys received by him therefor; and all disbursements which he is, or may be, authorized by law to make, shall be by checks drawn on said fund in his official capacity.

SEC. 18. When the boundary stakes required by the act to which this is a supplement, have once been set, it shall be neither a defense nor excuse for any person prosecuted for a violation of any of the provisions of this act, or the act to which this is a supplement, that they were not standing or visible at the time the alleged offense was committed; but if the person accused be proved to have taken oysters anywhere but on his own ground, he may be properly convicted.

SEC. 19. Repeals section 6 of chapter 363, laws of 1873.

SEC. 20. The sum of \$300 is to be set apart annually, from the oyster-fund of Kent county, to the improvement of certain roads along the shore. "And in order to facilitate such improvement, it shall be the duty of all oystermen to land and deposit their oyster-shells on shore, at some convenient place to said road, so that they may be used in said repairs, and it shall be unlawful to empty or throw such shells into the water, unless the distance from the place shall be so great as to make it unreasonable to land and deposit them as aforesaid, of which unreasonableness the collector and road-overseer shall concurrently be the judges."

SEC. 21. The foregoing act to be printed and distributed to owners of boats.

Under the operation of these laws there were registered, in 1879, 62 boats. The proceeds of their license-fees amounted to \$5,324. The statistics for 1880 were not available in time for this writing, but will not greatly differ from those of the previous year. Many of the boats take out a dredging-license only, and do not pay the extra \$25 which entitles them to plant. Out of the whole 62 boats, only six or eight belong at Little Creek Landing, the headquarters of the native oyster-business, and probably there are not more than a dozen sail-boats, employing 50 citizens, in all Delaware, owned and engaged in the shellfisheries, the remainder belonging at Philadelphia and elsewhere. To a great extent, therefore, this trade is operated out of the same capital, by the same men, and contributes to the same total means of support, as the West Jersey planting.

OYSTER-PLANTING: WEST SHORE OF DELAWARE BAY.—The western shore of Delaware bay is the great scene of planting the southern oysters, which are brought annually from the Chesapeake and intended for the Philadelphia market; but, for the present, I will pass by this, and confine myself to an account of the less important business of raising northern oysters from native seed.

As no work is done during summer, the oysterman's year of labor begins on the 1st of September. It is in the fall that he procures nearly all the native seed that he proposes to plant, and his time is very fully occupied at that season. Though continual dredging is pursued on the home-beds where natural oysters grow, by no means sufficient seed is gathered there to supply the demand along this shore. I was informed that the inshore creek beds along the coast of the state furnished last year about 40,000 bushels of seed, which would count 800 to the bushel. The off-shore beds, in the deeper waters of the bay, but within state limits, yielded about 170 000. In addition to this, there were planted about 160,000 bushels of seed that grew on the New Jersey side of the bay, the procuring of which, and sale by the Jerseymen, was an evasion of the New Jersey law, and was managed in this way: The New Jersey law prohibits taking any seed from her beds to be planted outside of the state. The Jerseymen, therefore, get a cargo of small oysters or half-culled dredgings, and take it to the general market in Philadelphia. If a buyer takes their cargo at a satisfactory price, it is regarded as no part of their business to inquire what he proposes to do with it; nor can there be urged any valid technical objection to this proceeding, since the law does not define what kind or size or condition of oysters shall be sold; or that oysters sold in open market shall not be replanted by the buyer, if he chooses, outside the state. So long as he is not a resident of New Jersey, the law can of course exercise no control over his actions in such a matter. This evasion, and its method, are perfectly well understood by everybody concerned, and if there is a way to put a stop to it—the extreme desirability of which

does not appear—no one exerts himself to do so. Another method in vogue, is, for the regularly licensed boat and crew of some man, who wishes to plant on the Delaware shore, to run out with the day's dredgings and, under cover of night, transfer the deck-load to some old schooner chartered in the Chesapeake or elsewhere out of this region, for the purpose. The ostensible purpose, if discovered, is merely the trade in these oysters, but really she runs across to the western shore, and has thrown over her load before daylight, and returns the next night for a second venture in blockade-running. The courts and the sentinels are very vigilant and strict, however, and every now and then some of the Philadelphia men or some of the Jerseymen themselves are arrested and fined. It is a widespread opinion, however, that some of the provisions of the New Jersey law are unconstitutional, being violations of inter-state comity, and an attempt at jurisdiction beyond the state's limits of power. The plea in defense is, that when New Jersey entered the Union she relinquished none of the old colonial rights reserved to her under the king's charter. It is not my intention to discuss this matter, which remains to be decided some day by the Supreme Court of the United States.

The Delaware, or "western shore" planting-grounds, lie chiefly opposite the central part of the state, the villages of Little Creek Landing and Mahon's Ditch, close to Dover, being the homes of most of the oystermen. There is some desultory catching in Indian river at the southern extremity of the state, but of little consequence. The beds are chiefly so near shore as to be in less than 10 feet depth of water, though some are as deep as 15 feet at low tide. Various sorts of bottom occur, but stiff mud is preferred. In the course of a dozen years' planting on such a spot, the mud, by accumulation of shells and refuse, is converted into a solid surface. It thus is made suitable for the deposit of spawn and the growth of young oysters, which, proceeding continuously, replaces the formerly barren bottom with a genuine natural bed or "oyster-rock". The title to the plot is not disputed, however, as it would be in some districts, because of this change, and the ground becomes extremely valuable, since it forms a natural nursery for the farm.

It is the custom to allow all northern seed to lie over two winters before sending to market. There are occasional exceptions, but to dispose of a native bed at the end of a single year's growth is generally condemned, and with wisdom. Under this arrangement, however, a large part of the plantation must lie idle every alternate year; and in view of this, many of the Delaware men complain that the limit of 15 acres, defined by the state-law as the size of a single farm, is too small. It may be, considering the fact that, as I was assured, *all* the farms are cultivated at present up to their full capacity. The growth of the business may now properly call for an enlargement of the privileged holdings.

TAKING UP OYSTERS: SEASON AND METHODS.—The season for taking the crop opens in September, and produces from Delaware waters from five to ten thousand bushels annually of natural growth, large sized, marketable oysters, but these are not always kept separate in shipment from the planted stock. In taking up the planted beds of northern oysters, it is calculated that they shall yield, at the least, an equal measure to the amount of seed put down. By count, however, there will not be more than half as many, showing that 50 per cent. of the blisters perish. The profit, then, is almost wholly on the growth; but as, after from eighteen months to two years' waiting, the stock which cost, put down, say 25 cents, sells, bushel for bushel, at from 75 cents to \$1 25, the return is a very fair one. It is not always, however, that as much (by measure) comes up as goes down, and I have estimated my total accordingly, at a deduction.

In the process of taking up a bed of oysters, here, each dredgeful is culled immediately on board, and all the "trash", that is, undersized oysters, shells, and refuse is saved, and at the end of the dredging is taken to the "idle-ground", where a field of seed is growing, and emptied upon it. Much of this trash is alive and will mature. When, six months (or perhaps not until eighteen months) later, this idle-ground is overhauled and culled out for market, it will be found to have been considerably reinforced by the "trash". A second good effect of this system is, that it thoroughly scrapes clean the ground from which the season's salable crop is gathered—an advantage not to be lightly estimated.

The season ends about May 1, when the sloops cease taking any more cargoes to market, for lack of stock to carry. It is needless to say that nothing but occasional lots, by express, goes from this coast to Philadelphia by rail.

In accordance with the law, a watch-boat, in the shape of a fast schooner, once a pleasure yacht, and hence comfortably fitted up, patrols the beds every day and at night, whenever any danger is expected, but ordinarily comes into dock at Mahon's ditch each evening.

A résumé of the facts given above, in regard to the planting of native oysters on the shores of the state of Delaware, is as follows:

Location of beds off Little Creek landing.

Source of seed, both shores of Delaware bay.

Market, Philadelphia.

Price, 80 cents to \$1 50 per bushel.

Number of vessels (partially) engaged, 65.

Number of bushels "natural growth" sold, 5,000.

Number of bushels "northern plants", about 300,000.

ENEMIES AND DISASTERS.—The only enemy of consequence on these beds, seems to be the small boring-snails, chiefly *Urosalpinx*, to which I have already frequently referred. The overhauling of the whole farm once every two or three years ought to give ample opportunity to keep this pest well in check, if sufficient care is taken to pick out the borers of every kind and carry them ashore. Incessant attention to this, for a few years, by all the planters, would practically extirpate an enemy which is likely at any time to become extremely destructive.

Starfishes are unknown here, and conchs not regarded as anything to be specially apprehended. There are several fishes, however, allied to the weakfish and the drumfish, which at intervals make a raid on the beds and do much havoc. Occasional gales from the southeast also drift the mud injuriously.

A strange manifestation in September, on these beds, is the abundance of what is known to the fishermen as "sea-grapes", and which seems to be the clustered egg-cases of some one or more species of squid. For a few days, at the beginning of the season, these clusters of eggs so cram the dredges as to interfere with and delay the work. Moreover, a hard storm, or even the disturbance made by the movement of the dredge, causes them to rise to the surface, so buoyant are they, and to float away, carrying with them the oysters to which they were attached. Considerable loss is thus occasioned at times. Otherwise they do no harm to the mollusks, so far as I know.

This shore is exposed to a long sweep of the winds and is wholly unsheltered. Gales, formidable enough to stir up the deep water in which the oysters are laid, are therefore liable to work great mischief. This is most likely to occur in the autumn. For example, in the latter part of October, 1878, a great storm destroyed many thousands of bushels by drifting them off the beds, or burying them under a bank of sand or sheet of mud. So violent was this gale, that 27 oyster-vessels went ashore at Mahon's ditch alone, and several of them were set high and dry upon the marshes. Most of these could be relaunched by making a canal from their involuntary dry-dock; but one or two never could be got back to the water without more expense than they were worth, and were therefore dismantled and left to decay.

PLANTING SOUTHERN OYSTERS IN DELAWARE BAY.—There remains now to be considered the great business of transplanting and maturing southern oysters in the waters off this shore. Though this stock is chiefly owned in Philadelphia and operated by Pennsylvanians, yet its consideration belongs properly here, since the beds are wholly in Delaware's waters.

The statistics I give in respect to this, were furnished me chiefly by Mr. J. C. Cleaver, collector of the Chesapeake and Delaware Canal Company at Chesapeake City, Maryland, and refer to the last half of 1879 and the first months of 1880, completing an "oyster-season".

All the southern oysters which are brought to Delaware bay or to Philadelphia, both for planting and for immediate consumption, come through this canal, which leads from the Chesapeake. There may possibly be half a dozen outside trips made (all from Chincoteague island), in the course of the year, but this is a small exception.

The vessels, as a rule, engaged in this traffic are "wood-droggers", schooners of light draught, and able to carry from 500 to 1,500 bushels. During the planting season they will average about 1,300 bushels per load, but when running direct to market, in winter, carry only 900 bushels, the difference arising largely from an absence of any deck-load in the latter case. The number of schooners thus used varies from year to year; but the number of trips during the season reported upon by Mr. Cleaver, was 868. At \$100 a trip, charter-pay, these schooners earned that year, therefore, \$86,800. Sometimes an even \$100 is given to make the trip, and sometimes a rate of about \$10 a day is paid, but it amounts substantially to the same thing. In addition, the charterer pays the canal expenses, consisting of entrance-toll, towage, and dues of 5 cents a ton on cargo, amounting in all to about \$50. The canal thus receives an annual revenue from this source of about \$4,340.

The schooners range in value from \$1,000 to \$6,000. The owners pay the captain of such a schooner, who must know all the little creeks and oyster-buying nooks along the whole Chesapeake coast, and be a capable man at a bargain for his employers, about \$50 per month. The men in the crews get \$25. The provisions supplied by the owners are said to be abundant and of good quality.

Among this fleet are about twenty-five "role captains", who own their vessels entirely, hire their own crew, get cargoes from the south with their own money, and plant on beds claimed and prepared by themselves. Attending to their plantations personally, they bring their cargoes to the market in the fall in their own schooners or sloops, and leave them to be sold there on commission. They are thus both planters and carriers.

During the fall and winter months most, if not all, of the vessels go directly to the Philadelphia market, and their cargoes enter into the immediate consumption of the city. Sales are made from the hull of the schooner, without unloading into a warehouse. The number of trips made for this direct market consumption, makes only about one-fourth of the total recorded as passing through the canal. Three-fourths of the oysters brought out of the Chesapeake are intended to be planted, and find their destination in the beds along the western shore of the bay. The large dimensions of these receipts appear in the succeeding table from the Canal Company's books:

RECORD OF OYSTERS IN SHELL WHICH PASSED THROUGH THE CHESAPEAKE CANAL IN 1879-'80.

During months—	From Virginia waters.	From Maryland waters.	Total.	Number of oyster-vessels.
1879.				
May	31,680	126,720	158,400	176
June	7,740	30,960	38,700	43
July				None.
August				None.
September	1,080	4,320	5,400	6
October	3,780	15,120	18,900	21
November	10,260	41,040	51,300	57
December	10,800	43,200	54,000	60
1880.				
January	8,280	33,120	41,400	46
February	11,340	45,360	56,700	63
March	36,400	145,600	182,000	140
April	166,400	166,400	332,800	256
	287,760	651,840	939,600	868

From—	For planting.	For Philadelphia and other markets.
Maryland waters	488,880	162,960
Virginia waters	215,820	71,940

The planting of this 700,000 and more bushels of Chesapeake seed, is not attended with any features greatly different from the same industry and investment at Fairhaven or Staten Island. When a load of oysters for planting arrives from the South, the owner of the cargo sends on board the vessel all the men he has, and the schooner then sails back and forth around and over the designated ground. The effort in loading is to have as much as possible of the cargo on deck. It is an easy matter, then, as the vessel proceeds, to shovel overboard; and as she is constantly changing her position, and the men shovel uninterruptedly until the whole load is overboard, the oysters are pretty evenly distributed. An ordinary crew of five will thus unload 400 bushels in an hour, for five or six hours in succession. Adding this expense to his first cost and charges, a planter, who puts down large quantities, expects the cost of his various lots of oysters, big and little together, will average about 25 cents a bushel.

These Chesapeake oysters, it is scarcely necessary to say, are left down only until the succeeding fall, before being taken up for market. They have then grown into larger and fuller proportions, and have assumed a far better flavor than they originally possessed. Sometimes accident or circumstances will cause a bed, or a portion of it, to be saved through the winter and not harvested until the second fall; but this is rare, very risky, and not attended by a large increase of profits. Making a recapitulation of the western shore produce, I derive the succeeding particulars:

STATISTICAL RECAPITULATION FOR WESTERN SHORE OF DELAWARE BAY:

Extent of natural "oyster-rock"	acres..	500
Extent of cultivated ground, about	acres..	3,000
Number of planters, not counted elsewhere		40
Number of men employed, about		625
Earnings and board		\$117,000
Number of men partially employed		400
Earnings of same		\$30,000
Number of trips made after southern seed, about		620
Freight earned by same		\$62,000
Canal charges on same		\$31,000
Southern seed planted	bushels..	704,700
Cost of same, about		\$176,175
Northern seed planted	bushels..	370,000
Cost of same, about		\$150,000
Southern oysters sold annually	bushels..	650,000
Value of same		\$500,000
Northern oysters sold annually	bushels..	300,000
Value of same		\$325,000

TOTAL STATISTICAL RECAPITULATION FOR DELAWARE BAY:

Number of planters, wholesale dealers, and shippers		350
Extent of ground cultivated	acres..	9,000
Value of same, about		\$15,000
Value of shore-property		\$123,500
Number of vessels and sail-boats permanently engaged		1,365
Value of same		\$350,000

Number of vessels partially engaged.....	100
Number of men hired by planters or dealers	1,915
Annual earnings of same.....	\$614,000
Number of sailors employed on Chesapeake vessels.....	400
Annual earnings of same.....	\$30,000
Total number of families supported, about.....	2,000
Annual sales of—	
I. Native oysters.....bushels..	1,900,000
Value of same.....	\$1,925,000
II. Chesapeake "plants".....bushels..	650,000
Value of same.....	\$500,000
Total value of oysters sold annually.....	\$2,425,000

N. OYSTER-INTERESTS OF PHILADELPHIA.

44. THE MERCHANTS AND OYSTER-BUSINESS OF PHILADELPHIA.

PHILADELPHIA AS AN OYSTER-CENTER.—It will already have impressed itself upon the mind of the reader, that this whole region is dependent upon Philadelphia for its market, and hence, for a large part of the capital employed in carrying on the daily operations of the business. The city of Philadelphia, therefore, takes a prominent position as an oyster-center, and deserves a careful survey. Yet here, more even than in New York, is the business centered and compact; or else it acts simply as a silent partner—a power behind the throne—in so many operations that have already been described in the review of Delaware bay, that little remains to be said except barren statistics condensed into small space.

The region directly tributary to Philadelphia as a marketing point, extends from Barnegat around to and including the whole of Delaware bay; and it yields two millions and a half bushels annually, one quarter of which, probably, are transplanted from the Chesapeake seed-grounds.

TRANSPORTATION AND ITS STATISTICS.—The transportation to the city from New York and the Atlantic coast of New Jersey is by rail, as also to some extent from the Delaware bay shore of the same state. This supply is carried almost wholly by three railways, the various sub-lines of the Pennsylvania corporation, the New Jersey Central, and the Philadelphia and Atlantic City narrow-gauge road. Railway statistics, in all cases, were given me without hesitation by officers of the roads. The combined receipts reported by these roads for 1879-'80, from New York and New Jersey, amounts to nearly 300,000 bushels, counting somewhere near 70,000,000 oysters. These cargoes weighed over 12,000,000 pounds, and gave an income to the roads aggregating over \$27,000. By steamers from Baltimore, Norfolk, and Chesapeake landings, there were brought nearly 20,000 bushels, or perhaps 6,000,000 oysters, while the Philadelphia, Wilmington and Baltimore railway eclipsed all other lines, by reporting receipts for Philadelphia (including Southwark and Gray's Ferry) of 182,980 bushels in shell, and 70,000 gallons of shucked oysters. For these figures I am indebted to Mr. Charles K. Ide, master of transportation. Adding these two sums, on the basis that a gallon is equal to a bushel, and that each will contain (of such stock as this road transports) an average of 300 oysters, we find that 71,000,000 oysters is the number annually brought to the city, by this line alone, every year. The net revenue derived from this freight in 1879-'80, by this road, approached \$30,000, while as much more accrued to its treasury from other carriage of oysters not coming within the scope of the present inquiry.

Coming by sail-vessel from the eastern shore of Delaware bay, I find about one and a half million bushels yearly, while the western shore of the bay produces nearly another million bushels, a large part of which are southern oysters transplanted to those beds. Lastly, in winter, about 250,000 bushels are taken by sailing-vessels through the canal from the Chesapeake to Philadelphia, for immediate use. A summation of the supplies from all these sources gives as the total quantity annually handled in Philadelphia, as shown by the statistics of 1879 and 1880, to be in the close neighborhood of 2,680,000 bushels, or more than 800,000,000 oysters, worth, in round numbers, not less than \$2,500,000 at wholesale.

DISTRIBUTING TRADE.—But, of course, only a portion of these oysters are consumed within the limits of the city of Philadelphia. A large part is distributed widely throughout a region which includes the Delaware valley, the state of Pennsylvania, and to some extent the West, where Philadelphia competes in the shell-trade with New York and Baltimore. The Pennsylvania railway, for instance, reports that nearly 60,000 bushels went to Pittsburgh and intermediate stations, in 1879. Pittsburgh becomes, thus, a distributing point for its neighborhood, augmenting this stock by large receipts from Baltimore and New York. Philadelphia sends to New York and intermediate points, by the same railway, more than 100,000 bushels, and Camden distributes ten or fifteen thousand bushels in western New Jersey. There remains the draught made by the express companies and various railroads, from whom there is no report. To have ascertained, with complete exactness, the proportion of this two and a half millions of bushels which is sent out again, and consequently the proportion which is left to be consumed here, would have required weeks of time and needless trouble. But from all that I can gather in the way of data, I believe that the city of Philadelphia and its large suburbs, which together contain 1,000,000 people, will consume annually an equal

number of bushels or gallons, counting 300,000,000 oysters. This would require each inhabitant to eat about six per week the year round, or a dozen per week for half the year. A single "stew" would include this number; and for the few who would not find upon their tables one mess of stewed or otherwise cooked oysters in a week, I believe there are many who would see them in some shape every other day for six or eight months, especially among the working classes.

EFFORTS AT PACKING: SHUCKING: SHIPPING.—It has been found that the extraordinary advantage which Baltimore enjoys in that direction, has made it useless for Philadelphia to attempt to compete in the packing-trade. The few attempts that have been made have all met with ill-success. Some fresh oysters are canned here, however, and sent out, chiefly to near neighborhoods. There is not enough of this done, however, to furnish employment to more than 50 shuckers among the whole shipping-trade of the city. These are mostly whites, and perhaps half of them are married. They come from the most ignorant laborers, and are reckless in behavior. Some are hired by the week at \$10, others prefer to work by the piece, and receive 60 cents a thousand.

The fresh oysters shipped are sent mainly in wooden "buckets" of variable capacity, but often holding several gallons, a large piece of ice being thrown into the oysters and the cover locked.

In addition to this there is some shipping of Maryland stock, opened at Seaford, Crisfield, etc., in sealed tins. These are square cans, holding one or two "quarts", but the measure is somewhat short. They are filled with four-fifths of solid oysters and one-fifth pure water. A "case" of these cans may hold two or four dozen. The cans are not manufactured in Philadelphia, but in Baltimore, where the large local demand enables them to be made from one-half to three-fourths of a cent cheaper than elsewhere.

WHOLESALE TRADE.—The total wholesale trade of Philadelphia is now divided, so far as can be ascertained, among about 50 firms, which, if all dealt alike, would give to each a business of about \$60,000 yearly. Of course there is no such equality. Most of these dealers are also planters, furnishing the capital with which their boats, registered in New Jersey and Delaware waters, and manned by crews, residents of those states, plant upon ground outside of Pennsylvania's waters, and consequently held in some other name than that of their actual owners and operators. A large part of all the floating and shore-property credited to the shores of Delaware bay, and estimated in the preceding chapter, is really owned, therefore, in Philadelphia. To separate from this inter-state and partnership aggregate the capital invested by the oyster-dealers of Philadelphia, becomes as great a problem, therefore, as in New York. Some elements for the calculation appear in the following items:

Value of wharf-property devoted to oyster-vessels, exclusively, about	\$400,000
Value of sheds and shore-property	100,000
Value of perhaps 250 vessels, etc.....	300,000
Floating capital.....	400,000

But all these are hardly more than guesses, and it is out of the question, under the circumstances, to separate the oysters planted by Philadelphia capital from those outside of it, I suppose. It is perhaps safe to say, roundly, that in the city of Philadelphia a million dollars are concerned in the oyster-business, outside of the estimates of values already credited to New Jersey and Delaware. Of this sum about \$100,000 consists of outstanding credits and the bank balances needful to be maintained by the dealers.

The fifty firms represent about 75 members. Each may be said to employ an average of five men as clerks, teamsters, and porters, amounting to 250 in all. To this again must be added the 50 shuckers heretofore spoken of, making a total of 375 men, representing from 300 to 350 families, finding their support out of the wholesale handling of oysters alone in the city.

RETAIL TRADE.—As to the number supported by the retail trade, that can be approximated with even less exactness. The latest business directory of the city gives: hotels, 150; oyster-houses, 376; restaurants, 441; lager beer saloons, 1,452.

Supposing we say, that in order to meet the demands of the guests for oysters, cooked or raw, these establishments find it necessary to employ extra help as follows:

150 hotels, 2 persons each	300
376 oyster-houses, 5 persons each	1,880
441 restaurants, 1 person each.....	441
1,452 lager beer saloons, one-half person each	721
Total.....	3,342
Add peddlers and curbstone-stands, 158	158
	<hr/>
	3,500

Many of these 3,500 persons are women and children, some of whom, nevertheless, assist in supporting others than themselves. In other cases various duties are combined with the service of oysters. But I think it within bounds to estimate 3,000 families maintained by this retail industry.

Dealings in oysters in Philadelphia are chiefly carried on at the foot of Spruce street, at the foot of Vine street, and at the Brown street wharves. In each case the locality is determined by the presence of a large provision-market, and the business in general fishing centers near it. At Brown street there is an association of the owners of boats selling there for mutual protection on questions of wharfage and the like. Most of the business is done at Spruce street, where the Jersey boats chiefly go, and where some of the heaviest dealers have their offices.

STATISTICAL RECAPITULATION FOR PHILADELPHIA :

Number of planters, wholesale dealers, and shippers.....	75
Value of shore-property.....	\$100,000
Number of vessels and sail-boats engaged (registered in other States).....	250
Number of men hired by planters or dealers.....	250
Annual earnings of same.....	\$150,000
Number of restaurant servants, etc.....	3,500
Annual earnings of same.....	\$1,000,000
Total number of families supported.....	3,250
Annual sales of—	
I. Northern oysters..... bushels.....	1,740,000
Value of same.....	\$2,000,000
II. Chesapeake "plants"..... bushels.....	940,000
Value of same.....	\$750,000
Total value of oysters sold annually.....	\$2,750,000

O. MARYLAND AND BALTIMORE.

45. OYSTER-FISHERIES OF MARYLAND.

THE INVESTIGATIONS OF MR. R. H. EDMONDS.—In respect to Baltimore and Maryland, the information to be given is due almost entirely to the labors of Mr. R. H. Edmonds, of Baltimore, who investigated the subject in the capacity of special agent of the Census. His report for this special region was published in the *Journal of Commerce*, Baltimore, of which Mr. Edmonds was an editor during the summer of 1880, and gave much satisfaction to those who were interested in the matter in that city and down Chesapeake bay. If some of his expressions are too enthusiastic, they can easily be pardoned. The men of Chesapeake bay believe that their waters cover the very best oysters in the world, but my note-books contain a record of a dozen localities, all along the coast, where the same assertion is fondly made and sincerely believed. He is a wiser man than I, who attempts to decide among their claims and, *ex cathedra*, to award supremacy to any one district.

I shall have little to add to Mr. Edmonds' history of the oyster-interests of Maryland, and include all of his report in quotation marks:

GENERAL CONSIDERATIONS: INTRODUCTORY.—“The Chesapeake bay and its numerous salt-water tributaries, contain prolific and valuable oyster-beds, probably about equally divided between the two states of Maryland and Virginia. Notwithstanding the great importance and value of the oyster-trade of the Chesapeake bay, it is a subject upon which there has been no trustworthy information, either as regards its extent, the amount of capital invested, or the past and present condition of the business. The legislatures of Maryland and Virginia have, at every session for many years, revised and re-revised the laws upon this subject for their respective states; but have always been content to work in the dark, knowing nothing practically, and never seeing the value of obtaining full information upon so important an industry. There is, perhaps, no subject of such vital importance to either state, that is so little understood. By some it is as greatly overestimated as it is underestimated by others. Many who have never lived near the water, and who gain their information from the rose-colored pictures, drawn by correspondents who see only the best features of the trade, imagine that an oyster-bed is a mine of wealth, from which every oysterman may gather a liberal competence with but little labor. Nothing could be more erroneous.

“The present report must, at the best, be but the basis for a more elaborate and thorough scientific examination of this subject. From the chaos in which I found the business, so far as regards statistical information, I have tried to evolve some facts and figures which, by showing the importance of the trade, may cause a more careful study to be made of the means to arrest the present depletion of the beds, and provide ways for increasing the natural supply of oysters. Until this is done, it is almost useless to hope for wiser laws than those now in existence, many of which are not worth the paper upon which they are written. There are so many widely-differing interests, each seeking, through its representatives in the state legislatures, to have such laws enacted as will protect its own particular branch of the trade, regardless of what may be desired or needed by other branches, that it is utterly useless to expect to please all. Politicians, however, dependent upon the votes of the unlearned as well as the learned, must seek by all means to please their constituents, however unwise may be their desires. The carrying out of this doctrine results in a conflict of opinion among legislators, and no one being willing to relinquish his own pet theories, much time is wasted in useless discussions; and, at last, when a bill is proposed, it is subjected to so many amendments that, when finally passed, it would scarcely be recognized by its originator. In this way the laws both of Virginia and Maryland, bearing upon the oyster-trade, are often worse than useless; and, if by chance a law should be good, the means of enforcing it, and the penalties for violating it, will be so inadequate

that no good results will follow its passage. It is a lamentable fact, that a large part of the oystermen, many of whom are negroes, are so ignorant as to be easily led by demagogues. I have been informed by a prominent and reliable gentleman in Virginia, that during a late political canvass for the state legislature, one of the candidates, in an address to the oystermen, promised, upon condition of their voting for him, that, should they desire to break any of the oyster-laws, he, as a lawyer, would defend them free of cost. My own observation leads me to believe that this is by no means an exceptional case. I am inclined to think that just here lies one of the greatest hinderances to the enactment and enforcement of suitable laws.

“The oyster-trade of the Chesapeake bay is of vast extent, giving employment to thousands of workmen and millions of invested capital; and yet there are many intelligent men who believe that the blessings so lavishly bestowed by nature upon the tidewater counties of Maryland and Virginia, in the abundant supply of oysters and fish, are in reality productive of more harm than good. This belief is based upon the non-progressive character of the oystermen, who, as a class, are illiterate, indolent, and improvident. As the great natural productiveness of the soil in tropical countries has tended to retard man’s improvement, by taking from him the necessity for constant labor, so has the abundant supply of oysters in the Chesapeake tended to make the oystermen unwilling to engage in any steady occupation. A tongman can, at any time, take his canoe or skiff and catch from the natural rocks a few bushels of oysters, for which there is always a market. Having made a dollar or two, he stops work until that is used up, often a large part of it being spent for strong drink. When his money is all gone he can repeat the same course. Unless spent in the indulgence of intemperate habits, a small amount of money will enable an oysterman to live in comparative comfort. He can readily, and at almost no expense, supply his table in winter with an abundance of oysters and ducks, geese and other game, while in summer, fish and crabs may be had simply for the catching. So long as they are able to live in this manner, it is almost impossible to get them to do any steady farm-work. This cannot, of course, be avoided, as they have a right to live in the manner which best suits their taste, although several laws have, at different times, been enacted, which, while not so expressed, were really intended to have the effect of making the tongmen, and especially the negroes, engage in other occupations. Could this be done without restricting the rights of citizenship, it would prove a great blessing to the negroes themselves, as it would lead them to regular work in the cultivation of land; and it is well known that as soon as these people are possessed of a house and a few acres of land, they become more law-abiding and industrious.

“It has generally been a favorite idea of the legislators, both of Maryland and Virginia, that each state should derive some revenue from the natural oyster-beds belonging to it. To this end many laws have been passed, but no satisfactory results have ever been accomplished. The expense of enforcing laws over such an extensive body of water as the Chesapeake bay, is necessarily very great. In 1879 the entire amount received from licenses to tong, to scrape, and to dredge in Maryland, was less than the cost of maintaining the oyster-police force. This, however, was an exceptional year, and very little was collected from dredgers, for reasons given elsewhere.”

THE MARYLAND OYSTER-POLICE.—The oyster-police, to which Mr. Edmonds alludes, was organized in 1868, according to the law of the Maryland legislature at its session that year, which appropriated \$22,000 for its establishment. This money was to be expended in purchasing “a steamer and two tenders to be propelled by steam, sail, or oars, as the commissioners deemed best”. The management of the force was intrusted to a committee composed of the governor, the treasurer, the comptroller, the superintendent of labor and agriculture, and the clerk of the court of appeals. The salary of the commander of the force was fixed at \$2,500 (now reduced to \$1,500) and his bond at \$20,000 (now reduced to \$10,000). The police-boats were required to be kept constantly cruising in search of violators of the oyster-laws, who, when caught, were taken before a magistrate for trial. The vessels of the force have been increased from time to time, till they now number one steamer and eight fast-sailing sloops and schooners. The sailing-vessels are assigned to certain parts of the bay, and are required to be constantly on the alert (except at night and Sunday) to prevent any violation of the laws by dredgers. The steamer is generally traveling as rapidly as possible, from one part of the bay to another, always trying to arrive in a locality before she is expected, thus hoping to catch illegal dredgers when they least expect it. This steamer, the *Leila*, Captain Travers, was generously placed at the service of Mr. Edmonds, by the fishery commissioners of the state, enabling him to obtain information of great value, which could not have been got at otherwise; and the thanks of Mr. Edmonds not only, but of the Census Bureau itself, are therefore due and gladly tendered to the commissioners.

All the boats of the police fleet are supplied with cannon and a large quantity of small-arms, and quite often there is need of the latter, as a fight with the dredgers will occasionally occur. Of late, however, these battles are becoming less frequent.

As appears elsewhere in this report, there has been dissatisfaction with the force ever since it was first organized, as it has never been possible to prevent illegal dredging; but the complaints largely come from those who know nothing of the difficulties encountered by the oyster-police. The number of dredging-boats is so great, and the territory over which the force must exercise supervision is so extensive, that it is impossible to arrest all who break the laws. The oyster-beds of Maryland “extend from Swan point, Kent county, opposite Baltimore, southward down to and up the Potomac—total distance, 125 miles; and east and west across the bay and Tangier sound, up all their tributaries as far as salt water reaches, in all depths of water—in fact, wherever there is salt

water in Maryland, we have oysters". This is the last official report in regard to the oyster-beds; since it was made, the beds have increased, and large quantities of oysters may now be caught in localities where a few years ago there were none.

Moreover, as will be exhibited subsequently in this report, the laws have never been in satisfactory shape for the operations of the force, and uncertainty, confusion, and positive hinderance in the carrying out of their obvious intention, has often arisen, through some misfortune in technical wording.

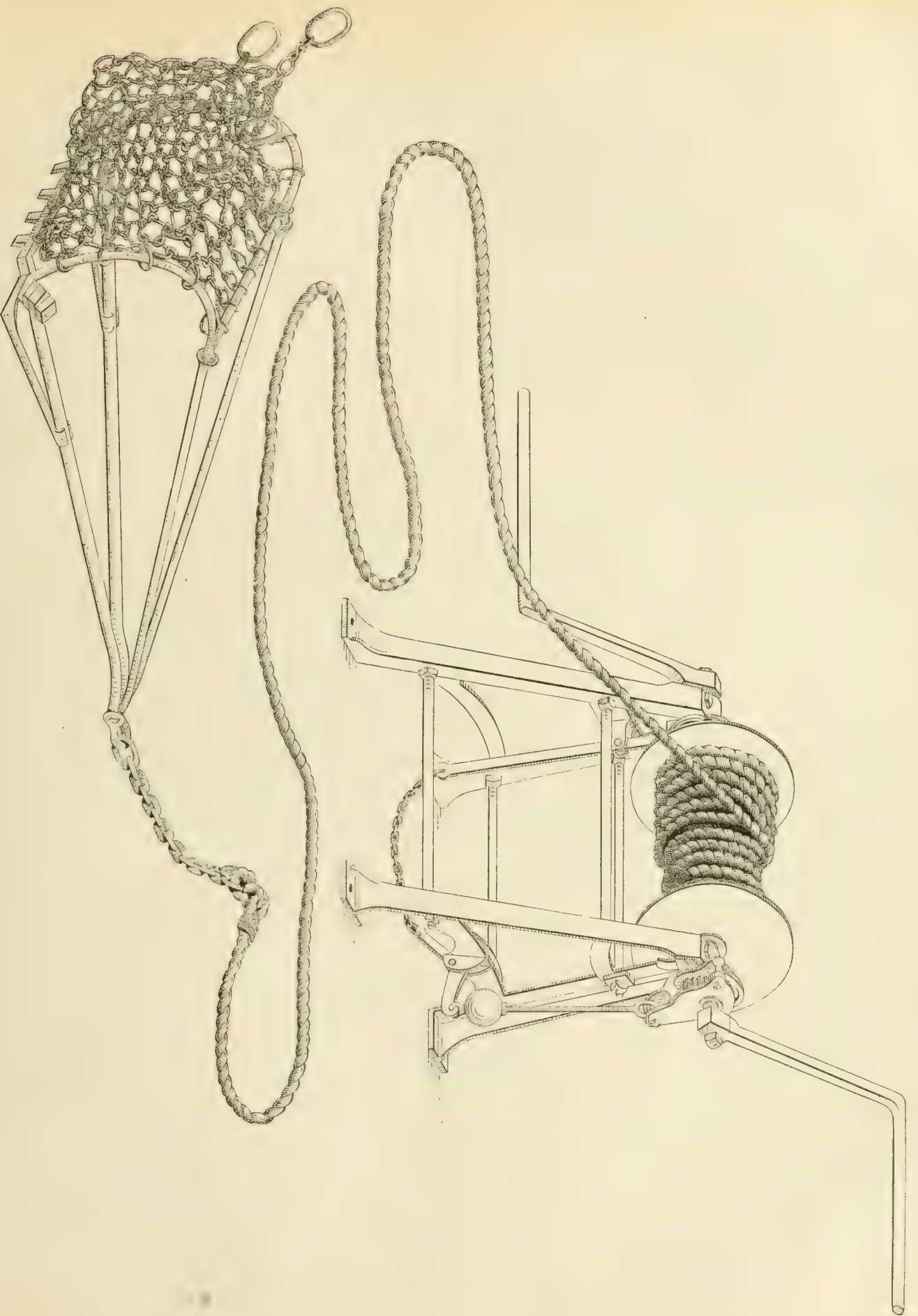
"Since the oyster-police force was first established," Mr. Edmonds continues, "up to September 30, 1879, the amount collected from dredging-licenses, measurers, and fines, exceeded the expenses of the force by \$235,156 59. In addition to this, there is a county tax upon tonging and scraping, which averages about \$10,000 a year. This amount is, by law, paid to the public schools of the respective counties. It would be necessary for the state to maintain the police force, even if it had to be done by appropriation from the general treasury. Disband the force, and in a few weeks the bay would be a battle ground for tongers and dredgers. This was plainly demonstrated last winter, on the Rappahannock river. Virginia having abolished dredging on natural rocks, it was decided to do away with the police force. In the winter of 1879-'80 about forty dredging-boats entered the Rappahannock and began work. The native tongmen, incensed at this depredation upon their beds, undertook to drive the dredgers away. In this, however, they signally failed. The dredgers, being well supplied with rifles, opened fire upon the tongmen. For several weeks the appearance of a tongman at any time, was certain to draw forth a volley from the dredgers. The legislature being in session at the time, it was decided to supply the tongmen with a cannon, a large number of rifles, and a supply of ammunition. Before the arrival of these, however, the dredgers had left. Such is but a sample of what would be constantly occurring, if the dredgers of Maryland were not overawed by the police.

"In Virginia there are some laws for taxing oysters, but as there are no means of enforcing them, they are worthless. The total amount of license-money received during 1879 was only a few hundred dollars. When gathering the statistics of the oyster-trade in Maryland, the matter seemed perplexing enough; but when the effort was made to obtain the same information in Virginia, the task was found to be even worse. State officials, from county clerks to auditor, knew nothing definite about the business. There was no license, as in Maryland; no record of the number of boats or men; in fact, nothing upon which to begin laying a foundation. The county officials, however, willingly rendered all the aid in their power, and to many of them I am greatly indebted for their kind assistance.

DREDGING.—"There are really but two ways of catching oysters practiced in this state: dredging and tonging. Scraping is but dredging on a smaller scale.

"Before discussing the merits and faults of our present method of dredging, it may be well to give some description of this manner of catching oysters, which, while very familiar to Marylanders, may not be so well understood by those who have never witnessed the practical working of it. Dredges are bags made of iron rings linked together, forming meshes similar to those of an ordinary seine, the mouth being held open by an iron frame, from the four corners of which project four iron bars converging to a point at a distance of a few feet from the mouth; to this point a short chain is attached, and joined to the chain is a long rope which winds around the windlass. Projecting downward from the bar, attached to the lower edge of the mouth, are iron teeth, which, as the dredge is drawn over the bottom, scrape up the oysters and guide them into the bag. Every vessel is supplied with two dredges and two windlasses, the latter being made stationary about midway of the deck on each side of the vessel. At the point where the windlass is screwed to the deck, a portion of the rail, three or four feet long, is removed, where, fastened to the side of the vessel, is an iron bar, over which the chain and rope run when the dredge is being worked, saving wear and tear. The windlasses are so arranged that each is worked by four men at the same time. When the boat reaches dredging-ground the captain takes the helm and the men prepare for their laborious task. The dredges are thrown overboard, and the vessel continues on her course until it is supposed that the dredge, which usually holds two or three bushels, is full, and then it is hauled up and its contents, consisting of oysters, stones, shells, crabs, fish, etc., emptied on deck. If the vessel has passed across the bar, she tacks and recrosses the ground, and continues sailing over the same bar for hours.

CULLING AND LOADING.—"If dredging is done in the day-time, the oysters are at once 'culled', but when working at night this is deferred until morning. 'Culling' consists in separating the oysters from the other things brought up by the dredge and throwing the latter overboard, while the former are placed in the hold of the vessel. In this manner the work continues until the vessel is loaded, when she at once proceeds to market. A trip will generally take about twelve or thirteen days. The effect upon an oyster-bar of dredging, has been thoroughly studied, both in this country and in Europe, and the conclusion almost invariably reached is, that it is beneficial to the beds when properly conducted as to time and manner; and my own investigations have satisfied me that this is correct. An oyster-bar, when left undisturbed for a number of years, has a tendency to solidify into an almost impenetrable rock. Dredging prevents this, and, by scattering the oysters over a wide area, greatly extends the bar.



CHESAPEAKE OYSTER-DREDGE WITH WINDLASS. [From specimen in U. S. National Museum.]

PROBABLE INJURIOUS EFFECTS OF DREDGING.—“But there is great danger that dredging may be carried to such an extent as to leave only an oyster here and there; and then the yield is too small to be profitable. Such is by some believed to be the present condition of a large part of the bay; and they hold that there is an abundance of oysters, although so widely scattered that it is very difficult to catch them. In a report upon the ‘oyster-beds of the Chesapeake bay’, made in 1872, by Mr. O. A. Brown, to the auditor of public accounts of Virginia, it is said that ‘the dredging of oysters is as necessary to their development and propagation, as plowing is to the growth of corn; the teeth of the dredge take hold of the rank growth of the oyster-beds, and, by being dragged through them, loosen them (which is done by hand in France in the management of their oyster-parks), and give them room to grow and mature properly; moreover, beds are continually increased in size, for when the vessel runs off the rock with the chain-bags filled with oysters, the oysters are dragged off on ground where no oysters existed, and thus the beds are extended, and when the vessel is wearing or tacking to get back on the oyster-beds, the catch just taken up is being culled off, the cullings thrown overboard to form new cultch for drifting spat to adhere to. Reliable oystermen tell me, that since dredging has been carried on in Tangier and Pocomoke, the beds have more than doubled in size, and, with the moderate force that worked upon them prior to the war, were continually improving. During the war the waters were thrown open to every one who would pay the military officials for a permit to oyster; the consequence was, that the oyster-beds were scraped bare, and it was two years before they could recuperate.’

“While dredging, properly conducted, is no doubt beneficial to the beds, I am inclined to think that it is being carried too far, and that its ultimate effect will be the same as in every European country where it has been unrestricted by proper laws. By some it is believed that the oyster-beds of the Chesapeake bay are of such vast extent, and the number of young annually spawned so great, that it will be impossible to destroy them. In view of the experience of Great Britain and France, and of the almost complete destruction of many of the once famous beds of the Chesapeake, such an opinion is without good foundation. The history of dredging in France and in Great Britain is very instructive, and may be studied with much profit by those who are interested in the preservation of the oyster-beds of the Chesapeake bay * * * :

PROSPECTIVE DESTRUCTION OF THE OYSTER-BEDS.—“As the best-stocked and most productive beds of Europe were quickly destroyed by unrestricted dredging, so may the hitherto seemingly exhaustless beds of the Chesapeake bay be depleted, if the present rate of dredging is continued. An illustration of this may be seen in the almost total exhaustion of the once famous beds of Tangier and Pocomoke sounds. Year after year these beds were dredged by hundreds of vessels, and even the summer-months afforded them but little rest. The result of this has been plainly seen during the past few years, and more especially during the season of 1879-’80, in the great scarcity of oysters in these sounds. Vessels having found it unprofitable to dredge in these sounds, since the oysters became so scarce, have turned their attention to other parts of the bay, and will thus give the beds a year or so of comparative rest. It is doubtful if they will ever again be as well stocked as in former years, for as soon as oysters again become plentiful, there will be a rush of all the dredging-boats in the state. Thirty years ago the depletion of these beds seemed almost impossible, and yet, at the present time, it is an admitted fact that oysters have decreased at least four-fifths in Pocomoke sound and two-thirds in Tangier. If it were possible to restrict dredging so as to give every bed an occasional year of rest, the result would prove the wisdom of such a course. Owing to the great extent of the oyster-beds in the bay, and their immense annual production, it may be some years before there is an oyster-famine, but sooner or later it is coming, unless there is a radical change in some of the present phases of the business. Properly protected and cared for, the ‘imbedded wealth’ of the Chesapeake might be increased many fold. It is a shame that the gifts so lavishly bestowed by nature upon Maryland and Virginia should receive so little practical appreciation.

LAWLESSNESS OF THE MARYLAND OYSTERMEN.—“Dredging in Maryland is simply a general scramble, carried on in 700 boats, manned by 5,600 daring and unscrupulous men, who regard neither the laws of God nor man. Some of the captains and a few of the men may be honest and upright, but it is an unfortunate fact, that such form a very small minority. The tenure by which the captains hold their positions is such, that they are almost forced to disregard the laws. Many of the boats are owned by unprincipled men, and I am informed that a number of them are even held by the keepers of houses of ill-repute. An honest captain, who complies with the law by not working on Sunday, at night, or on forbidden ground, will take at least a week longer to catch a load of oysters than one who, disregarding the laws, gets his oysters whenever or wherever he can. The first captain, upon his return, is informed in language more forcible than elegant, that unless he makes as quick trips as the second captain, his place will be filled by some one less scrupulous. With such a system as this carried out by a large number of the boat-owners, what but evasion of the laws can be expected of captains? When a premium is placed upon law-breaking, and a man is taught by his employers that oyster-laws are only made to be broken, and that the greater the skill displayed in evading them the greater will be his pay, it is scarcely to be expected that many will be able to resist the temptation. It is now rarely the case that a dredger can be found who will admit that he believes there is any wrong in disregarding the oyster-laws, and such a thing as being disgraced among his fellow-workmen by imprisonment for violating the laws, is totally unknown. In the above facts will be found

sufficient reasons why it has been impossible for the oyster-police, since its first organization, to enforce the laws. Seven hundred well-manned, fast-sailing boats, scattered over such a large space as the Chesapeake bay, are rather difficult to watch, and especially at night."

MORALS AND MANNERS OF OYSTERMEN.—Mr. Edmonds continues in his hard, but, I believe, entirely just, judgment upon his fellow-citizens, as follows:

"All blame for violating the laws does not, however, attach to the boat-owners, as some of them are prominent gentlemen of the most upright character. It is the misfortune of such men that their captains have often been trained by less honest employers, and having once acquired a love of ill-gotten gain, it is difficult to keep them from continuing in the same course. As he usually has a share in the profits, it is of course to his interest to make his trips as quickly as possible; and while the boat-owner may be opposed to breaking any laws, his captain may think and act otherwise.

"The unscrupulousness of the captain is well assisted by the character of his men. These men, taken as a class, form perhaps one of the most depraved bodies of workmen to be found in the country. They are gathered from jails, penitentiaries, work-houses, and the lowest and vilest dens of the city. They are principally whites, many of whom are foreigners (almost every European country being represented), unable to speak more than a few words of English. When a crew, which usually consists of about eight men, is wanted, the vessel-owner or captain applies to a shipping-agent, who then gathers these men wherever they may be found, drunk or sober. As one large boat-owner expressed it to me: 'We don't care where he gets them, whether they are drunk or sober, clothed or naked, just so they can be made to work at turning a windlass.' The shipping-agent having placed the crew aboard is then paid \$2 for each man furnished. With such a crew as this, who neither know nor care for laws, the captain is of course able to work wherever he desires to. As may be supposed, the life led by these men on board of the vessels is of the roughest kind. When sleeping, surrounded by vermin of all kinds; when working, poorly clad and with every garment stiff with ice, while the wind dashes the fast-freezing spray over them, hour after hour winding away at the windlass, pulling a heavy dredge, or else stooping with backs nearly broken, culling oysters. Returning from a trip, the men take their little pay and soon spend it in debauchery, amid the lowest grogeries and dens of infamy to be found in certain portions of Baltimore. It is a gratifying fact, though, that even amid such surroundings as these there are some few who are respectable and honorable men. This is more especially the case on the boats owned in the lower counties of Maryland. The crews of these are often gathered from the surrounding neighborhoods, and even as a class are not as degraded as those on Baltimore vessels.

PAY, "LAY," AND PROFIT.—"There are two ways in which these men are paid, the one most generally adopted, at present, being to pay them a stated amount per month, although payment is usually made at the end of each trip, the amount, of course, being proportioned to the length of the trip. The other plan is to allow the crew a share in the profits. When this is done, the vessel at the end of each trip first pays the 'grub bill', wharfage, and commission-merchant's charges; then, of the balance, one-third goes to the owner of the vessel, and a small bonus, usually about \$20, to the captain; after which captain and crew all share alike, except the cook, who receives something less than the others. When the first plan is adopted, the men receive their board and from \$10 to \$12, and occasionally as high as \$15, a month. Those working on shares will, during the season, average about the same as those who are paid a certain amount. A fair average of the amount made by each man would be \$11 a month, making \$77 for a season of seven months. Computing on this average, it will be seen that during an oyster-season the 4,900 dredgers receive about \$377,300, and the 700 captains, whose wages will average \$50 a month, about \$245,000, making a total of \$622,300. It would also be proper to add to this amount the cost of boarding these men, since that in fact forms a part of their wages. This costs the vessels about \$7 50 a month for each man; equal to \$420 a season for each boat, or \$294,000 for the entire fleet. This, added to \$622,300, gives a total of \$916,300 paid to the dredgers of Maryland during every oyster-season.

LICENSES TO DREDGE.—"The law requires all boats engaged in dredging to obtain from the state comptroller a yearly license, costing \$3 for each registered ton."

The blank form of this license reads as follows:

No. —.

License to dredge for oysters.

STATE OF MARYLAND, TREASURY DEPARTMENT,
Comptroller's Office, Annapolis, —, 187 .

License is hereby granted to —, of —, owner of a — named —, the tonnage of which, according to its custom-house license (or "as sworn to"), is — tons, and the master of which —, of —, to use said — in taking and catching oysters with scoop, scrape, drag, dredge, or any similar instrument, within the waters of the Chesapeake bay, from the 1st day of October, 187—, until the 1st day of May next, in accordance with the provisions of an act of the general assembly of Maryland, passed January session, 1874, chapter 181, entitled "An act to repeal article seventy-one of the code of public general laws, entitled 'Oysters', as amended and re-enacted by chapter three hundred and sixty-four of the acts passed at January session, eighteen hundred and seventy, and also chapter one hundred and sixty-seven of the acts passed at the January session, eighteen hundred and seventy-two", he having paid for this license the sum of — dollars.

This license shall hold good for one year, and authorizes said vessel to be used in catching oysters with scoop, scrape, drag, dredge, or any similar instrument, within the waters of the Chesapeake bay and in Eastern bay, outside of a line drawn from the southwest

corner of Second Kent point to Wade's point, but not on any oyster-bar within one and a half miles of Talley's point, Sandy point, Hackett's point, Thomas' point, Holland's Island bar, Three Sisters, Swan Point bar, Poplar island, one-quarter of a mile west of and between the island and the main land, nor within half a mile of Plum point, and authorizes the said parties to buy and sell oysters in this state, and does not authorize any steamboat, steam-vessel, or steam-machinery to be used for the purpose of catching oysters.

In testimony whereof I hereunto subscribe my name, and affix hereto the seal of the comptroller's office.

Comptroller.

STATISTICS OF OYSTER-LICENSES, 1870-'80.—“For reasons explained elsewhere,” continues Mr. Edmonds, “this law has never been fully enforced, and the records of the past season are entirely without value in determining, even to an approximate degree, the number of dredging-boats, since more than one-half of them worked without license. Through the kindness of the Hon. Thomas J. Keating, state comptroller, I have obtained the record of the past ten years, as shown in the following table:

A statement showing the number of boats licensed to dredge, their aggregate tonnage, and the amount of license-money paid during the past ten years, compiled from the books of the comptroller's office at Annapolis.

Counties.	Number of boats.	Aggregate tonnage of same.	Amount of license paid by same.
1870-'71	637	13,862.49	\$41,587.46
1871-'72	597	13,013.21	39,039.62
1872-'73	559	17,604.23	52,312.69
1873-'74	621	10,075.91	30,227.73
1874-'75	583	14,118.53	42,355.58
1875-'76	691	16,156.23	48,468.68
1876-'77	677	16,612.48	49,837.46
1877-'78	565	14,469.46	37,408.39
1878-'79	465	10,391.10	31,173.29
1879-'80	327	6,202.17	18,606.50
Total			391,517.49

NUMBER OF VESSELS IN THE FLEET: UNLICENSED VESSELS.—“It will be seen by examining the above table, that the highest number of licenses issued in any one year was in 1875-'76, when there were 691 boats, having an aggregate tonnage of 16,156.23, or an average tonnage of 23.38 each. Since that year there has been a steady decrease in the number of licensed dredgers, although there has been no decrease in the actual number of boats engaged in the business. Knowing this to be true, and also mindful of the fact, that even in 1875-'76, there were some unlicensed dredgers, I have thought it safe to place the number of dredging-boats working during the season of 1879-'80 at 700. There are some well-informed persons who would make the figure as high as 800, but I have based my statement upon information gathered from many sources. Taking the average tonnage in 1875-'76, and multiplying it by 700, we have 16,366 as the aggregate tonnage of the vessels now engaged in dredging. At \$3 per ton for license, this should have yielded the state, during the past season (1879-'80), a revenue of \$49,098 instead of \$18,606.50, the amount collected. The 327 vessels which, either from honesty or policy, paid into the state treasury \$18,606.50, received no privileges or advantages not taken by the 373 which dredged without license.

OYSTER DREDGING-BOATS.—“Dredging-boats range in size from 5 to 75 tons, and in value from \$500 or \$600 to \$8,000, some few owned in the lower part of the state being valued as high as \$10,000. The boats owned in Baltimore are, generally, in every way inferior to those hailing from the counties. The present value of these boats, basing the estimate upon information obtained from all parts of the state, would be an average of not less than \$1,500, and is believed by many to be much higher. At this rate, however, the 700 boats in the trade would be worth, to-day, \$1,050,000. In addition to this, the winders, dredgers, roller and chains, and dredge-lines on each boat may be valued at \$100, although costing considerably more. Adding this to the value of the boats, we have \$1,120,000 as the amount of capital invested in the dredging-boats. The total tonnage of the dredging-boats being 16,366, and the estimated value of the same being \$1,050,000, the average value will be \$64.15 per ton. As some tonnage has lately changed hands in Baltimore at \$67, the above estimate can scarcely be too great, when the high class of many of the boats is considered.

“The amount annually expended for repairing these vessels is about \$105,000.

SCRAPING AND TONGING.—“Scraping, which is simply dredging on a smaller scale, both as to the size of the boat and the dredge, is conducted only in shallow water; and while dredge-licenses are issued by the state, scraping-licenses are obtained from the counties, and hold good only in the local waters of the county in which issued. Dorchester, Talbot, and Somerset are the only counties in which scraping-licenses are issued. In the first two the charge is regulated by the tonnage of the vessel (being \$2 per ton), while in the last there is a uniform charge of \$10 on each boat, regardless of size. The crews of these vessels average about four men each, the majority of whom are able to return home after each day's work, as the boat does not go out of the county waters, except to make an occasional run to a neighboring market.

LICENSES OF SCRAPING-BOATS.—“The number of scraping-boats licensed during the past seven years is as follows:

Counties.	1873-1874.	874-1875.	1875-1876.	1876-1877.	1877-1878.	1878-1879.	1879-1880.	No. of men employed on same during 1879-'80.
Dorchester	106	149	180	142	142	157	134	536
Talbot *		59	40	47	27	34	29	116
Somerset	224	323	209	165	59	151	57	228
Total	330	530	429	354	228	342	220	880

* No scraping law until 1874-'75.

SIZE OF SCRAPING-FLEET: CHARACTER OF BOATS.—“The above figures have been kindly furnished to me by the clerks of the respective counties, and, while they embrace all vessels that are licensed, they by no means include all that are scraping. From personal inspection and from reports of reliable persons, I feel safe in placing the number of scraping-boats at 550, carrying 2,200 men. The additional 330 boats are working without license. The pay of these men will average about \$18 a month each, for the seven and a half months employed, amounting to \$135 for the season, and making a total of \$297,000 received by the 2,200 men, including the captains, whose pay is of course larger than that of the men.

“The average value of scraping-boats, including their outfit, is \$800, which gives a total of \$440,000 invested in scraping. About \$27,500 is annually expended in repairing these boats.

CHARACTER AND PROFITS OF OYSTERING: SCRAPERS AND TONGERS.—“Socially and morally the scrapers are somewhat superior to the dredgers. Tonging, although employing less capital and fewer men than dredging, is probably of greater value to the state than the latter, because the men engaged in it are of a better class, are better remunerated for their labor, and are less prone to evade the laws than the dredgers. While this much may be said in the tongmen's favor, it is yet an unpleasant truth that they, like all others engaged in the oyster-trade, either as catchers or shuckers, are, as a class, indolent and improvident. The majority of them live near the water, often owning a small house and an acre or so of land (the value of which depends upon the proximity of good oyster- and fishing-grounds), and a canoe or an interest in one, used in winter for oystering and in summer for fishing. Having secured a house, their ambition seems to be satisfied, and but little time or money is spent in beautifying or improving it. It is too often the case that tongers, especially many of the negroes, who comprise about one-third of the total number, will work only one or two days at a time, and then remain idle until necessity forces them again to earn a few dollars.

“By others, however, tonging is pursued as steadily and systematically as the wind and waves will allow, and when this is done I think it may safely be said, that the remuneration is equally as fair as in other trades. Those who pursue tonging in this way, form the most intelligent class of oystermen in the state. In some cases farmers and others, holding prominent social positions, may be found oystering during several of the winter months, when their legitimate business does not require close attention. Tonging necessitates very great exposure to the cold, but is, however, hardly as severe in this respect as dredging, and moreover the tongers suffer less, from the fact that they are generally better clad than the dredgers, and seldom work either during very cold or very windy weather, on account of the smallness of their boats. From this cause I find that even the industrious ones will lose, on an average, at least two days out of every week, and when the time wasted by the idle ones is taken into account, it will be found that 120 days out of an oyster-season of eight months is about the average length of time for each tonger. In this actual loss of at least one-half of their time, may be seen the cause which prevents the tongers, as a class, from making any improvement in their financial condition, and upon their financial condition depends their social position.

“While seeking information from the county clerks as regards the number of boats licensed, I also requested answers to the following questions, with a view to obtaining home-opinion upon the character of the tongers:

“No. 1. What is the moral and social condition of your oystermen? No. 2. What is their occupation during the summer-months?

“In answer I received the following from Somerset county: No. 1. The oystermen, as a class, are generally poor men, residing near the water-courses, living in and mostly owning small houses, with an acre or so of land or less attached to their premises, and in morals are equal to any body of men similarly situated. No. 2. In the summer, oystermen work on their lots and do some job work for their wealthier neighbors, but it is still to be feared that much of their time is unemployed. From Worcester county: No. 1. Of a rather low order; some of them good as to morals, but a large majority reckless and improvident. No. 2. Chiefly as day-laborers; others cultivate small parcels of land. From Dorchester county: No. 1. As a class, only fair. No. 2. Most of them have small truck-farms to cultivate. From Saint Mary's county: No. 1. Fair. No. 2. Fishing and agriculture principally. From Anne Arundel: No. 1. Unable to answer the question, but believe they compare favorably with other industrial classes. No. 2. Crabbing and bedding oysters.

VESSELS ENGAGED IN TONGING.—“Tonging, although generally confined to shallow water, is in some of the tributaries of the bay carried on in water varying in depth from 18 to 20 feet.

“Engaged in tonging there are 5,148 men, using 1,825 canoes or other small boats. To obtain even an approximate average of the amount of money made by each tonger is almost impossible, but I think it will be very near correct to estimate it at \$225 a season, at which rate the total amount made by the tongers would be \$1,158,300. There being 1,825 boats and 5,148 men, the average number of men carried by each boat is a little less than three. Many of the larger boats are held in joint ownership by two or three parties.

STATISTICS OF TONGING-LICENSES, 1870-'80.—“A statement is available and furnished herewith of the number of tonging-licenses issued during the past ten years, and the number of men employed on the boats in the season of 1879-'80.

Counties.	1870-1871.	1871-1872.	1872-1873.	1873-1874.	1874-1875.	1875-1876.	1876-1877.	1877-1878.	1878-1879.	1879-1880.	No. of men employed on boats 1879-'80.	Figures furnished by—
Anne Arundel	307	240	300	421	314	396	250	348	343	301	903	Sprigg Harwood.
Calvert	145	146	324	380	237	207	186	198	243	312	624	S. Sollers.
Charles	8	12	48	22	50	49	28	23	30	41	123	B. G. Stonestreet.
Dorchester	331	441	575	405	472	280	212	182	142	199	597	Chas. Lake.
Kent*					120	101	101	106	122	123	369	Samuel Beck.
Queen Anne's	118	119	178	183	210	172	146	139	144	145	435	James Wooters.
Somerset	179	252	245	125	329	239	72	59	2			Benj. F. Lankford.
St. Mary's	267	220	362	307	325	272	244	197	212	183	549	J. Frank Ford.
Talbot	199	184	274	280	294	276	254	217	258	281	843	J. Frank Turner.
Wicomico	112	106	195	125	172	98	88	133	108	134	492	S. P. Toadvino.
Worcester†					291	241	193	170	211	106	213	I. T. Matthews.
Total	1,666	1,720	2,501	2,248	2,814	2,331	1,774	1,772	1,815	1,825	5,148	

* No records farther back than 1874. † No license required until 1874-'75.

“The information contained in the above table was kindly furnished to me by the gentlemen named, who are the clerks of the circuit courts of the respective counties, and from whom all licenses to tong must be obtained.

LAWS FOR THE REGULATION OF TONGING.—“The law in relation thereto is, ‘that any resident of this state desiring to use any canoe or other boat in catching or taking oysters for sale, with rakes or tongs, in any of the waters of this state, shall first obtain, by application to the clerk of the circuit court for the county wherein he may reside, a license therefor, and such license shall have effect from the first day of June in the year in which it may have been obtained, to the first day of June next succeeding; provided that such license shall not authorize the use of said canoe or boat in taking or catching oysters in any creek, cove, river, inlet, bay, or sound within the limits of any county other than that wherein the license shall have been granted, and that the boundaries of counties bordering on navigable waters shall be strictly construed, so as not to permit the residents of either county to take or catch oysters beyond the middle of the dividing channel; * * * and every applicant for such license shall pay to the clerk of the court where such license may be granted, and before the issuing and delivery of the same, according to the following rates, viz: for any boat measuring in length 20 feet or less, the sum of \$2; measuring from 20 to 25 feet, the sum of \$3; measuring from 25 to 30 feet, the sum of \$4; and all over 30 feet, including sloops under custom-house tonnage, the sum of \$5 each; and all oysters taken with rakes or tongs shall be culled upon the natural beds where they are taken; the amount received from tonging-license to be paid by the clerk to the school commissioners for the public schools of the respective counties where such license is issued; provided the sum received from white tongers shall go to white schools, and the sum from colored tongers to colored schools.’

LICENSES AND THEIR VALUE TO THE STATE.—“The money arising from licenses issued to tong and to scrape during the year 1879, amounted to \$8,959 89, which was turned over to the boards of school commissioners of the various counties, with the exception of \$210 received by Worcester county for licenses, and which was used by the county commissioners in purchasing ‘plants’ to be bedded in the county waters. It may be well to explain, that the laws in Worcester county are different from those in the other counties, in respect to the disposal of license-money, and also as regards the issuing of license. In this county the license is \$1 on each man in the trade, and no account is taken of the boat.

“Since 1874-'75, the number of licenses granted has decreased from 2,814 to 1,825 in 1879-'80. There are several causes for this, the principal one probably being the unprofitableness of tonging, for several seasons past, as compared with former years. From 1865 or 1866 to 1874 or 1875, tonging was quite profitable, as oysters commanded a good price, but since the latter year prices have ruled very low, and many have turned their attention to other occupations. It may be that some few tongers are working without license, but from the testimony of those

well posted in the business, I am led to believe that the number is comparatively small. Mr. Benjamin F. Lankford, clerk of the circuit court of Somerset county, makes the following statement in regard to scraping-boats, which is equally applicable to tongers: 'The oyster-business has been gradually declining in this county since 1873; during that year the number of dredge [scraping] licenses issued was 327, and the money received therefor was \$3,270, which sum was paid into the public school treasury. I do not think, however, that the great difference exhibited between the years 1874 and 1879 shows the actual amount of the decline in the business. The present oyster-law is inefficient or is inefficiently executed.' By referring to the table showing the number of tonging-licenses issued during the past ten years, it will be seen that in Mr. Lankford's county—Somerset—there were 329 in 1874-'75, while in 1879-'80 there was not a single license issued to tong. The size of the tonging-canoe ranges from 15 or 16 feet to 30 feet or more, the larger ones being called 'bugeyes.' Owing to this diversity in size, it is very difficult to estimate the value of these boats, but a fair average is about \$100, which would cover the entire outfit—making \$182,500 the amount invested in tonging-boats.

CARRYING TRADE: "RUNNERS".—"Closely connected with tonging, and each mutually dependent upon the other, is another branch of the trade conducted by vessels, generally known as runners, of which there are owned in this state 200, carrying about 800 men. The oysters caught by tongers are either sold to these vessels, and by them carried to some market in the state, or they are bought by boats owned in other states and carried to northern cities. The runner will anchor near some tonging-ground, and an empty basket or a small flag will be hoisted to the masthead as a signal that she is ready to receive oysters. In one or two days she will be loaded, and is at once off for a market. On some occasions half a dozen or more runners may be seen in the same locality, surrounded by forty or fifty canoes. As soon as a tonger has caught as many as his small boat will carry, he sells out to the runner and returns to work.

CREWS OF RUNNERS AND THEIR PROFITS—"The men employed on runners will average about \$18 a month, including their board, which, with the pay of the captains (which is about \$50 a month), will amount to \$163,400 for a season of eight months, that being the length of time that these vessels are engaged in carrying oysters. Reckoning the average value of the runners at \$1,500, will give a total of \$300,000 in this branch of the trade. About \$30,000 is annually spent in repairing the 200 runners.

EXTENT OF THE MARYLAND OYSTER-FLEET.—"Summarizing the foregoing statistics as to the number of vessels, their value, etc., it is seen that there are:

Boats.	Number.	Crews.	Annual wages.
Dredging	700	5,600	\$916,300
Scraping	550	2,200	297,000
Canoes	1,825	5,148	1,158,300
Runners	200	800	166,400
Total	3,275	13,748	2,538,000

WAGES AND PROFITS.—"The totals of this table furnish an average of \$184 60 for each man. It is utterly impossible to obtain the number of people supported by this \$2,538,000. Perhaps not one-half of the dredgers support any family; but with tongers and scrapers it is different. Five is usually reckoned as the average number of a family; but as very many of these men are single, it would be too high in the present case. It can scarcely, however, be too much to reckon that for every oysterman there is an average of four individuals dependent upon him. This would give 54,992 as the number of people supported by the catching of oysters in this state. In addition to this, there are hundreds dependent indirectly, as shopkeepers and in other ways, upon the oystermen.

MARYLAND CAPITAL INVESTED IN OYSTER-FISHING.—"Invested in oyster-boats, the summary is:

700 dredgers, at \$1,500	\$1,050,000
Outfit of same	70,000
550 scrapers, at \$800	440,000
200 runners, at \$1,500	300,000
1,825 canoes, at \$100	182,500
Total 3,275	2,042,500

"The amount annually expended for repairs for these vessels is, as near as I can calculate, from reports received from shipbuilders, \$162,500, of which probably \$75,000 is received by carpenters, sailmakers, and other workmen."

MR. MALTBY'S ESTIMATE OF THE YIELD OF CHESAPEAKE BAY, IN 1865.—Before following Mr. Edmonds into a new branch of the business—that of shipments in shell—it may be well to give briefly some memoranda by Mr.

C. S. Maltby, of estimates upon the former yield of Chesapeake bay. The first of these is a table of oysters taken in Maryland waters alone in 1865, which is as follows:

Oysters taken in Maryland waters, 1865.

Destination.	Dredged.	Tonged.	Total bushels.
Baltimore	2,750,250	144,750	2,895,000
Washington and Alexandria	178,125	9,375	187,500
Boston	210,000	105,000	315,000
Fair Haven, Connecticut	131,250	393,750	525,000
New York		262,000	262,000
Philadelphia	360,000		360,000
Seaford, Delaware	27,500	247,500	275,000
Salisbury, Maryland	6,000	54,000	60,000
Total	3,663,125	1,216,375	4,889,500

Second, is given the following table of—

Oysters taken in Virginia waters, 1865.

Destination.	Dredged.	Tonged.	Bushels.
Baltimore	916,750	48,250	965,000
Washington and Alexandria	59,375	3,125	62,500
Boston	23,334	11,666	35,000
Fair Haven, Connecticut	43,750	131,250	175,000
New York		787,500	787,500
Philadelphia	40,000		40,000
Total	1,083,209	981,791	2,065,000

The consumption of Baltimore that year was: by city and county trade, 625,000 bushels; by raw-packing, 1,875,000 bushels; by "preserved", 965,000 bushels; total, 3,465,000 bushels.

EXTENT OF THE CHESAPEAKE OYSTER-FLEET OF 1865.—The gathering of oysters in the Chesapeake in 1865, according to the same notes, employed 1,000 boats in dredging. These would average 50 tons in size, and were said to yield \$200,000 in tax, at \$1 per ton. The average dredgings of these boats are given at 4,746 bushels, which, at 45 cents, yielded \$2,135 70. In tonging that year there were said to be engaged 1,555 canoes, distributed as follows:

Canoes tonging.

On Nanticoke river	200	On Chester, including Swan Point	195
On Fishing bay	150	On Annapolis	50
On Wicomico river	125	On South and West rivers	50
On Little Annemessex	40	On Herring	40
On Manokin	50	On Patuxent	200
On Pocomac and tributaries	300	On mouth of Potomac and Saint Mary's	75
On Miles river	50		
On Choptank and Sharp's islands	100	Total	1,555

Each of these canoes should pay \$44 a year tax. This, theoretically, yielded the state in 1865, \$68,420.

46. PACKING AND SHIPPING TRADE OF MARYLAND.

SHIPMENTS OF OYSTERS IN SHELL.—I now resume the language of Mr. Edmonds' report:

"From the prolific beds of the Chesapeake bay immense quantities of oysters are yearly taken for bedding in northern waters, and also for immediate consumption in the principal cities along the coast, from the bay to Portland, Maine. It is not the West alone which is dependent upon the Chesapeake for oysters, for without the supplies annually drawn from this bay the Atlantic coast, from Delaware to Maine, would be but poorly supplied. The Chesapeake is the great storehouse from which several millions of bushels of oysters are annually carried to restock the exhausted beds of other localities. More than two hundred vessels, averaging in value about \$3,000 each, are for eight months of the year engaged in the trade between the bay and northern markets. During the winter the oysters which are taken north are used for immediate local consumption, while those taken in the spring are used almost exclusively for bedding purposes. At Seaford, Delaware, there is quite an extensive packing-trade, Maryland oysters being used. It is well known that oysters are eaten during the summer at the North much more extensively than in Maryland and Virginia.

"Among many intelligent men, both in Maryland and Virginia, there is great opposition to the shipment of oysters in the shell to northern markets. They claim, and justly too, that the packing trade of the two states

would be much more largely developed if northern cities were unable to buy oysters in the shell, and as the shucking of oysters gives employment to such a number of people, they hold that it would be a wise policy to heavily tax all oysters shipped in the shell. It is very questionable, however, whether such a measure would be constitutional.

"Two great objections which might also be urged against the system, are that the majority of oysters shipped north are purchased late in the spring, when the packing trade is about over, at prices necessarily low, and that the beds are seriously injured by being disturbed after the commencement of the spawning season. The oysters purchased and taken north in the spring for bedding would, if allowed to remain until the fall and then sold for immediate use, bring nearly half a million dollars more than they now sell for; that is, there would be a yearly gain to the oystermen of Maryland and Virginia of nearly half a million dollars.

"There being in the spring no home demand for them, they sell sometimes as low as 4 cents a bushel, and from that up to 12 and 15. In the spring of 1879 a vessel loaded in the Great Choptank river with 16,000 bushels, cost \$640, or just 4 cents a bushel. These oysters are taken north and planted, where they grow very rapidly, and during the following fall and winter they come in competition with oysters from Maryland and Virginia packers.

STATISTICS OF SHIPMENTS FOR NORTHERN PLANTING IN 1879.—"During the spring of 1879, Capt. Samuel M. Travers, of the oyster-police force, directed his deputy commanders to board all vessels loading with plants for northern waters, and obtain the number of bushels taken. He has favored me with the result, which is as follows:

Shipped north for planting in spring of 1879.

	Bushels.
From Tangier sound and tributaries	353,750
Nanticoke river and Fishing bay	125,000
Little Choptank river	125,000
Great Choptank river	375,000
Eastern bay	62,500
Chester river	250,000
Anne Arundel county waters	112,500
Patuxent river and tributaries	150,000
Potomac river and tributaries	625,000
Total	2,178,750

"The average price paid was 7 cents a bushel. Owing to the action of the state legislature, at its last session, in forbidding the catching of oysters after April 15, the shipments from Maryland waters in the spring of 1880 were much smaller than for the previous year."

ESTIMATES OF SHIPMENTS IN 1879-'80.—The estimates made of shipments from Maryland waters to northern ports from May 31, 1879, to May 31, 1880, are compiled by Edmonds, as follows. I think they are hardly to be closely relied on, or of much value, but I annex the table:

Shipped to—	For planting.	For immediate consumption.	Total.
	Bushels.	Bushels.		Bushels.
Portland, Maine.....	9,000	75,000	84,000
Fair Haven, Connecticut.....	66,000	50,000	116,000
Providence and Providence river.....	110,000	30,000	140,000
Boston.....		80,000	80,000
Delaware bay.....	488,880		488,880
Philadelphia.....		162,960	162,960
Seaford, Delaware (for packing and for local use).....		200,000	200,000
New York.....			650,000
Per rail and steamers.....			100,000
Total.....			2,021,840

I have thrown distrust on this table, because I hardly think it possible to tell, with any accuracy, what went north from Maryland waters and what from Virginia.

SHIPMENTS NORTHWARD IN 1865.—In 1865 Mr. C. S. Maltby counted the shipments northward as follows:

Fair Haven, Connecticut	700,000
New York	1,050,000
Philadelphia.....	400,000
Boston, Massachusetts.....	350,000
Total.....	2,500,000

The vessels engaged in carrying oysters from the Chesapeake to the North are generally owned in the cities to which they run; and it would duplicate statistics to include them in the oyster-fleet of the Chesapeake. It would, however, be equally an error to make no mention of them at all. From the best information to be obtained by correspondence with the owners of the vessels, I would put their number at 200, with a present aggregate value of \$600,000. About 1,000 men compose their crews, and the wages of these will amount to about \$140,000 a season.

The oysters taken North for immediate use cost, on an average, about 25 cents a bushel; while plants, during the past season, probably averaged 10 cents a bushel, about 3 cents more than the price during the previous season.

The dismissing of this subject will be excused by the reader, who has access to and has read the previous chapters, which treat of the use of Chesapeake "seed" and oysters in the waters of the Atlantic states.

BEGINNING OF OYSTER-PACKING IN BALTIMORE.—"Having given an account of the oystermen, their boats, etc.," says Mr. Edmonds, "it is now appropriate to present some statistics of the number of bushels of oysters caught and the disposition made of them. The most important factor in this connection being the packing-trade, I will endeavor to show the extent of this business, as compiled from the books of the different firms engaged in it.

"About 1834 or 1835 a small packing-house was opened in Baltimore, but it soon passed out of existence, and no record of it can now be obtained. The first important enterprise in this line was the establishment of a packing-house in 1836, by Mr. C. S. Maltby, a native of Connecticut. Mr. Maltby, who, by the way, is still in the business, confined his operations exclusively to the raw trade for a number of years. As his business increased, he established a line of wagons from Baltimore to Pittsburgh, and was thus enabled to supply the west with fresh oysters long before the Baltimore and Ohio railroad had stretched out its track to that then distant region.*

BEGINNING OF STEAMED OYSTERS.—"Mr. A. Field was the first to develop in Baltimore the steam trade. He began a few years after Mr. Maltby. His oysters were steamed and then hermetically sealed in small tin cans.

"Having been once established, the trade increased quite rapidly, and for some years oyster-packing, both raw and steamed, was very profitable;† but as there is an abundant chance of financial success through dishonest means, with but little danger of detection, many unscrupulous firms engaged in the steamed-oyster business, and by packing 'light weights', *i. e.*, putting in a one-pound can about six or seven ounces of oysters, and filling the remaining space with water, and about the same proportion of oysters and water in larger cans, and either selling them under some fictitious brand, or else entirely omitting any name, they succeeded in gaining for the packing-trade of Baltimore a by no means enviable reputation. To enable them to compete with these 'tricks in trade', reliable houses were in some cases forced to follow their example, as in many places it was found impossible to sell standard goods at fair prices, while 'light weights' could, of course, be sold at much lower figures. In answer to the question as to whether 'light weights' were sold extensively in the west, I was lately informed by a gentleman from that part of the Union, that up to within a year or so it had been almost impossible to obtain full weights, but that some improvement had lately taken place in this respect. The same gentleman, on returning to the West, sent me the names of three packing-houses whose names appeared on the cans, and whose oysters were 'light weights'. An examination proved the names to be fictitious, there being no such firms in Baltimore.

THE UNION OYSTER COMPANY.—"Close competition, by causing a cutting in prices, helped on the trouble, and for several years previous to 1878 the business was very unprofitable. In 1878, to save themselves, the packers formed a combination known as the 'Union Oyster Company', embracing all the leading firms engaged in the steaming business, with the exception of three or four, who, having well-known standard brands, preferred to fight it out alone. The formation of the Union Company was, in itself, an evidence that the trade was in a deplorable condition. The company was established with a capital of \$300,000, the stock being divided among the twenty-three firms who entered it in proportion to the amount of business previously done by them. The affairs of the company are managed by a president, a vice-president, a secretary, and the twenty-three firms, who constitute the board of directors. In joining the company each firm entirely relinquishes their own steaming business (although they may still conduct the raw trade) and act merely as agents for the union. All oysters are bought and packed by the union, and then sold to the packers at a uniform price, thus placing every firm on exactly the same level. At the same time the union may sell directly to the trade.

"The result of this combination has been to partially break up fraudulent packing, although it is still carried on to some extent. Outside of the union there are three or four extensive firms, whose oysters sell on the reputation of their brands, and it would obviously be impolitic for them to engage in packing light weights.

THE RAW OYSTER PACKING-HOUSES.—"The raw-oyster business has always been more profitable and less subject to the vicissitudes of trade, although there are many losses from spoilt oysters when the weather happens to turn suddenly warm. Raw oysters, after being opened, are packed in small air-tight cans holding about a quart, and

* In 1850, according to memoranda furnished by C. S. Maltby, there were six houses engaged in packing oysters, to the extent of 400,000 to 500,000 cans a year. The price was \$7 a dozen, and five to ten cases to one purchaser was considered a large sale. Fruits, etc., were packed to a still larger value by the same houses.

† Mr. C. S. Maltby records that in 1865, 1,875,000 bushels of oysters were packed raw in Baltimore, and 1,300,000 bushels were preserved. In 1869 he numbers in Maryland 55 packers who, at 500 to 2,500 cans per day, put up twelve to fifteen millions of cans in a season of seven months, using 5,000,000 bushels. Sixty "raw" houses that year employed 3,000 hands, while the packers gave employment to 7,500 persons. Large quantities of canned oysters were annually sent, at that time, by steamship to Havana. In 1872 the same notes record as opening oysters, 2,000 men; making cans, 300 men; box-makers, 50 men; clerks and laborers, 300. All these were in the "raw" trade of Baltimore.

these are arranged in rows in a long wooden box, with a block of ice between each row, or they are emptied into a keg, half-barrel, or barrel made for this purpose. When the latter plan is pursued, the keg or barrel is filled to about five-sixths of its capacity, and then a large piece of ice is thrown in, after which the top is fastened on as closely as possible, and it is at once shipped to the West, usually by special oyster-trains or by express. Packed in this way, with moderately cold weather, the oysters will keep very well for a week or ten days. During the most active part of the "raw" season there are daily oyster-trains of from thirty to forty cars from Baltimore to the West, where nearly all the Baltimore oysters are consumed. From the shores of the Chesapeake bay, as far as Detroit, there is scarcely a city or town (connected with any of the great trunk lines) which is not supplied with Maryland raw-oysters. Farther west, and to a considerable extent in European countries, the demand is supplied by steamed oysters. The oysters used in the raw trade are of a finer quality, and consequently command better prices than steamed. In fact, nothing in the shape of an oyster is too small to be available for the 'steamed' trade. And from this arises one of the great sources of injury to the oyster-beds. So long as dredgers are able to sell their entire catch, regardless of the size of the oysters, it will be useless to expect any improvement in the beds. Young oysters of a very small growth can be disposed of almost as promptly as larger ones, and while this is the case, it need not be expected that dredgers will have foresight enough to see the wisdom of throwing all small oysters back on the bars. During the past season the supply of oysters was often insufficient to meet the demand, and the 'steamed' trade was compelled to suspend work for a considerable length of time on account of a scarcity of oysters, all that were received being quickly taken by the 'raw' men at prices which would be unprofitable for steaming.

STATISTICS OF THE BALTIMORE PACKING-HOUSES.—"Baltimore, the great oyster-market of the United States, annually packs more oysters than any other city in the world. It is the great center of the packing-trade, surpassing in that particular all other cities, and yearly handling more oysters than all the other packing points of Maryland and Virginia combined. During the season, extending from September 1, 1879, to May 15, 1880, the number of vessels loaded with oysters arriving at Baltimore, was 9,543 (or a daily average of 37 for the 257 days), bringing 7,252,972 bushels, which would make the average cargo 769 bushels. In addition to the amount brought by sail-vessels, there were 25,000 bushels received by steamers and consigned directly to hotels and restaurants, making a total of 7,277,972 bushels, of which there were packed raw 3,769,353 bushels, hermetically sealed 2,89,939 bushels, and used for city consumption 818,680 bushels.

"Engaged in oyster-packing in Baltimore there are 45 firms, with a capital of \$2,338,300, occupying, in their business, houses and grounds with an estimated value of \$1,360,966. During the summer these firms are generally engaged in fruit-packing, and their capital and buildings are thus in active use during the entire year.

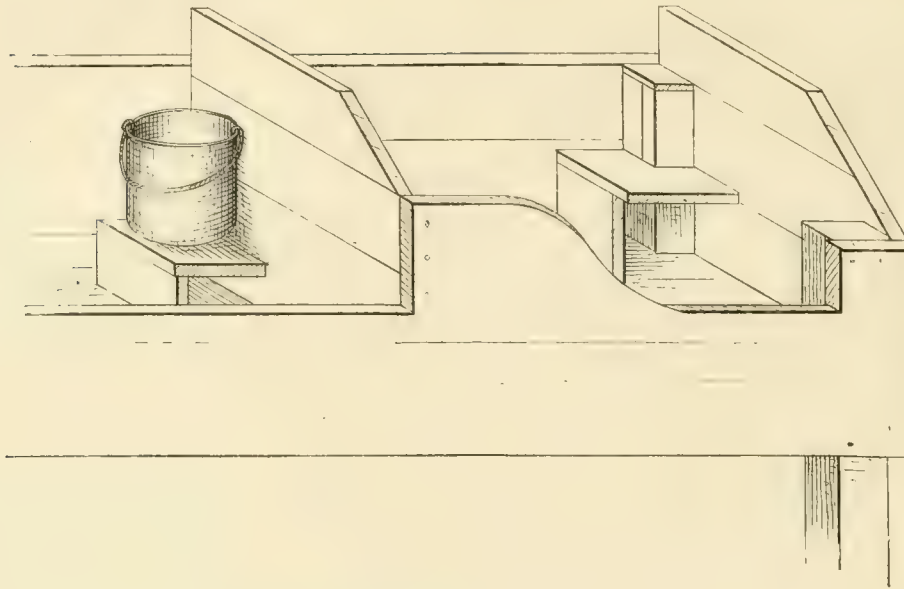
"These firms employ 4,167 males and 2,460 females—total, 6,627; and during the season of 1879-'80 paid to them in wages \$602,427. The total number of bushels of oysters packed was 6,459,292, which required 25,546,780 tin cans and 929,614 wooden cases. The value of the oysters packed, including shucking, cans, etc., was \$3,517,349. For the tin cans \$794,919 was paid, and for the wooden cases \$102,622.

CRISFIELD AS A PACKING CENTER.—"Next to Baltimore, Crisfield is the most important packing point in the state. Had the oyster-beds in the vicinity of Crisfield not been so greatly depleted, I think the trade at that city would have increased much more rapidly than it has. Crisfield is literally built upon oysters, or rather oyster-shells, almost the entire space now occupied by the business part of the city having been under water. The shells from the packing-houses have been utilized to make new ground, and gradually the city has pushed out nearly a half a mile into the bay. At the present time some of the houses are built on piles, and are entirely surrounded by water, having no means of communication with the land except by boats.

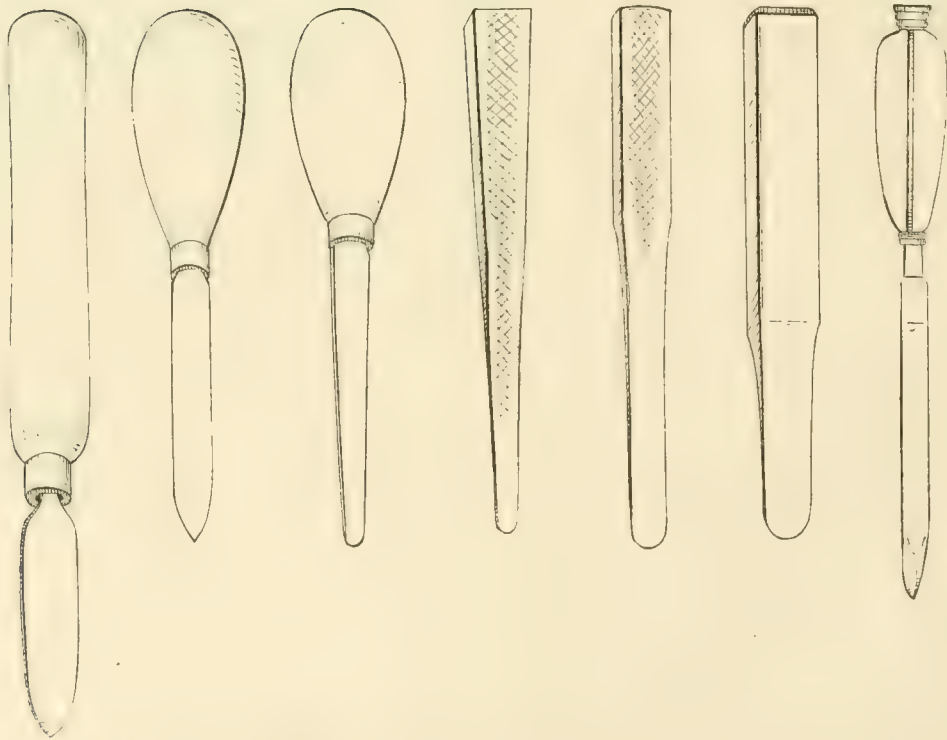
STATISTICS OF THE OYSTER-PACKING IN MARYLAND, 1879-'80.—"From the books of the 98 oyster-packing firms of Maryland, the following table has been compiled, showing the amount of business done at each city from September 1, 1879, to May 1, 1880:

Oyster-packing in Maryland, season 1879-'80.

	Number of firms engaged in packing.	Capital employed.	Estimated value of buildings occupied.	Number of males employed.	Number of females employed.	Amount of wages paid, season 1879-'80.	Number of bushels packed raw.	Value of same.
Baltimore.....	45	\$2,338,300	\$1,360,966	4,167	2,460	\$602,427	3,769,353	\$2,272,740
Crisfield.....	16	39,650	23,800	678	.....	65,481	427,270	165,100
Cambridge.....	8	20,300	10,000	385	.....	28,757	205,410	76,658
Annapolis.....	8	59,600	17,500	315	.....	26,482	156,703	69,555
Oxford.....	7	7,000	5,760	156	.....	23,258	108,960	39,986
Saint Michael's.....	4	4,500	3,000	91	.....	4,987	37,788	14,053
Sundry small places in Somerset county.....	10	23,000	15,000	387	.....	26,387	224,817	86,945
Total.....	98	2,422,350	1,436,026	6,179	2,460	777,779	4,930,301	2,725,737



BALTIMORE OYSTER-SHUCKING TROUGH.



OYSTER-KNIVES, OF DIVERSE PATTERNS, USED IN NEW ENGLAND, NEW YORK, AND THE CHESAPEAKE REGION.

Oyster-packing in Maryland, season 1879-'80—Continued.

	Number of bushels steamed and hermetically sealed.	Value of same.	Total number of bushels of oysters packed, season 1879-'80.	Total value of same.	Number of tin cans required.	Cost price of same.	Number of wooden cases required.	Cost price of same.
Baltimore.....	2,689,939	\$1,244,609	6,459,292	\$3,517,349	23,546,780	\$794,919	929,614	\$102,623
Crisfield.....			427,270	165,800				3,576
Cambridge.....	13,100	11,320	218,510	87,978				5,840
Annapolis.....	20,152	12,183	176,855	81,738				11,097
Oxford.....			108,960	39,986				1,257
Saint Michael's.....			37,788	14,053				2,530
Sundry small places in Somerset county.....			224,817	86,944				1,890
Total.....	2,723,191	1,268,112	7,653,492	*3,993,848	23,546,780	794,919	929,614	128,812

"Baltimore is the only place where tin cans and wooden cases are used to any extent, shipments from other cities being made almost exclusively in bulk—in barrels, half-barrels, and kegs—and it was thought better merely to ascertain the cost of these without giving their number.

CHARACTERISTICS OF THE "OYSTER-SHUCKERS."—"As shown by the table, there are 6,179 males and 2,460 females employed in oyster-shucking in Maryland. During the season they receive as wages \$777,779, this being an average of only \$90 06. Very few of the shuckers are regularly at work, and while in one week an expert hand may make from \$8 to \$15, during the next week he may be idle.

"Of the 6,179 males, nearly all of whom are employed in the 'raw' trade, about three-fourths are negroes, the majority of them being comparatively steady workmen, while the whites are more generally disposed to be idle and intemperate. The few whites in the business are generally of a very low class of society. Within the past year a few females have essayed to shuck raw oysters, but their number is still very small, and will probably so continue, owing to the nature of the work. The 2,460 females are all employed in the steam oyster-houses of Baltimore. They are mostly white girls of from sixteen to twenty-five years of age, the proportion of older ones, as well as of colored, being small. These girls are almost without exception of foreign birth or parentage, the largest proportion being of Bohemian origin, with Irish probably coming next. Few American girls, however poor, will consent to engage in this occupation, as in it both sexes must mingle indiscriminately, without regard to color, class, or condition. Owing to the thorough steaming the oysters are very easily opened, and the amount of physical labor required is comparatively light; but during busy seasons the work begins about daybreak and lasts until dark, and is of course exceedingly fatiguing. An industrious hand can make from 75 cents to \$1 a day, but from the great irregularity in their work they are probably not engaged over one-half of the time.

"Considering the class of the people employed in the packing-houses, I do not think it safe to estimate more than an average of two individuals dependent upon the wages of each shucker, at which rate there are in Maryland 17,278 people dependent upon oyster-shucking.

THE OYSTER-PACKING FIRMS.—"It may be well to say that there are about 225 men composing the 95 oyster-packing firms of the state. A noteworthy fact in this connection, is that the large majority of them are of northern birth, and many of them, especially those in Crisfield and the smaller packing towns, reside in Maryland only during the oyster-season, returning every spring to their northern homes. More oyster-packers have come from Connecticut than from all other states combined. It is a somewhat singular coincidence, that both Mr. C. S. Maltby and Mr. A. Field, who respectively established the raw and the steam trade, were both originally from Connecticut, and both are still living, the former in active business. There are about 1,125 individuals forming the families of the oyster-packers.

"During May, June, July, and August the packers of Baltimore are engaged in canning fruits and vegetables; and the same girls who in winter shuck oysters, in summer pare peaches and other fruits. The male shuckers of Baltimore, as well as those of the cities in lower Maryland, having no regular employment in summer, work at whatever odd jobs may be found.

THE MANUFACTURE OF CANS AND CASES.—"The manufacture of cans and cases, an important industry in Baltimore, is so largely dependent upon oyster-packing, that an effort has been made to obtain some statistics pertaining to it, although the exact figures will appear in the census of manufacturing industries. About \$250,000 is invested in the business, which gives employment to 400 men (on oyster-cans), whose wages for eight months amounts to about \$100,000. This estimate is based on the number of cans used, as shown by the returns from the packing-houses, the workmen being paid so much per 100 cans. It was very difficult to obtain any satisfactory

* Subtracting from this, cost of labor and packing-cases, about \$1,827,000, gives the original cost of these oysters, \$2,166,848. Add to this the value of the oyster "plants" sent north, \$303,276, and you get \$2,470,124. This is not quite the whole product of Maryland waters, however, and in my general summary I place \$2,500,000 as the total value annually of the state.—E. I.

statistics regarding the number of ship carpenters occupied in building and repairing oyster-vessels, but from an extensive correspondence with ship-builders in various parts of the state, I think it will be placing the estimate too low rather than too high, to say that there are 300 workmen, including carpenters and sail-makers, with yearly wages amounting to \$156,000. As can-makers, ship-yard workmen, etc., we then have 700 men, with about 3,500 people dependent upon them, receiving \$256,000 in wages.

THE RETAIL TRADE OF BALTIMORE AND OTHER CITIES.—"It was found impossible to obtain the number of people engaged in the retail trade of Baltimore and other cities, as any statistics gathered from restaurants and hotels would be delusive, since they are not engaged exclusively in handling oysters. Under the circumstances the best estimates that can be made may be deduced from calculations based upon the local consumption in the cities. In Baltimore the city trade is monopolized by a number of commission houses, which handle all the oysters taken for local use, with the exception of the receipts by steamers. From the books of these firms it was ascertained that the sales of oysters from September 1, 1879, to May 1, 1880, for consumption in the city and suburbs, amounted to 793,680 bushels. Add to this 25,000 bushels received by steamers, and the total retail trade is found to be 818,680 bushels. The average price paid for shucking raw oysters is 15 cents a gallon; these being all of fine quality, will open a gallon to a bushel, and hence the amount paid for opening 818,680 bushels would be \$122,802. Estimating the average amount made by the shuckers at \$6 a week, or \$192 for the season, it is seen that there are 640 men steadily employed for nearly eight months of the year in opening oysters for local consumption in Baltimore. There is, in addition to these, a large number of men who sell oysters around the streets; others who rent a cellar room and sell from there; some engage in driving oyster-carts; and a few are employed only during the oyster-season in restaurants as extra help. As near as can be discovered, the number of these may be placed at 500, with wages and earnings amounting to \$96,000. Of these 1,140 men about 800 are negroes.

CONSUMPTION IN BALTIMORE OF OYSTERS FROM OTHER STATES.—"In addition to its own stock, Baltimore annually uses a large quantity of 'fancy' oysters from northern cities. The Philadelphia, Wilmington and Baltimore railway, in 1879, carried to that city 273,120 pounds of oysters in the shell, representing about 30,300 bushels. In addition to this, a firm of Baltimore men has lately opened a large establishment near Cape May, New Jersey, whence last fall they shipped about 20 half barrels of opened oysters daily, during September and October. A similar importation from planting-beds near Providence, Rhode Island, has been heretofore described.

LOCAL CONSUMPTION OF TOWNS ON CHESAPEAKE BAY.—"The local consumption of towns on the bay is about 200,000 bushels a season, the shucking of which pays \$30,000 to 150 men. Estimating an average of five to a family, these 1,200 men who are engaged in shucking and selling oysters for local consumption throughout the state, represent an aggregate of 6,450 individuals. Knowing the consumption per capita of Baltimore and suburbs, and calculating that the inhabitants of the tidewater counties consume proportionately at least twice as many, it is easy to obtain an approximate idea of the total number of oysters annually consumed in the state, and not found in the returns from the packers. Of course the interior counties are not considered here, as they receive oysters from the packers which have already been noted. The estimate that the tidewater counties consume locally twice as many as Baltimore in proportion to the number of inhabitants, is based upon careful inquiry among well-informed persons. On this estimate, taking the population as returned by the present census, there are about 875,000 bushels annually consumed in the counties bordering on the bay, in addition to the 200,000 bushels consumed in the towns on the bay. These oysters are generally opened by the families who eat them, and hence there is no expense for shucking.

OYSTER-CURRENCY.—"In some of the lower counties of the state, oysters often pass current as money, and in one town there is a weekly paper (subscription price \$1), about 50 of the subscribers to which annually pay in oysters. As the editor thus receives from 100 to 125 bushels of oysters a season, all of which are used in his own family, I readily believe his assertion that he 'was very fond of oysters.'

47. STATISTICAL SUMMARY FOR BALTIMORE.

RECAPITULATION OF NUMBER OF MEN EMPLOYED IN OYSTER-INDUSTRY.—Summing up the total of all engaged in the oyster-trade, we have:

Occupation.	Number engaged.	Wages and earnings of same.	Estimated number of persons supported.
Dredgers	5,600	\$916,300	} 54,992
Tongers	5,148	1,158,240	
Scrapers	2,200	297,000	
"Runners"	800	166,400	
Employés of packing houses	8,639	777,779	
Can-makers and ship-yard workmen	700	256,000	3,500
Preparing for local consumption	1,290	248,802	6,450
	24,377	3,820,521	82,220
Individual packers	225		1,125
Total	24,602		83,345

“In the above enumeration no account has been taken of the number of owners of the dredge, the scrape, and the running-boats, as any attempt to obtain such would be futile, since not even the names of the boats can be ascertained. If it were possible to gather this information, it would swell the above figures to much larger proportions. From the \$1,850,000, the present estimated value of these 1,450 boats (excluding canoes), there must be a yearly profit of at least several hundred thousand dollars. Some of the boats are owned by packers, others by the captains, and the rest are distributed among all classes of society and almost all professions and occupations. When the number of these are taken into account, it will more than counterbalance any overestimates, if such there be, in regard to the number of persons dependent upon the oyster-trade of the state.

STATISTICS OF SEAFORD, DELAWARE.—“Seaford, Delaware, situated on the Nanticoke river, a tributary of the Chesapeake bay, has quite an extensive packing-trade; and as all the oysters are carried from Maryland waters, it was considered advisable to include in this report the statistics of the trade at that city. Mr. D. L. Rawlins, of Seaford, informs me that the oyster-packing business at Seaford was started by Platt & Mallory (of Fair Haven) in the fall of 1859. Hemingways, Rowe, and other eastern packers came in 1863 and 1864. They put nearly all their oysters in small tin cans, which they shipped in cases holding about 52 cans each, a good proportion being sent to Fair Haven, Connecticut, to be reshipped from there. The business not proving as profitable as was expected, by 1867 nearly all the original packers had sold out and left, since which time a fluctuating amount of business has been kept up by various successive parties, with alternating failure and success. No cans are used now, shipments being made nearly altogether in bulk.”

“There are at Seaford seven oyster-packing firms, having an aggregate capital of \$14,600, and occupying buildings estimated to be worth \$28,500. From September 1, 1879, to May 1, 1880, 184,500 bushels of oysters were packed raw, giving employment to 170 males and 45 females, the wages of both for the season amounting to \$14,230. The estimated value of the oysters, after being shucked and packed, was \$71,350. When shucked oysters are shipped in bulk, the package (barrel or half-barrel) is returned after being emptied, and then refilled. On this account only 1,400 packages, costing \$1,000, were bought by Seaford packers during the season of 1879-'80. About 100 persons are dependent upon the oyster-trade of Seaford. The local consumption, added to the packing, gives a total of 200,000 bushels handled at Seaford.

CAPITAL AND LABOR EMPLOYED IN MARYLAND OYSTER-TRADE.—“The following general summary of the whole trade in Maryland will give a good idea of its extent:

	Capital in-vested, real and personal.	Number of persons employed.
In packing.....	\$3,928,376	8,639
In oyster-boats.....	2,042,500	13,718
In can-making, etc.....	250,000	700
In local trade.....	*25,000	1,290
Total.....	6,245,876	24,377

*Estimated.

YIELD OF MARYLAND OYSTER-FISHERY.—“The number of bushels of oysters caught in Maryland during 1879-'80, and the disposition made of them, is as follows:

	Bushels.
Packed in the state, of Maryland oysters*.....	6,653,492
Shipped out of the state.....	2,021,840
Local consumption in Baltimore.....	~18,680
Local consumption in other cities of the state.....	200,000
Local consumption in the counties.....	875,000
Imported “fancy” oysters.....	30,000
Total.....	10,599,012

“Exactitude is not altogether possible; the ‘round number’, 10,600,000, will, therefore, express the total well.”

THE PLANTING INTERESTS OF MARYLAND.—The planting interests of Maryland have heretofore been very slight. Now attention is being turned to it more and more. In Virginia, however, considerable planting is done, and under the chapter devoted to that state will be found a study of the planting of the whole of Chesapeake bay. Important experiments are now being made at Saint James, under the directions of Maj. T. B. Ferguson, commissioner of fisheries for the state, who intends to introduce the best methods of European oyster-culture:

STATISTICAL RECAPITULATION FOR MARYLAND:

Number of planters and shippers.....	7,648
Value of shore-property.....	\$1,500,000

*The total number of bushels packed in the state was 7,653,492, but 1,000,000 bushels came from Virginia.

Number of vessels and sail-boats engaged.....	3,275
Value of same	\$2,042,500
Number of men hired by planters or dealers	6,897
Annual earnings of same.....	\$775,520
Number of women hired.....	2,460
Annual earnings of same.....	\$250,259
Number of men in canneries.....	6,400
Annual earnings of same.....	\$1,082,700
Total number of families supported.....	10,000
Annual sales of—	
I. Native oysters	bushels.. 10,600,000
Value of same.....	\$2,650,000

48. THE OYSTER-LAWS OF MARYLAND.

OYSTER-LAWS.—The oyster-laws of Maryland are too voluminous to be given in full, and an abstract has, therefore, been made of them. Before giving this, I quote Mr. Edmonds' remarks upon them and their effect, as follows:

“For the enforcement of these laws an oyster-police force is established, and for the use of the force one steamer and eight fast-sailing sloops are provided; but owing to the character of the laws in force previous to the last session of the legislature, it was impossible for the police force to carry out the purposes for which it was intended. During the fiscal year ending September 30, 1879, the cost of supporting this force amounted to \$44,379 76, while the receipts of the ‘oyster-fund’ for the same time were \$31,969 12, thus leaving the force in debt to the state for that year \$12,410 64. Previous to 1877 the amount received for dredging-licenses had been more than enough to pay the annual expenses of the force; and when this was changed so that the receipts were less than the disbursements, great dissatisfaction was manifested throughout the state. The oyster-police force received the blame, although it did not deserve it. The loss of revenue was occasioned by the fact that more than one-half of the dredging-fleet worked during the past season [1879] without any license. This was mainly owing to the failure of the legislatures of Maryland and Virginia to ratify the report made by a commission previously appointed to determine the boundary line on the Potomac river between the two states. In consequence of this neither state could claim jurisdiction over the waters of the Potomac, and hence dredgers could work without license. Many of the unlicensed boats also caught their oysters in Maryland waters on forbidden ground, and escaped arrest, not through any fault of the police force, but in consequence of defective laws, which made it so difficult to convict the violators of them that it was useless to arrest the dredgers.

“During my investigation of this subject I spent a week on board the police-steamer *Leila*, and about ten o'clock one morning, while on this trip, I was called forward by Captain Travers, the commander of the steamer, to watch the movements of a large fleet of dredgers some eight or ten miles ahead of us. Sixty-three boats were counted, only five of which were licensed. It was useless to arrest any, since they had seen the steamer nearly an hour before she reached them, and had taken in all their dredges. The wet oysters and ropes lying on deck should have been *prima facie* evidence that the law had been violated; but repeated trials had demonstrated that it was impossible to convict the captain of a dredging-boat, unless the officers of the steamer were able to swear that they had seen the dredge hauled up; and not only that, but must also be able to swear that oysters, and not rocks or stones, were brought up by the dredge. These two things were obviously impossible in nearly every case. In many cases the police force were hindered and restricted by the rulings of illiterate magistrates, some of whom, it is said, are interested in dredging-boats, while others are more in sympathy with the dredgers than with the police. Such was the working of the old law. It is to be hoped that the new one will prove of more value, notwithstanding the fact that it is still imperfect. Under the old law the beds were allowed but little rest, tonging and dredging continuing long after the spawning-season had begun. By the new law, however, it was intended that the close-season should be extended, and it was made unlawful to take oysters from the waters of the state ‘between the 15th day of April and the 1st day of September, except for private use, to the amount of five bushels per day, or for sale of the same to any citizen or citizens of the neighborhood, and to them only for the purpose of being consumed where sold, or for the purpose of replanting or bedding in the waters of the counties wherein they are caught, or for sale to the citizens of the county wherein they are caught, and to them only for the purpose of replanting or bedding in the waters of the said counties’. The meaning of this clause being somewhat obscure, the courts have been called upon to interpret it, and by some means they have rendered decisions allowing the tongmen to catch an unlimited quantity of oysters during what was intended to be the close-season.

“The two most important features of the new law are, that the penalty for illegal dredging, which was formerly imposed upon the captain and crew only, is now shared by the vessel, and that the evidence necessary for conviction is made somewhat less difficult to obtain than by the old law. It is, however, still defective, and its force greatly impaired by the insertion of the words ‘on deck’, in section 39, which says: ‘That if any boat or vessel shall be seen sailing over any of the waters of this state which are exempted from dredging by law, in the same manner in which they sail to take or catch oysters with scoop, scrape, drag, dredge, or similar instrument,

the sail-boat or vessel shall be pursued by any officer or officers authorized by this act to make arrests, and if said boat or vessel apprehended by said officer shall be found to have on board any wet oysters on deck', etc. If the law had been framed in the interest of illegal dredging, it would have been hard to make a better loophole of escape than the two words 'on deck'. The dredgers, by keeping a careful watch, can almost invariably have at least thirty or forty minutes' notice of the approach of a police-boat, and in that time it will be very easy to throw all the oysters either into the hold or overboard. After this is done they are safe. It is probable that the change in regard to fines will lead to a better enforcement of the laws relating to dredging, but there will still be many unlicensed dredgers, so long as the question of jurisdiction over the waters of the Potomac remains unsettled. Under the old law the captain and crew of the vessel were held responsible for any violation of the laws, while the vessel was allowed to go free. The captain and crew, if caught, were placed in jail; the former, if a useful man, was bailed out by his employers, his fine eventually paid if the case went against him, and he was placed on the same or another vessel, while the crew were left, often for many months, in jail, simply imposing a heavy expense upon the counties. As many of the dredgers are foreigners, knowing nothing in regard to the laws, it was manifestly unjust to make them suffer for obeying the orders of their captains. At the same time, however, there were others who were not ignorant of the laws, or of the penalties imposed for the violation of them; but were specially trained in various devices and subterfuges, such as would enable them to escape arrest. The crew could not be taken until the captain was seen; if he could not show a license all hands were placed under arrest. Sometimes, when an officer of the police force boarded a vessel and asked for the captain, he was told by the very man who was himself the captain, that the captain was on shore and had all the vessel's papers with him. At other times the captain would escape to the shore in a small boat, and remain hid as long as the police-boat was in sight, even if that was several days. The dredging-boats being well supplied with small-arms, are sometimes disposed to show fight when approached by a police-boat, and in forcing a surrender some of the dredgers have occasionally been severely wounded, and one or two have been killed. Happily, however, occurrences of this kind have been very rare. As a result of the new law which makes the boat responsible jointly with the captain and crew, much of this trouble will probably be avoided.

"From my investigations, I am inclined to think that the police force is well conducted, and that Capt. Sam. M. Travers, commander, did all that could possibly be done to enforce the old law. The blame for illegal dredging should be placed where it belongs—on the framers of the laws, and not on the executors of them."

ABSTRACT OF THE OYSTER-LAWS OF MARYLAND, PASSED JANUARY SESSION, 1880.

CHAPTER 198—*Oysters.*

SECTION 1. *Be it enacted by the general assembly of Maryland,* That chapter 181, of the acts passed at January session, 1874, be, and the same is, hereby repealed, and the following enacted in lieu thereof, to be article 71 of the code of public general laws, title "Oysters".

SEC. 2. No steamer shall be used in catching oysters in the waters of this state, with scoop, dredge, or similar instrument, and no other boat shall be so used, without first having been licensed as hereinafter provided.

SEC. 3. The comptroller of the treasury shall, upon application of any person who has been a resident of this state for twelve consecutive months next preceding such application, and to no other person, issue a license to such resident to employ such boat in catching oysters with scoop, dredge, or similar instrument, within the Chesapeake bay, and in Eastern bay, outside of a line drawn from the southwest corner of Second Kent point to Wade's point; provided, that nothing herein contained shall authorize the catching of oysters with scoop, dredge, or similar instrument, on any oyster-bar within one and a half miles of Tolley's point, Sandy point, Hackett's point, Thomas' point, Holland Island bar, Three Sisters, Swan Point bar, Poplar island, one-quarter of a mile west of, and between the island and the main-land, nor within a half mile of Plum point, and to buy and sell oysters in this state, which license shall hold good for one year, but shall only authorize the catching of oysters between October 15 and April 1; but it shall be lawful for the owner of any such licensed boat, whenever said owner shall convey by bill of sale for a *bona fide* consideration, said boat, unto any person who has been a resident of the state of Maryland for at least one year, to transfer the said license to said vendee with said boat: *Provided,* The said vendee and assignee shall appear before the comptroller of the treasury and make oath before him to all the facts and prerequisites required, and shall pay \$5 to the state treasury.

SEC. 4. The owner of such boat shall make oath before the comptroller or his clerk, or if the owner be a resident of Baltimore city, he shall make oath before the clerk of the court of common pleas, or if a resident of a county, shall make oath before the clerk of the circuit court of said county, that he is the *bona fide* owner of such boat to be described in the license; that he has been a resident of the state for the time beforementioned; that there is no lien on said boat by a non-resident; and that the said boat is not held with an intention to violate the provisions of this law. Such applicant shall produce before the comptroller, at the time of such application, the certificate of the taking of such oath, the custom-house enrollment or license of such boat; and, if such boat is under custom-house tonnage, the owner shall swear to her tonnage. The master of such boat shall make oath that he has been a resident of the state of Maryland for twelve months next preceding the time of taking such oath.

SEC. 5. Before granting such license, the comptroller shall receive for it, from the applicant, at the rate of \$3 per ton for every ton the boat may measure; and the license shall be exhibited whenever called for by any officer of the state of Maryland.

SEC. 6. Any person who shall violate any of the provisions of the preceding sections shall be deemed guilty of a misdemeanor, and, upon indictment and conviction in any circuit court, or before any justice of the peace of this state, before whom such case is tried, shall be fined not less than \$50 nor more than \$200, or sentenced to the house of correction for a term not less than three months, nor more than three years; and the boat or vessel used in said violation, together with the papers, furniture, and tackle on board of said boat or vessel at the time of the said violation, shall pay a penalty of not less than \$50 nor more than \$200 for each and every violation of the preceding section.

SEC. 7. Upon information given under oath to any judge of the circuit court or justice of the peace, of any violation of any of the provisions of this act, he shall issue his warrant to the sheriff or any constable, requiring them to proceed forthwith to arrest the party or parties alleged to have been engaged in the violation of this act, and to seize and take possession of any boat, canoe, or vessel, together with all her tackle and apparel, and deliver the same to the judge of the circuit court, or a justice of the peace of this state, to be dealt with according to the provisions of this act.

SEC. 8. Any person or persons who shall resist any officer authorized under this act to make arrests, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be imprisoned in the house of correction for not less than three months nor more than three years.

SEC. 9. It shall be the duty of the sheriff, constable, or officers of the state fishery-force, to arrest any person or persons, and to seize any canoe, boat, or vessel found violating any of the provisions of this act, and bring the offender or offenders before a judge of the court having criminal jurisdiction, or a justice of the peace most convenient or accessible, to be dealt with as herein provided.

SEC. 10. The judge or justice of the peace before whom any person or persons may be brought, charged under oath with violating any of the provisions of this act, shall either give the case an immediate hearing, or shall appoint some early day within the next ten days thereafter, to hear the case, the party or parties charged giving good and sufficient bail for his or their attendance, and on conviction of the offenders, the said judge or justice of the peace shall impose a fine of not less than \$50 nor more than \$200, or imprisonment in the house of correction for not less than three months, nor more than three years, and the boat or vessel used in such violation, together with all the apparel and tackle on board, at the time of said violation, shall be held until said fine and costs are paid; provided, that if said fine shall not be paid within twenty days thereafter, the said judge is hereby authorized to order any sheriff or constable to sell said boat or vessel, with all the apparel and tackle on board, to the highest bidder, for cash, after giving at least twenty days' notice of the time and place of said sale, and the proceeds of said sale shall go to the payment of the fine and costs of such prosecution, and the balance, if any, shall be paid to the owner of said boat or vessel; provided, the said owner shall have the right of an appeal to the circuit court.

SEC. 11. Any boat owned wholly or in part by any non-resident, used in catching oysters in this state with scoop, dredge, or similar instrument, shall be condemned by order of any judge of the circuit court nearest the place of her capture, and shall be sold by the sheriff of the county where condemned; one-fourth of the proceeds of such sale shall be paid to the party making the capture (except the officers of the state fishery-force), and the balance shall be paid into the treasury of the state to be credited to the oyster-fund.

SEC. 12. The fines accruing under this act shall be paid within ten days to the clerk of the county or city where such fine may accrue, and be placed to the credit of the oyster-fund.

SEC. 13. It shall be unlawful, without authority from the owner, for any person or persons to take or catch planted or bedded oysters; any person violating the provisions of this section shall, on conviction in the circuit court of the county wherein the oysters were bedded, be fined not less than \$5 nor more than \$50, or be sentenced to the house of correction for a term not less than three months nor more than three years.

SEC. 14. It shall be unlawful for any person or persons to take or catch oysters, except for private use, to the amount of five bushels per day, or for sale of the same to any citizen or citizens of the neighborhood, and to them only for the purpose of being consumed where sold, or for the purpose of replanting or bedding in the waters of the counties wherein they are caught, or for sale to the citizens of the county wherein they are caught and to them only for the purpose of replanting or bedding in the waters of said counties, between the 15th day of April and the 1st day of September, in each and every year. Any person violating this section shall be deemed guilty of a misdemeanor, and be fined by a justice of the peace of the county wherein the offense was committed, not less than \$50, nor more than \$200, or imprisonment in the house of correction for not less than three months nor more than three years.

SEC. 15. It shall be unlawful for any person or persons to take oysters on Sunday or at night, or to carry oysters in the shell outside the state, between April 1 and September 1.

SEC. 16. The comptroller of the treasury shall have painted in black figures, on white canvas, two sets of numbers, corresponding to the license to catch oysters; each figure shall be 22 inches in length and of proportionate width, and the figures at least 6 inches apart, and he shall give to each person taking out such license two numbers thereof, one of which shall be firmly sewed upon the starboard side, and in the middle of that part of the mainsail which is above the close-reef, and the other number on the port side, and in the middle part of the jib, which is above the bonnet and reef; these numbers shall be placed in an upright position, and worn at all times during the dredging-season, and shall not be concealed or defaced, and no other number shall be exposed to view or used, than that which is furnished by the comptroller.

SEC. 17. Any resident of this state, desiring to use any canoe or other boat, in catching or taking oysters with rakes or tongs for sale, in any of the waters of this state, shall first obtain, by application to the clerk of the circuit court of the county wherein he may reside, a license therefor, and such license shall have effect from June 1, in the year in which they may have been obtained, to June 1 next succeeding; provided that such license shall not authorize the use of said canoe or boat in taking or catching oysters in any creek, cove, river, inlet, bay or sound within the limits of any county, other than that wherein the license shall have been granted, and that the boundaries of counties bordering on navigable waters shall be strictly construed so as not to permit the residents of either county to take or catch oysters beyond the middle of the dividing channel; *Provided*, That nothing in this section shall be so construed as to prevent the citizens of Saint Mary and Calvert counties from using the waters of the Patuxent river in common, or the citizens of Queen Anne and Kent counties from using the waters of Chester river in common, or the citizens of Dorchester and Wicomico counties from using the waters of the Nanticoke river in common, or the citizens of Queen Anne and Talbot counties from using the waters of Wye river and the mouth thereof in common, or citizens of Dorchester or Talbot counties from using the waters of the Choptank river in common.

SEC. 18. Each and every license to take or catch oysters for sale, with rakes or tongs, shall state the name and residence of the person to whom the same is to be granted, the number, together with the length, to be obtained by top, or over-all, measurement of the canoe or boat licensed, the county in which the same is to be used, and the period at which said license will expire, and every applicant for such license shall pay to the clerk of the court where such license may be granted, and before the issuing and delivery of the same, according to the following rates, viz: For any boat measuring in length 20 feet or less, the sum of \$2; measuring from 20 to 25 feet, the sum of \$3; measuring from 25 to 30 feet, the sum of \$4; and all over 30 feet, including sloops under custom-house tonnage, the sum of \$5 each; and all oysters taken with rakes or tongs shall be culled upon the natural beds where they are taken; the amount received from tonging license to be paid to the clerk of the school commissioners, for the public schools in the respective counties where such license is issued; provided, the sum received from white tongers shall go to white schools, and the sum from colored tongers shall go to the colored schools.

SEC. 19. Every applicant for license to use any canoe or other boat in taking or catching oysters with rakes or tongs, shall be required to make oath or affirmation before the clerk authorized to issue the same, or some justice of the peace, on whose certificate of the taking of such oath or affirmation the clerk shall issue said license: that the facts set forth in said license are strictly true; that he has been a

bona fide resident of the county for the twelve months next preceding his application for said license; that he desires and intends to use said canoe or boat only in the county in which he resides, or in the waters used in common, as herein provided in this act; that he will not allow the same to be used for taking oysters by non-residents of the county; that he will comply with and obey all the laws of this state, regulating the taking or catching of oysters; and every person to whom such license shall have been granted, shall paint the number of his canoe or boat on the outside thereof, near the gunwale, in black figures, and not less than three inches in length, and of proportionate width, in a white ground, and no number, other than that in the said license, shall be exposed to view on said canoe or boat; and any person failing to comply with this provision before using said boat or canoe for the purpose aforesaid, shall, on conviction thereof before a justice of the peace, be fined not less than five dollars, nor more than ten dollars, and any person who may refuse to pay said fine shall be committed to the county jail for the period of thirty days, or until said fine be paid.

SEC. 20. The comptroller of the treasury shall cause to be printed and delivered to the clerks of the circuit courts of the several counties, the requisite number of such blank licenses; and the said clerks shall, on the first Monday of March and December, in each year, return to the comptroller a list and account of such licenses issued by them; and no licenses to take or catch oysters with rakes or tongs shall be issued to any boat or vessel which is licensed to take or catch oysters with scoop, drag, dredge, or any similar instrument.

SEC. 21. If any person shall use any canoe or boat, not licensed as required by the preceding section of this article, in taking or catching oysters with rakes or tongs, except for private use, he shall, upon conviction thereof, be fined not less than twenty nor more than one hundred dollars; and in case of refusal to pay the said fine, said person shall be confined in the house of correction not less than three months nor more than three years.

SEC. 22. All moneys arising from fines, penalties, or forfeitures imposed under this article shall, upon warrant of the comptroller, be paid into the treasury and placed to the credit of the oyster-fund.

SEC. 23. The owner or owners of any land bordering on any of the navigable waters of this state, the lines of which extend into and are covered by said waters, shall have the exclusive privilege of using the same for protecting, sowing, bedding or depositing oysters or other shellfish, within the lines of their own land; and any owner or owners of land lying and bordering upon any of the waters of this state shall have power to locate and appropriate in any of the waters adjoining his, her, or their lands, five acres, for the purpose of protecting, preserving, depositing, bedding, or sowing oysters or other shellfish; and any other citizen of the state shall have power to locate and appropriate five acres in any waters in said state not located or appropriated; provided, thirty days' notice in writing shall be given the owner or owners, occupant or occupants of land bordering on said water proposed to be located; that the owner or owners, occupant or occupants, may have priority of claim, and if they shall fail to locate or appropriate the water mentioned in said notice within thirty days after receiving the same, then it shall be open and free to any one under the provisions of this section; provided, also, that the said location or appropriation shall be described by stakes, bushes, or other proper and visible metes and bounds, which description shall be reduced to writing under the oath of some competent surveyor, and recorded in the office of the clerk of the circuit court of the county; and provided, also, that such location and appropriation shall not injure, obstruct, or impede the free navigation of said waters; and provided, that no natural bar or bed of oysters shall be so located or appropriated, and that six months' peaceful possession of all locations of oyster-grounds under the laws of this state shall constitute a good and sufficient title thereto; but should any one, within the six months herein provided, be charged with locating or appropriating any natural bed or bar hereinbefore prohibited, the question may be at once submitted, by any person interested, to the judge of the circuit court in the county where such questions shall arise, who, after having given notice to the parties interested, shall proceed to hear the testimony and decide the case, and if decision be in favor of the party locating said five acres, said decision shall be recorded with the original record of said five acres, and shall in all cases be conclusive evidence of title thereto.

SEC. 24. If any creek, cove, or inlet, not exceeding 100 yards at low water in breadth at its mouth, make into the lands, or that if any creek, cove, or inlet of greater width than 100 yards at low-water mark, make into the lands, the owner or owners, or other lawful occupant or occupants, shall have the exclusive right to use such creek, cove, or inlet when the mouth of said creek, cove, or inlet is 100 yards or less in width, and when the said creek, cove, or inlet is more than 100 yards in width at its mouth at low water, the said owner or owners, or other lawful occupant or occupants, shall have exclusive right to use such creek, cove, or inlet, so soon as said creek, cove or inlet, in making into said land or lands, shall become 100 yards in width at low water, for preserving, depositing, bedding, or sowing oysters or other shellfish, although such cove, creek, or inlet may not be included in the lines of any patent.

SEC. 25. Empowers the board of public works to purchase for each of the guard-boats arms and ammunition.

SEC. 26. For the more efficient working of the state fishery-force, the waters of this state shall be divided into seven districts, of which the waters of Kent county and Queen Anne shall be the first; the waters of Queen Anne and Talbot shall be the second; the waters of Dorchester and Talbot, the third; the waters of Wicomico, the fourth; the waters of Somerset county, the fifth; the waters of Anne Arundel county, the sixth; the waters of Saint Mary, Charles, and Calvert, the seventh; each of the said districts shall be guarded by one sailing-vessel, except the third and seventh, which shall be guarded by two; and it shall be the duty of the deputy commander of the first district to guard the waters of Chester river, belonging to Queen Anne county and the waters of Kent county, including Swan Point bar; and the duty of the commander of the second district to guard the waters of Eastern bay and its tributaries, and the waters of Talbot county, as far down as Black Walnut point; and it shall be the duty of one of the deputy commanders of the third district to guard the waters of Choptank river and its tributaries which lay in Talbot county; and the duty of the commander of Wicomico county boat to guard the waters of Wicomico county, and the line between Somerset and Wicomico county; and the remaining commanders to guard their respective districts; provided, that the board of public works or the commander of the fishery-force, are hereby authorized and empowered to order the deputy commanders to do duty in any of the waters in this state, when, in the judgment of either, they may deem it necessary.

SEC. 27. The board of public works shall appoint a suitable person to command said force, to appoint the deputy commanders for their respective districts, and the said commander and deputy commanders shall have power to appoint their subordinates and select their crews; and the term of office of said commander and deputy commanders shall be for two years.

SEC. 28. The board of public works shall have the power to remove any officer of said force for neglect of duty or incompetency, and any officer commanding in said force shall have the power to remove any subordinate under his command, and appoint a person to fill the vacancy whenever the interest of said service may, in his judgment, require him to do so.

SEC. 29. The board of public works shall keep the steamer and said vessels in good order, and the treasurer of the state, upon requisition of the said board, and the warrant of the comptroller, is directed to pay sums necessary to carry out the provisions of this act.

SEC. 30. The commanding officer of the steamer may be selected from the state at large, but the deputy commanders shall be selected from the districts in which they are to serve.

SEC. 31. The commanding officer is required to keep his vessel constantly on duty when circumstances will permit; every locality

where a violation of the law is likely to occur shall be visited as often as the duties of the force and condition of the vessel will allow; and every three months a report shall be made of all official action taken under the law, and of all moneys received for license issued to parties engaged in carrying oysters taken in this state.

SEC. 32. It shall be the duty of the deputy commanders to confine themselves ordinarily to their several districts; but it shall also be their duty to enforce any of the provisions of this act in any waters adjacent to their districts, when a violation of the same shall come to their knowledge.

SEC. 33. Commanders of said force shall, before entering upon their duties, take the oath prescribed by the constitution, and the commanding officer of said force shall enter into bond to the state of Maryland in the sum of ten thousand dollars, and each deputy commander in the sum of three thousand dollars, for the faithful performance of their duties.

SEC. 34. Fixes salaries of commander and various subordinates of police force.

SEC. 35. The officers and crew of the steamer shall each receive one ration per day of the quality and quantity allowed by law to the officers and crew of the Revenue Marine of the United States, but no rations shall be allowed to officers or crews of the sailing-vessels.

SEC. 36. The officers and crews aforesaid shall be paid monthly by the treasurer upon warrant of the comptroller, etc.

SEC. 37. All oysters in the shell disposed of in the state of Maryland shall be measured in a sealed measure of any capacity, from half a bushel to three bushels, that may be agreed upon between the seller and purchaser; provided, that the said measure or measures shall contain in quantity for each bushel thereof, according to the following dimensions, that is to say, 16½ inches across, from inside to inside at the bottom, 18 inches across from inside to inside at the top, and 21 inches diagonal from the inside chime to the top, and the same shall be even or struck measure.

SEC. 38. It shall be the duty of the purchaser or seller to have and use said measure or measures, duly inspected and sealed by the proper officers, and no other measure shall be used under a forfeit of \$50 for each and every offense.

SEC. 39. If any boat or vessel shall be seen sailing over any of the waters of this state, which are exempted from dredging by law, in the same manner in which they sail to take or catch oysters with scoop, scrape, drag, dredge, or similar instrument, the said boat or vessel shall be pursued by any officer or officers authorized by this act to make arrests, and if said boat or vessel apprehended by said officer, shall be found to have on board any wet oysters on deck and properly equipped for taking or catching oysters with scoop, scrape, drag, or dredge, or similar instrument, it shall be *prima facie* evidence that the said boat or vessel has been used in violation of this act, and it shall be the duty of the officer to arrest the person in command of said boat or vessel and seize the said boat or vessel, together with all her equipments, and bring the same before a judge or justice of the peace most accessible, to be dealt with according to law; provided, that nothing in this act shall be construed to prohibit vessels from seeking harbor in any waters of this state.

SEC. 40. All oysters taken from any of the waters of this state shall be culled upon their natural bed or bar, under risk of heavy penalties.

SEC. 41. Any person convicted under this act, shall, in all cases, have the right of an appeal.

SEC. 42. Nothing in this act shall be construed to apply to Worcester county.

SEC. 43. It shall be the duty of the commanders of the steamer and sloops to diligently watch and guard, and to arrest all persons dredging, tonging, or scooping without license; and any violation of duty in this respect shall be deemed a sufficient cause of removal.

SEC. 44. Nothing contained in this act shall be construed to affect any prosecutions under the existing law, now pending in this state.

Laws of 1878, chapter 471.

SECTION 1. It shall not be lawful for any person or persons to take or catch oysters for any purpose, in any manner, or with any instrument whatever, in the waters of the Patuxent river within the boundaries of Calvert county, between Point Patience and Sheridan's point, in Calvert county, and between Town point and Long point, in Saint Mary county, from the 1st day of May to the 1st day of October in each year after the passage of this act; provided, however, that this act shall not be construed to prohibit the citizens of Calvert county or Saint Mary county from taking from the waters thereof oysters for private use, or for the purpose of replanting or bedding in the waters of said counties, or for sale to the citizens of the county wherein they are caught.

SEC. 2. Upon information given upon oath to any justice of the peace in and for the counties aforesaid, of any violation of the provisions of this act, the said justice of the peace shall issue his warrant for the arrest of the offender or offenders, and the seizure of the canoe or boat in his or their possession, or used in the commission of the offense, together with the tackle, instruments, and all things on board at the time of the commission of the offense.

SEC. 3. Prescribes method of legal procedure for trial and for collection of penalties.

SEC. 4. Provides right of appeal.

Laws of 1870, chapter 405.

SECTION 1. *Be it enacted by the general assembly of Maryland,* That it shall not be lawful for any person or persons to rake, drag, or dredge for oysters within five hundred yards of either edge of the new channel at the mouth of Patapsco river, known as the "Craighill channel", extending from the Seven-Foot knoll to the mouth of Magotly river.

SEC. 2. Stipulates proceedings for arrest and punishment of offenders, closely similar to the foregoing laws.

BALTIMORE CITY.—*Laws of 1864, chapter 368.*

SECTION 1. All oysters carried to the city of Baltimore for sale, shall be sold by the sealed half-bushel, or sealed bushel-and-half measure, and each and every person offending against the provisions of this section shall be subject to a fine of \$50 for each and every offense, to be recovered before a justice of the peace of the city of Baltimore.

Laws of 1874, chapter 221.

SECTION 1. All oysters in the shell, disposed of in the city of Baltimore, or in the port of Crisfield, or at any oyster-packing establishment in this state, shall be measured in an iron circular tub, of any capacity from one-half bushel to three bushels, as may be agreed upon between the buyer and seller; said measure shall contain in quantity for each bushel thereof, according to the following dimensions, that is to say, sixteen and one-half inches across from inside to inside at the bottom, eighteen inches across from inside to inside at the top, and twenty-one inches diagonal from the inside chime to the top, and the same shall be even or struck measure; all oysters in the shell sold in the city of Baltimore shall be measured by a licensed measurer. Any person may obtain a license therefor from the clerk of the court of common pleas, by paying therefor ten dollars and taking an oath before said clerk for the faithful performance of his duty; said license shall hold good for one year. A measurer shall receive for his services one-half cent per bushel, to be paid equally by the buyer and seller.

SEC. 2. The measure provided for above shall be inspected and stamped by the proper officer in Baltimore, and it shall be unlawful to use any other measure, except for oysters shipped in the barrel on any steamboat, to be sold in the barrel.

Laws of 1878, chapter 325.

SECTION 1. The act of January, 1874, relating to catching oysters with scoops or light dredges in Dorchester county, is repealed and re-enacted to read as follows:

SEC. 2. It shall be lawful for citizens of Dorchester county to catch oysters with scoop or light dredge in boats not exceeding ten tons burden, * * * in Honga river, Hooper's straits, Par bay, and that part of Fishing bay which lies to the southward and westward of a straight line drawn from the middle of the mouth of Tedious creek to Clay island light-house, and in all the waters to the southward and eastward of Clay island, in Dorchester county, and adjoining the Wicomico lines up to Sandy island; *Provided*, That no boat or boats licensed under the provisions of this act shall work within 200 yards of the shore; and the board of county commissioners for Dorchester county shall purchase two buoys of proper size and have them properly anchored on said straight line, between Tedious creek and Clay island light-house, and the captain of the oyster-sloop of the second district shall place them in position.

SEC. 3. In order to avail themselves of the privileges of section 2, a license must be procured from clerk of circuit court, good for one year, but not permitting any catching of oysters between May 1 and September 15, following.

SEC. 4. Every such license shall state the name and residence of the person to whom the same is to be granted, the number beginning with two hundred, together with the true tonnage of said boat or vessel, according to the rule of custom-house measurement; and every owner of a boat or vessel shall pay \$2 per ton for every ton said boat or vessel shall measure.

SEC. 5. The board of school commissioners of Dorchester county shall appoint a competent person to measure all boats licensed under this act.

SEC. 6. Measurer must give \$500 bonds, and shall receive 50 cents per ton measured, as compensation.

SEC. 7. Any applicant for a license under this act, shall make oath that he has been a *bona fide* resident of said county for the twelve months next preceding his application for said license, and that he intends to use said vessel only in said county, and that he will comply with and obey all laws of this state regulating the catching of oysters; and any person to whom said license shall have been granted shall paint the number of his boat on each beam, near the gunwales, on a white field, with black letters, seven inches in length.

SEC. 8. Enacts heavy penalties for use of any sort of boat without a license, with right of appeal.

SEC. 9. Directs all moneys arising from fines and forfeitures to be immediately credited to the public-school fund of the county.

SEC. 10. Prohibits taking oysters with scoops or dredges in all waters reserved for tonging.

SEC. 11. Fees allowed clerk of circuit court.

SEC. 12. Adds Great Choptank river to ground privileged to be worked with scoops or dredges.

Laws of 1868, chapter 228.

SECTION 1. Prohibits catching oysters "with rakes, drags, or dredge within the waters of Honga river, in Dorchester county, or in the Nanticoke river at or above Roaring point, in Dorchester and Wicomico counties, in quantities over five bushels in any one day" during June, July, and August.

SEC. 2. Forfeitures and fines fixed for violation of the above section to be paid into the school fund.

Laws of 1876, chapter 396.

SECTION 1. Forbids catching oysters in Dorchester county during June, July, and August, except five bushels a week for family use.

SEC. 2. Penalties upon conviction of violations: a fine of \$10 and forfeiture of boat and canoe employed; one-half the fines and the proceeds of the sale of the boat to go to the informers, and the remainder to be paid into the free-school treasury of Dorchester county; provided, that nothing in this act shall apply to catching oysters in either the Great or Little Choptank rivers or their tributaries in Dorchester county.

SEC. 3. All boats condemned shall be sold at public auction to the highest bidder for cash, after ten days' notice of the time and place of sale.

Laws of 1878, chapter 359.

SECTION 1. Repeals chapter 437, passed January, 1874, and chapter 405, passed January, 1876, and re-enacts as follows:

SECTION 1. The clerk of the circuit court of Talbot or Dorchester county shall, upon the application of any person who has been a resident of such county for twelve months next preceding such application, and to no other person, issue a license to such resident to employ any boat of a capacity of ten tons or under in taking oysters with dredge, scoop, or scrape in the waters of the Choptank river in said counties, for sale to any person, between September 15 in each year and June 1 next following; *Provided*, That nothing in this act shall authorize the taking of oysters with dredge, scoop, or scrape above a straight line drawn from Oyster Shell point, on the Dorchester shore, to the Talbot shore, immediately opposite, or in any tributaries of said river above or below said Oyster Shell point; and provided, further, that the applicant shall pay to said clerk, before the issuing of said license, the sum of \$2 per ton, which said license shall be good for twelve months from the day of its issue; and until such license is obtained it shall be unlawful to use or employ any vessel in taking or catching oysters as hereinbefore described; provided, that the waters of Talbot county lying between Black Walnut point and a line drawn from Tilghman's point to the southwest point of Parson's island, except the waters between Poplar island and the mainland, lying within a line drawn from a point of land on the north side of Ferry cove, known as Lowe's point, to the northern extremity of Poplar island on the north, to a line from the northwest extremity of Tilghman's island to the southern extremity of south bar of Poplar island on the south, which are hereby reserved for the use of tongmen, shall be opened to the citizens of Talbot county, licensed under this act, between September 15 in each year and May 1 next following, but it shall be unlawful to take oysters with scoop or dredge in any other waters of Talbot county; provided, also, that the waters of Choptank river, lying north of a straight line running from Benoni's point to Clara's point, are hereby reserved for tongmen, and it shall not be lawful to catch oysters with scoop, scrape, or similar instrument to the northward of said line.

SECS. 3 to 11. Substantially reproduce the provisions of laws of 1876, chapter 405, heretofore quoted, as to terms of application for license and penalties for violation.

CALVERT COUNTY.—*Laws of 1870, chapter 188.*

SECTION 1. Catching of oysters for sale prohibited in Saint Leonard's creek, Island creek, and Battle creek in Calvert county, except such oysters as have been "imbedded or planted".

SEC. 2. Upon information given under oath, of any violation of this act, to any justice of the peace of Calvert county, he shall forthwith issue his warrant directed to the sheriff, or any constable or military officer, requiring either of them to arrest the party or parties alleged to have been engaged in violating this law, and to seize and take possession of any canoe, boat, or vessel, together with all their tackle and apparel.

SEC. 3. Provides for a speedy hearing before a justice, and forfeitures and penalties in case of conviction, with right of appeal. Moneys so arising to be devoted, one-fourth to the arresting officer, one-fourth among his assistants, and the remainder to the school fund.

Laws of 1878, chapter 163.

SECTION 1. It shall not be lawful for any person to take or catch oysters for sale, with any instrument whatever, in the waters of Mill creek, Back creek, or Saint John's creek, in Calvert county, for the period of three years from the passage of this act, except from land in said waters located and appropriated, or which may be hereafter located and appropriated by virtue of any act or acts of the general assembly of Maryland, authorizing the location and appropriation thereof for the purpose of protecting, preserving, depositing, bedding, or sowing oysters, and any person violating the provisions of this law shall be deemed guilty of a misdemeanor.

SEC. 2. For the purposes of this act a line drawn from the steamboat wharf on Solomon's island, and running in a northeasterly direction to Township point on Rousby Hall farm, shall be the dividing line between the mouth of Mill creek and the Patuxent river.

KENT COUNTY.—*Laws of 1872, chapter 359.*

SECTION 1. Any resident of either Queen Anne or Kent county, having in his possession any boat under custom-house tonnage, and desiring to use said boat or canoe in taking oysters for sale, with rakes or tongs, in any of the waters of the aforesaid counties, shall first obtain, by application to the clerk of the circuit court for that county wherein he may reside, a license, such as is now prescribed by the general law, and which said license shall give him a right to take or catch oysters in the waters of either Queen Anne or Kent county; and such license shall have effect from October 1, in the year in which it shall have been obtained, to the first day of October next succeeding, subject to the provisions of the general law as to the time in which oysters shall be caught or taken with tongs: *Provided*, That such license shall not authorize the use of said canoe or boat in taking or catching oysters in any creek, river, cove, inlet, bay, or sound within the limits of any county other than Queen Anne and Kent; and that the boundaries of the counties bordering on navigable water shall be strictly construed, so as not to permit the residents of either of these counties to take or catch oysters beyond the channel of the creeks or rivers lying between these and other contiguous counties; and provided further, that this act shall not authorize the taking or catching of oysters from grounds already located or appropriated for the purpose of preserving, depositing, or bedding the same in the waters of said counties, under the provisions of the general laws.

QUEEN ANNE COUNTY.—*Laws of 1876, chapter 381.*

SECTION 1. The following lines, to wit, from the south point of Wye island to the southeast point of Bennett's point, thence to the south point of Parson's island, are established as a boundary for the protection of the oyster-grounds in that branch of Wye river known as "Back Wye", and the oyster-grounds lying on the land or Queen Anne side of that part of said boundary extending from the southeast point of Bennett's point to the south point of Parson's island.

SEC. 2. It shall not be lawful for any non-resident of Queen Anne county to catch, or in any manner to molest, oysters on Queen Anne's side of the boundary here specified.

SEC. 3. The dividing waters of Wye river, and the waters of Saint Michael river, lying west of the boundary line described in section one of this act, and the waters around Herring island, are hereby opened to the citizens of Queen Anne and Talbot counties in common, for the purpose of catching oysters with rakes or tongs.

SEC. 4. It shall be unlawful for any person to take or catch oysters with scoop, scrape, or any similar instrument, in the waters of Queen Anne county, lying west of Kent island, between Kent's point and Cove point, within 400 yards of the shore.

SEC. 5. Penalties for violation.

SOMERSET COUNTY.—*Code of public local laws, article 19.*

SEC. 91. Prohibits taking oysters for manure in Somerset county.

SEC. 92. Prohibits purchasing any oysters for manure caught in the county.

SEC. 93. Penalties imposed.

Laws of 1867, chapter 129.

SEC. 94. Permits citizens of the county to take oysters with a dredge or scoop in any waters of said county not parcel of any creek, cove, river, or inlet, upon obtaining license therefor as hereinafter directed.

SEC. 95. The clerk of the circuit court for said county, upon application of any citizen of said county, shall issue a license to such citizen, authorizing him to take or catch oysters with scoops, drags, or dredges in the waters of said county, subject to the provisions of this law, for one year from the date of said license, for which said license the citizen applying shall pay to the said clerk the sum of ten dollars; provided, that the citizen so applying shall have first satisfied the said clerk that he has obtained from the comptroller of the state license to take or catch oysters in the waters of the Chesapeake bay.

Code of public local laws, article 19.

SEC. 96. The person so applying for a license shall first be required to make oath that he is a *bona fide* owner of the vessel to be licensed, that he has been a *bona fide* citizen of the state for one year immediately preceding said application, and six months a resident of the county, and that the license is intended for his use only.

Laws of 1867, chapter 129.

SEC. 97. Any person taking oysters within the waters of said county with a scoop, drag, or dredge, without a license, or who is not a citizen of said county, or otherwise, contrary to any law of this state, shall be subject to all the penalties provided by law against the illegal taking of oysters in this state.

Code of public local laws, article 19.

SEC. 98. In all cases where a vessel or individual shall be tried under this law and acquitted, the expenses of the suit shall be borne by the county.

SEC. 99. Issue of warrant.

SEC. 100. Fees.

SEC. 101. Money from licenses to be paid to the county school fund.

Laws of 1878, chapter 373.

SECTION 1. Prohibits taking oysters with scoops, drags, or dredges, in Wicomico river, in Somerset county, on the eastern side of a straight line from the mouth of Rock creek to Clay island light-house, under liability to heavy penalties and forfeitures.

TALBOT COUNTY.

(*See Dorchester county, laws of 1874, chapter 437; laws of 1876, chapter 405; laws of 1878, chapter 359.*)

WICOMICO COUNTY.

(*See Dorchester county, laws of 1868, chapter 228.*)

Laws of 1872, chapter 241.

SECTION 1. It shall not be lawful for any person to employ any canoe, boat, or vessel in taking oysters with scoop, dredge, or any similar instrument, within the waters of Wicomico county, nor shall any person take oysters for sale within the waters of said county, otherwise than with tongs, as restricted and regulated by the provisions of the general oyster-law in force in this state.

SEC. 2. For the protection of the young oysters in the waters of Wicomico county, it shall not be lawful for any person or persons to convey beyond the limits of said county any oysters from May 15 until September 1 in each year.

SECS. 3, 4, 5, 6, 7. Prescribe penalties and forfeitures, and regulate forms of official proceeding in arrest and trial of offenders.

WORCESTER COUNTY.—*Laws of 1868, chapter 343.*

SEC. 3. Prohibits taking oysters in this county for making into lime.

SECS. 4, 5, 6, 7, 8, AND 9. Prescribe legal proceedings for arrest and the recovery of fees and penalties.

SEC. 10. If any person shall take, steal, or sell planted oysters of another, knowing them to be such, from any of the waters in this act mentioned, he shall, upon conviction in said court, be fined not less than fifty nor more than one hundred dollars, and may, at the discretion of the court, be confined in jail not less than one nor more than six months.

Laws of 1872, chapter 131.

SEC. 2. It shall not be lawful for any person or persons, other than citizens or actual residents of Maryland, to haul or fish with any seine or seines of any description; rake or catch oysters, clams, or terrapins, or plant oysters in the waters of Sinepuxent bay or any of the tributaries thereof included in the boundaries of Worcester county.

SECS. 3 AND 4. Refer to seine fishing.

SEC. 5. Provides fines and forfeitures in case of violation; but provides that this act shall not restrict or prevent traders or other persons from purchasing from or selling to non-residents the shellfish in this act mentioned.

SEC. 6. If any citizen of Maryland shall be concerned or interested with any person not resident within this state in the taking, catching, or planting of oysters in the waters of Sinepuxent bay, or in any of the tributaries thereof included in the boundaries of Worcester county, or shall knowingly permit any person not a citizen and actual resident within this state to take, catch, or plant oysters in his name, he shall be liable to the penalties and forfeitures imposed for the violation of the preceding sections of this act, and shall be proceeded against in the same manner; provided, that nothing herein shall be construed to prevent the employment of non-residents as day laborers for the above purposes.

SECS. 7, 8, 9, AND 10. Forms of proceedings against alleged offenders, and disposal of condemned property forfeited.

SEC. 11. In case of persons unlawfully engaged fleeing from their boat, the boat or vessel shall be seized, which shall be condemned, if the evidence shows it to have been illegally used.

SEC. 12. Money thus arising to be paid into the school fund.

SEC. 13. Prohibits taking any shells from the "rocks or flats whereon oysters grow within the limits of Worcester county". Penalty, \$25.

SEC. 14. All oysters in the shell disposed of in the waters of Worcester county shall be measured in a sealed measure of any capacity, from a half bushel to two bushels, that may be agreed upon between seller and buyer. Penalty, \$25.

SEC. 15. It shall be the duty of the purchaser or seller to have said measure or measures duly inspected and sealed by the standard-keeper, under a forfeit of \$25 for each and every offense.

Laws of 1876, chapter 277.

SECTION 1. Chapter 77, passed January, 1874, "for the protection of oysters in Sinepuxent bay and its tributaries, is hereby repealed, but all violations of said act may be prosecuted and punished as fully as if said act had not been repealed".

SEC. 2. The clerk of the circuit court for Worcester county may issue to any citizen of said county a license to take or catch oysters with rakes or tongs from the waters of Sinepuxent bay and its tributaries, until the first day of May next after the issuing of said license; provided the applicant for said license shall satisfy said clerk, by his own oath or other sufficient proof, that he is a citizen of said

county, and shall pay to said clerk the sum of one dollar, to be paid by said clerk to the county commissioners of Worcester county, to be expended in the procuring of seed-oysters to be planted in said bay as the commissioners aforesaid may direct, but no person licensed as above, nor any other person, shall take or remove any oysters from the waters of said bay or its tributaries on any Sunday or in the night at any season, nor during the day from the 1st day of May to the 1st day of October, or any shells from the natural rocks at any time; provided, that nothing herein shall be construed to forbid any person from taking or catching his or her own planted oysters at any time and with any kind of instrument.

SEC. 3. No person shall catch, take, or remove any shells or oysters from the natural beds in the waters of Sinepuxent bay or its tributaries with scrapes, scoops, dredges, or drags, or with any instrument in the working of which any other than hand power is used.

SEC. 4. It shall be lawful for any citizen of Worcester county to plant, or for any resident to lay down, oysters on not exceeding five acres in any one place in any of the waters, except upon the natural rocks of the said bay or its tributaries, and that no person, except the owner or his employé, shall work upon or among said planted or laid down oysters; provided, that portion of the said waters so planted in be kept plainly marked with bushes, stakes, or buoys, and any person maliciously removing said bushes, stakes, or buoys, shall be liable to the penalties of this section; and provided, that nothing in this section shall affect the rights of owners of land to the exclusive use of any creek, cove, or inlet, within their said lands, not exceeding one hundred yards in width at its mouth, and any person violating the provisions of this section shall be liable to be sued as for damage to any other property.

SECS. 5, 6, 7. Regulate penalties, forfeitures, and proceedings against offenders.

P. COASTS OF VIRGINIA.

49. OYSTER-FISHERIES AND OYSTER-PACKING.

GENERAL CONSIDERATIONS.—Upon the study of the oyster-interests of the Chesapeake, included within the state of Virginia, several persons contributed besides myself, notably Mr. R. H. Edmonds, of Baltimore, to whom the credit of the Maryland chapter belongs, and Col. Marshall McDonald, of the United States Fish Commission.

The waters of Virginia being in many places separated from those of Maryland by imaginary lines only, it is not to be expected, remarks Mr. Edmonds, that the conditions of the oyster-trade, and the class of people dependent upon it, should show any very material difference in the two states. Different laws have of course exerted an influence upon some features of the trade; but the essential and most important facts in regard to the trade, in both states, is the same—that the oystermen are generally poor and illiterate, often intemperate and reckless.

METHODS OF GATHERING OYSTERS.*—Dredging on natural rocks was abolished in Virginia in 1879, and is only allowed at present on private beds; few, however, avail themselves of this privilege. In some parts of the state, where planting is extensively conducted, there are a few dredge boats, but they meet with considerable opposition, as it is very generally believed by planters who do not dredge, that the dredgers do not confine their operations to their own beds. This belief is probably correct. The beds are staked off with poles, sometimes fifty to a hundred yards apart, and the dredgers sailing over one bed can scarcely, even if so disposed, keep from crossing the line which separates adjoining beds. The law entirely abolishing dredging on natural rocks, was undoubtedly a mistake, since there are many localities in the state where, rightly restricted, it would prove very advantageous to the beds; while there are other places where the water is so deep that tonging cannot be carried on, and the beds are thus lying idle, of no value to the state or to any individual.

The tonging interests of Virginia are far more extensive than the same interests in Maryland, and differ slightly in a few other respects, the most important of which is, that the trade is greater in the former state than in the latter.

STATISTICS OF TONGING AND DREDGING IN 1865.—As long ago as 1865, Mr. C. S. Maltby, the great oyster-merchant of Baltimore, estimated that the total annual supply and disposal of oysters taken in Virginia was as follows:

Oysters taken in Virginia waters.

Destination.	Dredged.	Tonged.	Total bushels.
Baltimore.....	916,750	48,250	965,000
Washington and Alexandria.....	59,375	3,125	62,500
Boston.....	23,334	11,666	35,000
Fair Haven, Connecticut.....	43,750	131,250	175,000
New York.....		787,500	787,500
Philadelphia.....	40,000		40,000
Total bushels.....	1,083,209	981,791	2,065,000

THE OYSTERMEN OF VIRGINIA.—Previous to the late war the oystermen of Virginia were composed of negroes, working for their masters, and of a very rough class of whites; but at the close of the war the demand for oysters

* Chiefly from notes by Mr. Edmonds.

was very great, and high prices were paid, and many who had been reduced from wealth to poverty were glad to avail themselves of the chance to make a support by oystering, which was at that time a very profitable employment. The four years of war, during which the oysters had almost a complete rest in many parts of the state, gave them a chance for development, and when the trade revived, the beds were well stocked with large finely-flavored oysters. Men from nearly all occupations, representing all classes of society, eagerly entered the business, and soon there were hundreds of oystermen where formerly there had been but a dozen or so. Many of the most extensive farmers in the tidewater counties found that the conditions of labor had so greatly changed, that to make a living it was necessary for them to devote all spare time to the oyster-trade. This is still done to a considerable extent by those whose farms border on some salt-water creek or river; but the great bulk of the trade is in the hands of a rougher class, and in certain parts of the state it is almost monopolized by negroes. A very noticeable fact in connection with the tonging interests in Virginia and Maryland, and especially of the former state, is the almost total absence of foreigners. The entire trade may be said to be in the hands of native Virginians, since there are probably not 300 tongers in the whole state who were not born and raised there. Such is not, however, the case in the other branches of the trade. The business of oyster-tonging is one involving great exposure, hard labor, and some risk, and the men engaged in it are mostly adult males in the vigor of health. The injury to health from exposure is so great, that few ever reach old age. The death rate among oystermen, as compared with other trades, is very great. Nor does oyster-tonging give returns in proportion to labor expended. The element of chance is a large one. A clear, smooth water, with its opportunities for coving, permits the fisherman to gather in one day what he may not realize by a week's exertion in stormy and tempestuous weather. The influence of these uncertainties upon the habits and thrift of the men is plainly marked, particularly in dislike of steady industry. Few of them ever pretend to work on Saturday, Sunday, or Monday, those days being consumed in going to market and returning, though there is nothing to prevent their going home on Saturday night, or at least on Sunday morning. Many of them have a small piece of land and a house, but their efforts at accumulation do not seem to go beyond living "from hand to mouth".

THE JAMES RIVER.—The most productive of all the tonging-grounds, at least in southern Virginia, are doubtless those of the James river. Go anywhere in it, from its mouth up nearly to Jamestown, and you will catch oysters. There are certain "shoals", however, where the oystermen usually work. Such a one was visited recently by a correspondent of the *New York Times*, who records what he saw as follows:

The shoal from which the Dennis was loaded extended over about 500 acres, and from this shoal, on the day that she was loaded, not less than 10,000 bushels of "plants" were taken. To do this about 250 oystermen were employed, with about 100 boats. And this business of gathering plants had been going on from off the same shoal for upward of two months, with the probability that between 300,000 and 400,000 bushels of oysters have been gathered, and fully 200,000 bushels more will be taken away before the season ends, on May 20. This gives a yield of 1,000 bushels to the acre, and yet nowhere on all this shoal would it be possible to find a spot as large as a set of tongs will cover without oysters on it. The tongs are never pushed down and pulled back without bringing with them a number of oysters. In September the oystermen will begin work again on the same shoals and work for three or four months catching plants; then, during the winter until the 1st of April, they are engaged in taking up, assorting, and selling the products of these plants. It seems as if the supply of oyster-plants in the James river could never be exhausted, yet the oystermen say they are growing less and less each year; but if they are correct in this assertion, it is difficult to conjecture in what abundance these oysters must have been when they were plenty.

To see the oystermen balancing themselves in one of their canoes, and working with so much energy at the same time, was quite a novelty. Many of these canoes are so narrow that should a novice step into one it would most probably be overturned; yet the oystermen work in them all day long in smooth weather, and sometimes in pretty stormy weather, and apparently keep them properly balanced without any effort. To propel them through the water they use a long paddle, and, balancing it over the stern (the canoes, of course, are sharp at both ends, having no row-locks and no indentation to aid them in keeping their paddle in place), they move them swiftly.

STATISTICS OF THE VIRGINIA OYSTER-FLEET.—No records are kept in Virginia of the number of boats engaged in the trade, and it was a very difficult matter to obtain any reliable information upon this subject. After traveling through the tidewater counties, and gaining as near an estimate as possible, Mr. Edmonds sent out a large number of circulars to the officials, and also to one or more prominent oystermen of each county, requesting their aid in the work, and desiring them to give their estimates as to the number of canoes in their respective counties. Many of these gentlemen, he reports, went to considerable trouble to work up the matter, and by their aid he was enabled to correct some of his own figures, and he considers he is able to present reliable figures, showing the number of canoes in each county engaged in the oyster-trade, and the number of men working on them. In addition to this he succeeded in obtaining the number of schooners and sloops used for running oysters to market. It is difficult to divide these latter according to the counties in which they are owned, but I think the figures, as given in the following table, will be found very near correct. The number credited to Norfolk county appears somewhat large, but the figures are furnished officially by Mr. Rusha Denise, county clerk. The majority of these boats hailing from Norfolk county are owned in the cities of Norfolk and Portsmouth. Over three-fourths of them are quite small, being under ten tons register, while there are very few of the other fourth that will register as high as fifteen tons.

Table showing the number of canoes and larger vessels, and the number of men on each, by counties.

Counties.	Number of canoes and skiffs.	Men on same.	Number of larger vessels.	Men on same.	Total number of men.
Accomac	545	925	282	1,176	2,101
Elizabeth	170	510	40	160	670
Essex	150	400	6	24	424
Gloucester	410	530	28	112	642
Isle of Wight	58	250	22	88	338
Lancaster	400	900	35	140	1,640
Mathews	450	900	20	80	980
Middlesex	475	950	12	48	998
Nansemond	80	240	39	225	465
Norfolk	235	470	700	2,800	3,270
Northampton	350	700	38	144	844
Northumberland	281	420	27	108	528
Princess Anne	100	130			130
Richmond	200	400	20	80	480
Warwick	50	80	15	60	140
York	250	500	26	104	604
Westmoreland	275	550	5	20	570
King William	2	5	2	7	12
Total	4,481	8,860	1,317	5,376	14,236

NUMBER OF OYSTERMEN IN VIRGINIA.—Of the total number of tongmen there are 5,906 colored and 5,954 whites, while of those employed on the larger vessels only 1,792 are colored. The total number of each race engaged in the trade is, of whites, 6,538, and of colored, 7,698. About 200 white men, with wages amounting to \$83,200 a year, are employed in building and repairing oyster-vessels, making cases, etc.

PROFITS AND EARNINGS.—Tonging in Virginia is probably equally as profitable as in Maryland, but there is more time wasted by the tongmen of the former state than by those of the latter. This is explained by the fact, that the proportion of negroes is larger in Virginia than in Maryland, and these people are more generally inclined to be indolent than the whites. There were many cases last winter where tongmen made as high as \$500 during the season, but their number is comparatively small when the total number of those engaged in this occupation is taken into account. A close estimate of the average amount made during a season by each tonger would give \$200, or \$25 less than the average amount made in Maryland. Calculating on this estimate, it will be seen that the earnings of the tongmen of Virginia will yearly aggregate about \$1,772,000. Those employed on the running vessels receive during an oyster-season of eight months \$1,022,172, including their board.

CANOES AND BOATS.—The canoes used in Virginia are much smaller and less costly than those in Maryland—their average value being about \$50. At this rate their total value at present is \$224,050. The larger vessels, exclusive of those owned in Norfolk county, average about 16.13 tons; but when the large number owned in the latter county is considered, the average is considerably reduced and amounts to only about 10 tons—making the total 13,170 tons. The aggregate value of these vessels is about \$460,950, and the amount of money annually expended in repairing them is in the neighborhood of \$125,000.

A large part of the running trade in Virginia is conducted by boats owned in Maryland and in northern cities; but as the statistics of these have already appeared in the Maryland report, it is needless to repeat them here. The number of people engaged exclusively in handling oysters for local consumption in the cities of Virginia, is about 300 (nearly all colored), whose wages will aggregate about \$57,600 a season.

OYSTER-PLANTING AT LYNNHAVEN BAY.—To the business of planting oysters Virginia men devote much more attention than do the residents of Maryland. The planting consists of little more, however, in any case, than the simple transferring of young "seed" oysters in the rough shape in which they are dredged from the beds of natural growth, to certain spots where ground has been staked off as private property, and where they grow under better conditions than in their native state. The extensive operations and elaborate methods of the northern states are not to be found in these waters.

The southernmost, and at the same time one of the most famous localities for oyster-planting in Virginia, is at Lynnhaven, just inside of Cape Henry. The wide reputation and acknowledged superiority of the oysters raised in this river and bay led Col. M. McDonald to examine particularly into the methods pursued there; and he has kindly placed at my disposal the succeeding memoranda:

Lynnhaven river is simply a branching arm of Chesapeake bay, and has been made by the tidal ebb and flow. It is fed by very little surface-drainage, the rain waters of the back country finding their way into it by percolation through the porous subsoils that form the banks. When the tide is out the fresh water flows out on all sides by infiltration, and dilutes the salt water in the coves and all along the shores. When the tide is at the flood the saltness is in a measure restored. It is to these incursions of fresh water twice in 24 hours, that the extreme fatness and flavor of these oysters are probably to be attributed.

Oysters for planting are obtained from Back bay and Linkhorn bay, tributaries of Lynnhaven river, in which there are natural beds. They are also obtained from spawning-coves in the river itself. Oysters from James river and other localities have been tried, but have not done well.

The seed-oysters are carefully separated and planted evenly and thinly over the bottom, by a careful hand-sowing, broadcast, with a shovel. Any bottom will suit, provided it is not sandy, so as to shift with the action of the tide and bury the oysters, and is not too soft to bear their weight. They remain in the beds six years or more, and are then sent to the market, where they bring from \$5 to \$7 per barrel, or from \$2 to \$3 per bushel. They are disposed of almost wholly at retail, in the shell, over the tables of saloons and hotels as "fancy" stock.

The amount now planted in this river is about 200,000 bushels. The amount marketed varies, of course, with the demand. For this year (1879-'80) it is estimated by Mr. Joshua Garrison, one of the largest planters on the river, at 25,000 bushels, and the planters receive on an average \$2 per bushel.

All the coves of the river and a greater part of the bed are occupied by plants, and it will probably be found in the future that they have overtaxed the capacity of the river.

Summarizing, we credit Lynnhaven bay with 25,000 bushels, valued at \$50,000.

OYSTER-PLANTING AT CHINCOTEAGUE.—Another point where planting has long been carried on successfully, is at Chincoteague bay on the ocean side of the peninsula. As described briefly by Mr. Edmonds, the whole bay is staked off in small plats, which are always salable should the owner desire to retire from the business of planting. Oysters are bought in the Chesapeake bay at prices ranging from 10 to 20 cents per bushel, carried by vessels to Chincoteague, and there planted, and allowed to remain undisturbed for two or three years. Sometimes they will remain very poor for several successive seasons, and at times it happens that the entire bed will be found on examination to be dead. The winter of 1879-'80 was the most profitable one that Chincoteague bay has known for many years. The oysters were large, fat, and finely flavored, while for several preceding years they had been poor and almost entirely unsalable, and the trade, in consequence, had been very unprofitable. Chincoteague oysters are shipped almost exclusively to New York and Philadelphia, and during good seasons command high prices. From September 1, 1879, to May 15, 1880, the shipments from the bay amounted to 318,113 bushels, of which 166,113 bushels passed over the Worcester railroad, and 152,000 bushels were shipped in sail-vessels. Of those shipped over the Worcester road, 71,184 bushels were taken directly from the bay, while 94,929 bushels were taken from small creeks on the Maryland shore, where they had been transplanted and allowed to stay for a day for the purpose of fattening.

During the season of 1879-'80, Chincoteague oysters were in active demand at high prices, the average for the winter being not less than 60 cents per bushel, and in the latter part of May 90 cents was readily obtained. A feature of the Chincoteague trade is, that all oysters are sold by the thousand, and not by the bushel, as in other parts of Maryland and Virginia. This custom has been adopted in conformity to the usages of northern markets.

OYSTERING AT CHINCOTEAGUE IN 1865.—The correspondent of the *New York Times*, whose letter I quoted a few pages back, accompanied the schooner to Chincoteague, describing the operations witnessed. Greenback is a town situated near Franklin, on the Chincoteague bay, the southern terminus of the Old Dominion Steamship Company's railroads on the peninsula. Nearly every man living in Franklin, and every one in Greenback, depends on the oyster-business for his support. Both of these villages have grown up since the war, Greenback being the older place. It was so named by an old oysterman, one of three or four who first planted in the bay in front of the place, because the first season's shipment of oysters returned to the oystermen such a rich reward in greenbacks. This was in 1865, and since then the quality of the oysters produced in this part of Chincoteague bay has been so generally good, that they have made a favorable impression on European shippers. Following is the quotation:

When the Dennis had secured 3,500 baskets—called by the courtesy of the oystermen half-bushel baskets, but really holding over two-thirds of a bushel—the captain pronounced her loaded, and then all energy was used in getting under way, because the sooner the plants are returned to the water after they are removed from their natural beds, the less will be the mortality among them. In 36 hours after leaving the James the Dennis let go her anchor on the planting-grounds off Greenback, and one day sufficed to place all her cargo on the beds, staked out, and, by Virginia laws, made the private property of those who so marked them. They will be left to remain on these beds for upward of eighteen months, and, although many of those planted will die before the gathering time, yet it will be a poor return that will not give to the planter a bushel and a half for each bushel planted, and sometimes as high as three and four bushels have been gathered from each bushel of plants. These plants cost the planter in Virginia 5 cents per bushel, and about 6 cents to freight, and, perhaps, 2 cents to plant, making 2,500 bushels of plants cost but about \$300.

The cost of taking these oysters up and preparing them for the market is about 20 cents per bushel, and as 2,500 bushels will almost always return 4,000 bushels, it will be seen at once that those planters who have favorable planting-grounds, have it always in their power to make their energy pay them a good profit. At no time for the past ten years have Chincoteague bay oysters sold, delivered on board of vessels in the bay, for less than 50 cents per bushel, and mostly for 60 cents. At the lower rate it will be seen that any one at Greenback, possessed of a working capital of \$1,000, can realize a profit (if he owns share-privileges) of \$800 a year from it, with a chance of doing much better. Doubtless such also is the case in all the bays and coves celebrated for their fine oysters, yet many places along the James and in the Chesapeake bay grow as fine looking oysters as can be produced anywhere, and quite popular at home, that will not sell for enough to warrant the expense of planting.

OYSTER-INDUSTRY OF HAMPTON AND VICINITY.—In Hampton, and Elizabeth City county generally, Colonel McDonald spent much time in investigation of the oyster-industries, and reports as follows:

The fleet of larger vessels that fish, from Hampton, consist of 13 vessels, sloops and schooners, averaging about 25 tons burden. These vessels employ 50 skiffs and 100 men, and allowing the same average per man per season as deduced from the actual operations of

a crew in 1877, viz, 1,300 bushels, we have as the estimated product of this oyster-fleet 130,000 bushels. The number of canoes and small sloops engaged in tonging for oysters in Hampton and Elizabeth City county, may be safely reckoned at 150. The number of men engaged is about three to the boat, or 450 men and boys, each of whom takes an average of 400 bushels as his year's catch.

The planting interests in Back river, Hampton, and Mill creeks will add to the foregoing product about 30,000 bushels.

Summarizing Colonel McDonald's figures, I get :

Number of registered vessels.....	13	
Number of small craft	200	
		213
Number of men engaged on vessels.....	100	
Number of men in small craft.....	450	
		550
Bushels of oysters marketed.....	310,000	
Bushels of oysters from plants.....	30,000	
		340,000
Total crop.....	340,000	
Value, at 20 cents per bushel		\$68,000

Further particulars of this region appear as follows :

Back river is the dividing line between Elizabeth City and York counties. It was once extensively planted with oysters, and the product bore a good reputation and brought good prices. For some reason the ground became unproductive—attributed by my informant to over-planting—and only in the last two or three years has it begun to recover. At the present time about 10,000 bushels are planted annually. The capacity of the planting-grounds is estimated by Mr. Booker at 100,000 bushels. Poquosin river, a few miles to the northeastward, in York county, has a planting capacity of about 175,000 bushels. The amount annually planted there is from 25,000 to 30,000 bushels, and the amount obtained by tonging from the commons is about 5,000 bushels.

NATURAL AND ARTIFICIAL BEDS IN HAMPTON ROADS AND JAMES RIVER.—From another gentleman, described as a “planter of intelligence and varied experience”, Colonel McDonald obtained information which enabled him to plot upon his charts all of the natural “rocks” and the planting-grounds in Hampton roads and the James river. The plantings specified, with their products, are these :

In Mill creek back of Fortress Monroe :		
Now planted.....		Bushels. 5,000
Capacity		10,000
On Hampton flats, between Newport News and Hampton creek :		
Now planted.....		5,000
Capacity.....		400,000
In Hampton creek:		
Now planted.....		10,000
Capacity.....		10,000
On edge of Channel, back of Ripraps :		
Now planted		5,000
In Willoughby bay, back of Ripraps:		
Now planted.....		50,000

Up the James river are a few plants—probably 25,000 or 30,000 bushels—but thousands of acres are available for planting which, in a few years more, will be brought into productiveness.

METHODS OF OYSTER-CULTURE ABOUT HAMPTON.—The seed for this cultivation is chiefly obtained in the James river, and the favorite points are high up the river near the upper limit of the natural-growth of the oyster, which limit is at the Deep Shoals light-house, a few miles below Jamestown. The effort is always to get round, single, deep, thin-shelled oysters for planting; the smaller the better, if they can lie until of mature growth. The tongs employed are of three sizes—24, 32, and 36 inches in breadth of “head”. They are of the ordinary pattern. The size employed depends upon the rankness of growth of the bed. Where single, or “cove”, oysters are sparsely scattered over the bottom, a small pair of tongs, with eight or ten inch jaws, is employed to gather them. The use of these is impracticable, however, unless the water be clear and smooth, so that the oysters can be “sighted”, or seen and aimed at. This can readily be done in water from 4 to 7 feet deep. Such oysters are large, fat, and of good shape; they class as “selects”, and bring “top” prices in the market, from 60 cents to \$1 per bushel. The seed is obtained by the tongmen, who work with their own canoe or tools, or by the planters, who hire crews and equip boats of their own to go after seed. In taking the oysters for planting, little or no culling is usually attempted. The cost of planting oysters (culled) varies from 10 to 40 cents per bushel, depending upon the character of the seed. Rough oysters—the run of the rock—may be planted for about 5 cents a bushel.

The amount planted on a given area is regulated by the time they are to lie. For one year about 30 square feet is allowed to the bushel; when the plants are to lie for two years about 40 square feet to the bushel. Where the oysters are simply shifted to fresher water to fatten, and lie but a few months, several thousand bushels to the acre are often laid down. Ordinarily, the increase after lying fifteen months is one-fourth; for small single oysters it is double, or 100 per cent. The rate of growth will vary with location and other circumstances. The best judges, at Hampton, think that plants ought not to lie less than two years in order to get the best results.

THE "GREEN-GILL" DISEASE.—In 1880 what the oystermen call the "green-gill" began to affect the planted oysters in Back river, and Colonel McDonald inquired carefully into it. He learned that it began with the oysters lowest down the river and traveled up the stream. It was supposed by the planters to be due to the extremely dry weather, which caused the water of the river to be unusually salty, since the condition appeared first where the water was saltest. When the oysters of Back river were similarly affected many years ago, one man moved several hundred bushels around to the Bay-shore, and allowed them to remain some time in the salty waters of the bay without producing any change. The *salient* fact, if true, is that the change began in the salt water. Furthermore, it is observed that this peculiarity only affects them when they are fat. The existence of it does not impair the quality of the oysters, but it does materially affect the sale, because people generally are ignorantly afraid of it.

PREJUDICIAL OYSTER-LAWS.—One other feature of this district calls forth remarks from Colonel McDonald, which I quote herewith:

The Hampton flats furnished a notable example of a condition of things that is beginning to prevail extensively in Virginia waters. Formerly they were covered with a natural growth of oysters that had great reputation and commanded a high price in the markets. They lay right at the doors of Hampton, and gave profitable employment to her fishermen; now these flats are exhausted, and though possessing a productive capacity of nearly half a million bushels annually under judicious planting, the law of the state prohibiting planting upon "oyster rock", keeps them barren, when an annual income of not less than \$125,000 is possible. There are not now, nor is it likely there ever will be again, any natural, wild oysters growing there. Yet 2,500 acres of fine planting-ground, at the very doors of the oystermen is compelled to lie idle through shortsighted prejudice.

OYSTER GATHERING AND PLANTING IN YORK RIVER.—For information in regard to the oyster-fisheries and industries of York river, I am again indebted to Colonel McDonald, whom I quote:

York river is the common estuary of the Mattaponi and the Pamunkey rivers. It is a broad arm of the Chesapeake, some 30 miles in length. At the head of it stands West Point, the terminus of the Richmond, York River and Chesapeake railroad, whence lines of steamers ply to New York, Boston, and Baltimore. The average width of the river is about three miles. At its mouth, between Yorktown and Gloucester point, the width rapidly contracts to less than 1,200 yards. Through this narrow gorge the tide rushes with great velocity and has scoured out the channel to the depth of nearly 80 feet * * *

The natural oyster-rocks of York river are now insignificant, compared to former days, and most of the oystermen who formerly worked on this river every season, now go to the Rappahannock and the James. Relatively, the oyster-planting interests are of greater importance, yet are insignificant now compared to what they were ten years ago. At that time the high price of oysters caused overplanting, which led to the impoverishment of the planting-grounds, while the sudden fall in prices ruined most of those who were engaged in the business.

The plants for this river are obtained in part from James river, the larger part from the Potomac, and cost to bring and lay down from 15 to 20 cents a bushel. The same conditions of "greening" characterize the oysters in this river as in Back river. The greening begun with those lowest down the river, and has traveled up. Captain Van Pelt states as a curious fact, that green oysters have never been found on the York side higher up than Sandy point.

The planting grounds extend to about 25 miles above Yorktown, and are occupied by 15 or 20 planters, who raised about 350,000 bushels for market during the past season. The ruling price was 35 cents, which would make the total value \$122,500. Including the hired help, a hundred families probably make a living out of oyster-planting in York river, with the help of tonging, clam-digging, and various land-occupations. The product goes in schooners to the New York and Boston markets.

PLANTING IN THE RAPPAHANNOCK.—In respect to the Rappahannock, what has been learned of the planting-interests is rather discouraging. The extent of ground under use is a strip along the flats on both sides, averaging 100 yards in width. These extend from Ware's wharf or Russell's rock, which is about eight miles above the light-house, to the mouth of the river. The seed comes chiefly from the natural beds in the Rappahannock and Potomac rivers, with a few from elsewhere. The planters are roughly estimated by Mr. B. L. Farinholt, of Montagues, Essex county, Virginia, who kindly gave me much information on this district, at about a thousand; and taking into account the tongers who sell exclusively to the planters, and others employed, Mr. Farinholt thinks no less than 5,000 men are supported by this industry. Many of these persons come to the river from elsewhere to work during the season, but very few are hired at stipulated wages in any capacity.

Last season the planted crop is roughly estimated at about 400,000 bushels, which sold at an average price of 50 cents. The season of 1880-'81 was an exceptionally profitable one. Mr. Farinholt writes me in conclusion, as follows:

Planting is largely on the increase. The natural beds are rapidly being destroyed, oysters are becoming scarcer, and prices are increasing from 20 to 25 per cent. each year for plants. Unless the season for catching is made shorter, or some heavy tax is laid on, or both together, it is my opinion that within a few years this interest will become a very small one on this river, simply from the depletion and destruction of the natural beds.

THE PACKING-TRADE OF VIRGINIA.—The packing-trade of Virginia is of much later origin than that of Maryland. About the year 1859 Mr. Edmonds states that Mr. Edward Fitzgerald opened an oyster-packing establishment in Norfolk; but the war coming on, the business was greatly hampered and restricted, and it was not until 1865 that the trade gave any evidence of ever becoming very extensive. As the transportation facilities of the city increased, and the ill-effects of the war began to die out, the oyster-trade showed a very marked

improvement, and during the last few years it has developed very rapidly. Mr. Edmonds' report upon this phase of the oyster-business in Virginia is very complete, and I quote him as follows:

In Norfolk, as in Baltimore and other cities of Maryland, the trade is largely in the hands of northern men, one difference, however, being quite noticeable, and that is, that whereas in Maryland the packers are principally natives of Connecticut, in Norfolk they are nearly all either New York or Boston men. The enterprise and capital of these gentlemen has largely developed this business, which now forms one of the most important branches of Norfolk's trade. The increase in the packing-trade of Norfolk has been instrumental in decreasing the shipments of oysters in shell by sail vessels from the bay to New York and Boston, as these two cities receive, by means of the Old Dominion line and the Merchants' and Miners' Transportation Company lines, the great bulk of Norfolk oysters. This important change in the course of trade has been very beneficial to Norfolk, as the shucking and handling of oysters give employment to a large number of workmen.

The trade of Norfolk is almost exclusively in raw oysters, there having been only 3,000 gallons of steamed-oysters packed during the entire season. Shipments are made in bulk in barrels, and, although, as previously stated, the largest part of the trade is with New York and Boston, there are considerable shipments to all points of the North and West.

Although Baltimore is pre-eminently the great packing center of the bay, it is nevertheless true that, considering the amount of capital invested in the business, Norfolk handles proportionately a much larger trade than the former city. The number of shuckers employed and their wages are in about the same proportion in the two cities. The number of oysters packed at Norfolk during the season of 1879-'80, was much larger than the combined totals of all packing points in Maryland, excluding Baltimore. The exact figures are as follows:

Packed at—	Bushels of raw oysters.
Crisfield, Maryland.....	427, 270
Cambridge, Maryland.....	205, 410
Annapolis, Maryland.....	156, 703
Oxford, Maryland.....	108, 960
Saint Michael's, Maryland.....	37, 788
Sundry small places, Maryland.....	224, 817
Total.....	1, 160, 948
Norfolk, Virginia.....	1, 370, 855
Difference in favor of Norfolk.....	209, 907

Outside of Norfolk the packing of raw oysters in Virginia is very light. At several places a light business is done, but too small to be noted separately. At Hampton and at two places on the Rappahannock river quite an extensive trade in steamed or cove oysters is conducted. The word "cove", as applied to oysters, has two entirely distinct meanings. When used by tongers it refers to large oysters caught in the small coves tributary to all creeks and rivers, while with packers and others it means oysters which have been steamed and hermetically sealed.

Table showing the packing trade of Virginia for 1879-'80 (by R. H. Edmonds).

	At Norfolk.	Elsewhere in Virginia.	Total.
Number of firms.....	13	12	25
Capital invested.....	\$96, 350	\$23, 000	\$119, 350
Estimated value of buildings and grounds occupied.....	\$138, 500	\$29, 000	\$167, 500
Average number of hands employed.....	1, 027	501	1, 528
Wages of same.....	\$154, 584	\$46, 367	\$200, 951
Number of bushels packed raw.....	1, 370, 855	58, 275	1, 429, 130
Value of same.....	\$589, 127	\$22, 020	\$611, 147
Number of bushels steamed.....	3, 000	190, 000	193, 000
Value of same.....	\$1, 500	\$119, 400	\$120, 900
Total number of bushels packed.....	1, 373, 855	248, 275	1, 622, 130
Value of same.....	\$585, 273	\$141, 420	\$726, 693
Number of tin cans used.....	91, 000	620, 000	711, 000
Value of same.....	\$3, 615	\$18, 500	\$22, 115
Number of wooden cases, barrels, etc., used.....	16, 871	1, 000	17, 871
Value of same.....	\$11, 119	\$1, 939	\$13, 058

Since Mr. Edmonds' visit to Norfolk, a large steaming-house has been put up there by representatives of the Union Oyster Company of Baltimore. This employs many hands, additional to the number counted above, and uses a large quantity of oysters which otherwise would rot, or at least not find sale to the "raw" houses. This conduces to the general prosperity of Norfolk, in that it makes the chance of selling at some price more certain than before, and thus induces a larger number of boats to come to the town and do their trading as well as sell their catch there. The steaming-house also gives employment to many girls and women. Previously, very few females had been employed in the packing-houses of Norfolk, but of the 501 shuckers in other parts of the state, 244 are females. I suppose this new establishment would add at least 10 per cent. to the totals of the above-given table; but as I have no precise figures, I prefer not to enter into the summary of statistics.

SHIPMENT OF OYSTERS IN THE SHELLS.—Although I have added from other sources a large additional amount of local particulars, no better statistics are available for Virginia than those furnished by Mr. R. H. Edmonds, in connection with his report on Maryland. The summaries will be found in the succeeding tables:

Shipments of oysters in shell from Virginia for year ending May 31, 1880.

To—	For plant-	For imme-	Total.
	ing.	di-ate use.	
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
New York.....			600,000
Philadelphia and Delaware bay.....	215,820	223,940	439,760
Boston.....	5,000	90,000	95,000
Providence and Providence river.....	180,000	50,000	230,000
Fair Haven.....	133,000	150,000	283,000
Portland, etc.....	9,000	75,000	84,000
Washington.....		317,317	317,317
Maryland.....		1,000,000	1,000,000
By rail and steamers.....		216,113	216,113
Total.....			3,315,190

YIELD OF VIRGINIA OYSTER-FISHERIES.—The number of bushels of oysters caught in the state during the year, and the disposition made of them, may be summarized as follows:

	Bushels.
Packed in the state.....	1,622,130
Shipped out of the state in shell.....	3,315,190
Used for local consumption in the cities of the state.....	275,000
Used for local consumption in the small towns and counties of the state.....	1,625,000
Total.....	6,837,320

STATEMENT SUMMARY.—The average value of these oysters from first hands, would be about 28½ cents a bushel, or a sum total of \$1,948,636 20. This is shown, by sections, in the following statement:

Department of work.	Capital invested.	Number of people employed.	Wages and earnings of same.	Estimated number of people dependent upon the trade, calculating four to each worker.
Planting.....	\$586,300			
Packing.....	286,850	1,528	\$200,951	
Tonging.....	224,050	8,660	1,772,000	
Running.....	460,950	5,376	1,022,172	
Local trade.....	10,000	300	57,600	
Building oyster-vessels, etc.....	50,000	200	83,200	
Total.....	1,618,150	16,264	3,135,923	65,056

Reducing this to the formula for summary used heretofore, it presents itself as follows:

STATISTICAL RECAPITULATION FOR VIRGINIA:

Number of packers, planters, and tongers.....	10,439
Value of shore-property (about).....	\$50,000
Number of vessels and sail-boats engaged.....	1,317
Value of same.....	\$460,950
Number of canoes and skiffs.....	4,481
Value of same.....	\$224,050
Number of men hired by planters or dealers.....	500
Annual earnings of same.....	\$140,800
Number of sailors employed.....	5,376
Annual earnings of same.....	\$1,022,172
Total number of families supported.....	16,264
Annual sales of—	
I. Native oysters..... bushels..	6,837,320
Value of same.....	\$1,948,636

Q. THE SOUTHERN ATLANTIC COAST.

50. THE OYSTER-PRODUCTS OF NORTH CAROLINA.

GENERAL ASPECT OF THE INDUSTRY.—In North Carolina the business in oysters and oyster-culture is of small proportions, and is confined almost wholly to the Neuse river, Beaufort, and Wilmington. The census of 1860, imperfect, of course, in both estimates, gives North Carolina only \$2,100 worth of oysters, compared with \$53,145 credited to Virginia, and \$15,395 taken in Maryland. The inside of the outer "banks", or the long line of beaches that protect the inner submerged area of nearly fresh water from the demolishing force of the ocean, is lined with oyster-growth to a greater or less degree along its whole extent, but these oysters are not always either edible or available for commerce. Currituck sound was closed from the ingress of salt water forty years ago, and of course all marine life has died out there. Albemarle sound is said to be the largest body of fresh water in the country, except the Great Lakes, and sometimes sweetens the water clear down to Roanoke island. Pamlico sound, on the contrary, has inlets from the Atlantic which make all its water, at least along its eastern half, thoroughly saline, and permits a luxuriant oyster-growth. This is availed of by the simple fishermen of these desolate beaches and islands in a way that shows how a primitive custom may survive for many years after the commonwealth in which it grew up has passed on to something more complicated and better fulfilling the same purpose. Of these fishermen there are about 300 between the middle of Core sound and Roanoke island, as I am informed by Mr. R. E. Earll, of the United States Fish Commission. Mr. Earll tells me that every winter, at intervals in their fishing, or in connection with it, all of these fishermen are wont to take partial loads of oysters, gathered on the outer banks, to the shore and river towns, perhaps 20 or 30 or more miles away, and there dispose of them, not for cash, but by a system of barter. The exchange is ordinarily made for corn, and the rate last winter was one bushel of oysters in the shell for one bushel of Indian corn in the ear. Taking this, together with what the families of the fishermen eat, and these people live on oysters the year round, and with small interruption, Mr. Earll considers that forty and perhaps fifty thousand bushels a year, worth, perhaps, \$10,000, reckoned in money, would not be too large an estimate to put upon this consumption. One obtains from such a picture as this an appreciation of the importance of oysters, and the oyster-trade, to the people who live in the neighborhood of the beds, and of which little or no statistical account can usually be given.

THE VICINITY OF BEAUFORT.—The first point of inquiry, which develops any systematic or commercial use of oysters, is in the vicinity of Beaufort and Morehead City, which lie at the lower end of Core sound, and on opposite sides of Newport river, whose mouth and inlet from the ocean form Beaufort harbor, and separate Core sound on the north from Bogue sound on the south. The oysters brought to Beaufort come chiefly from the two sounds mentioned. They are almost always of natural growth, but the transplanting of seed has been done at a good many different points, and there will, no doubt, be considerable cultivation in a few years. An attempt was made in 1880 by a Baltimore firm to establish an opening-house at Beaufort, but inclination or circumstances caused its removal to Newberne. There is little regular business at Beaufort, therefore.

I am in receipt of a letter from Dr. H. C. Yarrow, United States army, containing some notes on the oyster-interests in this locality in 1864. Dr. Yarrow writes:

At the time I was in Beaufort the oyster was not cultivated, and all I can tell you is, that the best ones were found about 25 or 30 miles west of Fort Macon, in Bogue sound. These oysters, which were famous, brought 40 cents a bushel; ordinary ones only 25. Good oysters were also got up the North river and in a river, running a little north of Harkness island, which is near Cape Lookout.

NEWBERNE.—More facts are to be ascertained at Newberne, where more business is now done. Newberne gets its oysters from various points in Pamlico sound. The marshes of the lower part of the Neuse are full of them, but little or no use is made of this seed. Bay river, on the shore of the mainland, gives a good thin-shelled and white oyster, with a deep "cup" and fine flavor, but the freshets in the Neuse are likely to ruin these beds. Smith's creek is also a very good locality, and oysters of very fine flavor are caught opposite Fort Smith, but contain a great many crabs. Good single oysters, capable of being made very fine by planting, are reported to abound in the vicinity of the Royal Shoal rocks. Other good localities are Point of Marsh and Broad creek. The objection to all Core sound oysters is, that though of fine shape and good flavor, they do not seem to thrive under transplanting. However, this may be a libel upon them, since none but the crudest experiments have been made in cultivation. There is no reason to doubt that it would succeed grandly, and with comparatively small trouble, for I have rarely seen shells come up so completely overgrown with infant oysters, as are those which are brought to Newberne. There is little hope that the fishermen themselves, who now live along the shore and work upon the beds, will ever become cultivators to any extent. Whether outside capital will ever find it profitable to undertake oyster planting in these apparently highly favorable waters, depends upon a dozen outside considerations of market, means of transportation, possibilities of procuring labor, etc., which it would be futile to discuss, because they are constantly changing. It appears then that all the oysters—with occasional exceptions—sent to market from this district, are taken from the natural beds without any intermediate process of transplanting, or fresh-water fattening.

NORTH CAROLINA OYSTERMEN.—The men who supply the oysters are partly fishermen, few of them expecting to derive as much as half of their support from this occupation. In all, I suppose there are from 300 to 400 men tonging more or less in Pamlico sound, but it is out of the question to arrive at any definite average of what each one earns. The main cash receipts go to the hundred or so chief oystermen. The boats are the same ones used in the general fisheries, and will average \$200 to \$250 in value. They belong chiefly in Core sound, and in all there are perhaps 50 or 60 of them. In spite of this array of natural resources, men and boats, only about 25,000 bushels were landed at Newberne, and about 5,000 bushels more at Beaufort, during the winter of 1879-80. It is said that about half as much more (say 15,000 bushels) were bought by peddlers alongshore, who carted them back into the country and sold them from their wagons. The total production of this district, therefore, is about 45,000 bushels, which would be increased to 50,000 bushels if we counted the immediate consumption on the shore. Not only ought there to have been raised from the water a very much larger amount than this, when we consider the great area of the beds and the number of men employed, but a vastly larger amount would have found an immediate market at Newberne. There are two or three persons there who regularly ship in the shell as many good oysters as they can procure. Besides this there has recently been opened a shipping-house, which would be glad to consume 1,000 bushels a day during all of the cooler half of the year, if they could only obtain the stock. But unfortunately, the general laziness and improvidence of the oystermen are so great, that it is impossible to make a contract and expect to fill it. Not only has it proved extremely difficult to obtain oysters in sufficient quantity, and at the time they were needed, to make the running of this new packing-house profitable, but when by good luck a stock was on hand, there was incessant danger that the men hired as shuckers might suddenly desert their employer, without a single compunction as to their duty or responsibility under the circumstances. When it is cold, or the weather is at all rough, no one of these North Carolina oystermen can be persuaded or driven to go to work, notwithstanding that the beds are near shore and well sheltered, and in spite of his manifest poverty. The fact that some discomfort will attend his raking, is reason enough for him why he should stay home and sit over his miserable fire. Yet it is in cold and stormy weather that the buyers are most anxious to get oysters, and will pay a higher price, because then there is not only a greater demand produced by general scarcity, but the frosty air sharpens the appetite of their customers.

The question of labor in opening presented an obstacle to success of the same nature. These men are paid by the gallon, and it was found that no reliance could be placed upon a large number of them. Both white men and colored were employed, but the latter have proved the more reliable of the two, and have nearly superseded white help. Many men would come to the house, beg to be taught the art of opening oysters, which was new to most of them, and be set at work. For the first few days the novelty would keep them pretty steadily employed, then suddenly, when perhaps their assistance was most needed in filling an order, they would knock off. After that their promises proved worth nothing, and no reliance whatever could be placed upon their staying longer than was necessary to earn the 15 or 20 cents which would buy them a little corn meal and tobacco, to keep themselves and their families from starvation for a couple of days. So impossible have the proprietors found it to improve these lazy, unbusiness-like habits of the people, upon whom they must rely for their stock and their labor, that Newberne is likely to lose the benefit of an industry which, in a different community, would distribute much needed money among hundreds of families of the poorer classes.

Some oysters bring as high as 50 and 75 cents a bushel in Newberne and Beaufort, but the average price during this last winter was not above 35 cents, if quite as high as that. At this rate the 50,000 bushels credited to the district was worth \$17,500.

THE USE OF OYSTERS FOR MANURE.—I must not omit to mention a custom which prevails in Pamlico sound in summer, and which has been described to me by Mr. Earll. It seems that when the weather becomes too warm for the fishermen to safely carry their catch to market, and there is no other employment for their boats, they catch up boat loads of rough "coon oysters" and carry them to the farmers up the rivers to be sold and used as manure. They receive from 3 to 5 cents a bushel for this strange, but doubtless highly nutritious, fertilizer, but what is the total amount thus gathered and spread on the land each season, I am unable to estimate.

OYSTERING ABOUT NEW RIVER.—South of Newberne and Beaufort oysters grow in nearly all the inlets, but there is no regular production until New river is reached, about half way between Beaufort and Wilmington. The main location of the raking here is right opposite Sneed's ferry, beginning two miles from the bar and extending for three miles. The water here is only brackish, and of a uniform depth of about 9 feet. The crooked channel is full of "oyster-rocks". The oysters are of large size, fairly regular shape, and for the most part single. They possess a most pleasing flavor; but when now and then storms drive the salt water up the river, their excellence departs and the oysters take on a greenish appearance, locally called "green-gill". When in this condition they are not considered fit to be eaten, but the disaffection soon wears off.

The oystering here is done in skiffs, of which from fifteen to twenty are constantly busy for four or five months in the spring. As there are two men to each skiff or canoe, from 30 to 40 families get a living from the tonging. The law permits every man owning a water-front to inclose a large space of the adjoining bottom, if he wishes to plant oysters. About a dozen persons have taken such plots and raise planted oysters, but the total crop this year will probably not exceed 2,500 bushels, and this stock was inferior to the natural growth. All these oysters, wild and planted, are sold to carters, who buy them at \$1 a bushel, or from 60 to 80 cents a gallon, for a large part of the

whole product is opened there to prevent the carriage of the extra weight of shells. The wagoners carry them to interior towns and peddle them at various prices. It is thus that Wilmington is supplied, and the retail price there is \$2 a bushel. Wilmington also receives oysters in small quantities from Myrtle Grove sound, where some experiments in planting have just been begun about two miles northeast of Fort Fisher. These are small, but fat and very choice specimens. Another point whence oysters of good reputation come, is Winbury, on Topsail sound. It is difficult to come at it, but I judge that from fifty to sixty thousand bushels is an estimate of all that the production of the New river and Wilmington region would require annually. Out of the perhaps 50 men who busy themselves regularly in this industry, as tongers, openers, carters, or shippers, there are none who are not also largely engaged in other sources of daily bread. It is believed by those best informed upon the subject, that the state law which prohibits dredging within the state is an injury rather than a blessing to the oyster-beds. They are probably right. Under proper restrictions which shall save the privilege from abuse—something hardly to be apprehended in this case, owing to the geographical conditions—dredging would aid both in the extension of the oyster-bearing areas and in the better production of good single oysters on the grounds where they now grow, but in a coarse, bunchy way. The permission of dredging might bring some evils, as in the Chesapeake, but the benefits following to North Carolina would probably overbalance any harm.

STATEMENTS FOR NORTH CAROLINA.—Reviewing this, furnishes estimated totals as follows, for the whole state:

Number of planters and tongers	1,000
Number of shippers	10
Value of shore-property	\$15,000
Number of vessels	90
Number of small boats	800
Value of fleet and tools	\$53,500
Number of shoremen hired	10
Annual earnings of same	\$1,300
Families supported, partially	1,000
Native oysters annually sold	bushels.. 170,000
Value of same	\$60,000

51. OYSTER-FISHERIES OF SOUTH CAROLINA.

CHARLESTON AND VICINITY.—At Charleston all the business is confined to a little desultory planting around Sullivan's island, and it is doubtful if there is any shipping of oysters done there whatever. The same is true of Port Royal; and I am convinced that 50,000 bushels, worth perhaps \$20,000, would supply the yearly demand of the whole South Carolina coast. The interior towns of the state derive their supplies from the North or else from Savannah.

52. OYSTER-FISHERIES OF GEORGIA.

SAVANNAH.—A somewhat unsatisfactory report of the oyster-business in the neighborhood of Savannah, was all that it was possible for me to obtain during my stay there; but it is a small industry at best, though the most important producing and shipping point on the southern coast.

Savannah is situated upon bluffs on the banks of the Savannah river, just where the salt meadows and sea islands give place to the mainland. In the Savannah river, itself, no oysters grow above the immediate mouth. This is due to the great volume of fresh water which it pours out. In time of freshet, the red, turbid current is visible 25 or 30 miles at sea, and so completely freshens the water to the very outlet, that oysters will not flourish. Off Potato point, however, and in the shape of two elongated banks, marked by beacons, in mid-stream, oyster-beds are to be found, and are raked for seed, or, more than that, for marketable oysters, which are brought to Savannah. These beds in Tybee roads are mainly tonged by colored men, who are fishermen at other times, or do it in a desultory way. Their number and catch varies endlessly.

RACCOON OYSTERS.—But everywhere in the thousand channels which intersect the marshy islands that border the coast, making a perfect net-work of salt-water tide-ways, the raccoon or bunch oysters grow in endless profusion. Let there be old shells, sunken fragments of castaway stuff, logs, or anything upon which it is possible for an oyster to catch, and it will be surely covered with the young shells before a single season has gone by. The oysters spawn here regularly from April till June, and scatteringly till a much later date. So prolific of spawn are they, and so favorable seem to be the conditions for their safe growth, that such an object as an old shell will become completely coated with the infant bivalves. As these grow (and with great rapidity) they sink and gather in the mud, and crowd each other for lack of room to enlarge. All these effects produce their slender and irregular shape, they being able to increase only in the narrow, outward direction. Before they are half grown a second season bestows upon them a new collection of young oysters, which must struggle in a similar way, and thus there arise clusters or bunches or columns of oysters, sometimes three or four feet high and several inches thick, which are closely agglomerated and of very heavy weight. These are called raccoon or 'coon oysters, and are collected, knocked to pieces, and sold in market, chiefly by colored men. Though some of them will not furnish a meat much larger than the thumbnail, they are sweet and well flavored when brought from a good locality.

PLANTING FOR THE SAVANNAH MARKET.—No oysters were planted for the Savannah market until about forty years ago, when, it is said, the first attempt was made by Mr. Andrew Nelson, who is still engaged in the business at Vernonburg. Now there are planted beds, also, alongside of his, in Burnside river and at Thunderbolt, about five miles south of the city.

The Thunderbolt planters go for their seed chiefly into Wilmington river and Wassaw sound, and particularly along the southern end of Tybee island. The Vernon and Burnside planters go down the Vernon river and into Ossabaw sound, especially along the northern end of Ossabaw island, and at the southern point of Big Wassaw. Here they tong up their seed into batteaus, the water being so deep in some places as to require 18-foot handles. The law of the state prohibits dredging, or "any other instrument than the oyster-tongs heretofore in general use". These tongs do not differ essentially from those made and used in the north. Only a portion of the seed obtained for planting, however, is tonged up from the deep-water beds, where it occurs singly, or nearly so. A larger portion is obtained from the shores of the various sounds and salt-water channels, and consists of incipient bunches of raccoon oysters. At low water the planter takes a bateau and four men and goes to the shore where he designs to work at the time of low water. Getting out upon the exposed mud, one or two of the men pull or rake up out of the mud the small bunches of oysters imbedded there, and the rest follow after and pick them up. The instrument used is a rude piece of iron of convenient length, bent at one end so as to act (as it is called) as a "hooker". Old wagon tire is a favorite material out of which to make this instrument. One of these bateaux will carry 100 to 200 bushels, and four men can often fill it in a tide, breaking the bunches in pieces as they pick them up.

GEORGIA OYSTER-LAWS.—It is only recently that the state has given legal sanction to oyster-culture. The law is brief, but very much to the point, and reads as follows:

Where any person having taxable lands on the banks or shores of any of the rivers or creeks of this state, shall plant beds of oysters upon them, it shall not be lawful for any other person to take from such beds of oysters: *Provided*, the same shall be distinctly staked or marked.

When an oyster-bank, or beds of oysters, or natural formations, be within rivers or creeks, not exceeding 125 feet in width, and not used for purposes of navigation, the persons having the ownership of the lands on both sides of such creeks or rivers shall have the exclusive right to the usufruct of such banks or beds of oysters as aforesaid.

PRE-EMPTION METHODS.—Under this law large amounts of public marsh and islands have been staked off, much of which (it is widely complained of) is not properly done, since *bona fide* planting is not carried on, nor are taxes paid. The truth of this charge of abuse, which must only exist by common consent, I did not investigate; but heard several planters say that large portions of their most accessible seed-grounds had been thus shut off, compelling them to go a long distance, with much labor and pains, for their "plants". The boundary marks used are stakes, upon which is nailed a board with the letter "O" painted upon it. One of these oyster-signs at the mouth of a narrow creek would prohibit any boat gathering oysters above it; and it seems to be universally respected, except by the vagrant negroes, who catch and sell oysters when they want a little money to prevent utter starvation, or to pay for some sport.

METHODS OF CULTURE.—The seed thrown overboard is mainly about a year old; smaller takes too long to grow, and a much larger growth will not survive transplanting. There are two classes of beds—shore-beds, going dry at low tide, and channel-beds, always covered—the latter producing the finer oysters. The bottom is mostly clay mud. After two years the oysters are taken up, the marketable ones picked out, and the rest thrown back; then another lot of new seed is thrown on the same bed. A regular rotation of planting and harvesting stated beds is not followed, and the best oysters obtained are of scraggy, poor shape (even where single), rough shell, and small size. I saw almost none which would pass in New York as "box". Nevertheless, they are of pretty good flavor, though not so salt as one would expect, and of too dark a tint to look as inviting as they taste. Of those I tried, I like the Vernon samples best; Thunderbolt seems not to have so clear a stream. They are usually four years old when taken to market.

Each of the planters has a small hut built upon posts at the edge of the water, where he opens his oysters. In these houses he opens almost all of the stock he sells, and only takes the meats to town, receiving about fifty cents a solid gallon. The method of opening is the same as that used in New York, the knife and handle being of one piece, and the latter very heavy. The shells are used to make causeways from the land to these huts, and also to build roads. Two fine driveways, each several miles long, extend out of Savannah, which have been paved with oyster-shells.

Each oysterman owns a sloop, the hull of which is skiff shaped and not at all handsome. They are only half-decked, in many cases, but have a little cabin aft, and a hatchway to the hold; they are far from beautiful boats, but are worth an average of \$200 each. In this part of Georgia there are perhaps a dozen of these vessels in the oyster-business, only one of which, I believe, is registered at the custom-house.

EXTENT OF TRADE AND CONSUMPTION IN SAVANNAH.—In respect to the city trade, it is only to be said that three or four men handle the majority of all the oysters brought to the city, and ship them throughout this state and South Carolina, Charleston competing very feebly. Very few oysters come from the North, perhaps 50 barrels

a year in all. These are wholly in the shell, and go to the restaurants. In the case of every dealer, oysters form only a portion of a general fish-trade, and so cannot be counted as "supported" by dealings in them.

It was very difficult to arrive at any just estimate of the annual consumption of oysters in and through Savannah. From what I could ascertain, I judge the yield of the transplanted beds to be less, rather than more, than 15,000 bushels. If you add another 15,000 bushels of raccoon oysters gathered, I think the total will account for all brought to Savannah. A planter told me he received 50 cents a gallon for opened oysters, and \$1 per bushel for the best single oysters. A leading dealer gave me present wholesale prices as 60 cents to \$1 per gallon, and \$2 50 a barrel for shell-stock. I suppose the value of the 30,000 bushels estimated to be handled annually in Savannah, may be given as \$25,000.

LOWER GEORGIA.—Below Savannah all the sounds and lagoons and river mouths are more or less obstructed with oyster-reefs, and furnish many good raking-grounds. The denizens of Darien, Doboy, Saint Simon, Brunswick, and Saint Mary, all procure oysters from their near neighborhood at small prices. Some intentions of planting were once entertained at Brunswick, and I heard of an old county-ordinance that prohibited all outsiders from tonging there.

STATISTICAL RECAPITULATION FOR GEORGIA:

Number of tongers, planters, and wholesale dealers	300
Value of shore-property	\$5,000
Number of boats	100
Value of same, with gear	\$13,500
Number of shuckers hired by planters or dealers	50
Total number of families partially supported	200
Annual sales of—	
I. Native oysters	bushels.. 70,000
Value of same	\$35,000

53. OYSTER-INTERESTS OF EAST FLORIDA.

FERNANDINA AND VICINITY.—This abundance becomes more and more noticeable as you approach Fernandina, Florida. Every bit of sunken log in the marshes, each fallen tree whose branches trail in the water, and row-boat stake, becomes at once loaded down with "coons". Frequently large specimens are obtainable, and such are very good, as I proved, but they are rarely eaten, and no attempt whatever is made to utilize the easily obtainable seed for transplanting. There is no legal protection or proper sentiment to encourage planting. If a boat-load is brought in and laid down over night, even, the probabilities are that it will be stolen. Fernandina, then, gets all its home oysters from beds 10 to 15 miles distant, where they grow large and singly: the favorite spot, at present, is Crooked creek, over towards Saint Mary. The oystermen are colored fishermen, and no estimate can be formed of the total catch. The price they receive is \$1 per barrel. In addition to this an uncertain amount of better oysters are brought to Fernandina from Cedar Keys, by rail.

On the point of land terminating Old Fernandina are remains of an extensive Indian shell-heap; and in the bottom of the harbor opposite the marshy shore between the old and new towns, was formerly an exceedingly large bar of raccoon oysters. Latterly these have died, and now they are being washed up and are forming a long, firm shell-beach. Here, as in Georgia, the barnacles appear to be troublesome.

SAINT JOHN'S BAR.—At the bar or mouth of Saint John's river good oysters are obtained, though of a very salty taste. They are eaten locally and sent now and then to Jacksonville by the fishermen. Jacksonville, however, is supplied chiefly by Cedar Keys and Apalachicola, the latter, in my opinion, sending the best oysters sold in Jacksonville. The amount consumed is not large, and it frequently happens that the city will be wholly unsupplied. Nobody seems to make an exclusive business of oyster-sales.

SAINT AUGUSTINE.—At Saint Augustine the oyster-supply is chiefly derived from the immediate shores, since they are abundant everywhere. They are, as a rule, small and poor, the best coming from Matanzas, some miles below. They sell them to cart-men who peddle them about the streets. The supply is irregular and uncertain, and no planting whatever is practiced, or is demanded. Not more than 5,000 bushels a year, probably, are ever sold. The boats used by the fishermen in oyster-gathering are small dug-out canoes.

I did not go down to Indian river, but have been informed that in many parts of the great system of estuaries which extends from the upper end of Indian river down to Bay Biscayne, there are oyster-beds yielding edible mollusks of large size and good flavor. I am willing to believe it.

Beyond a reminder that everywhere occur unlimited quantities of small, crowded 'coon oysters, at present undesirable to eat, but always available as seed, and that undoubtedly it only requires further exploration to bring to light many more good localities for gathering edible oysters, I close the account of the eastern part of Florida, and with it dismiss the Atlantic coast of the United States.

R. THE GULF OF MEXICO.

54. OYSTER-INTERESTS OF WEST FLORIDA.

GENERAL CONSIDERATIONS.—The Gulf of Mexico presents an area of profuse and widespread oyster-growth, and of considerable commercial interests. Though the extent of coast is large, and the points of noteworthy production are scattered, yet the whole Gulf can conveniently be considered together. In addition to my own hasty investigations of this region, I am afforded the assistance of two very competent gentlemen—Mr. Silas Stearns, of Pensacola, Florida, and Mr. Franklin F. Ainsworth, of New York, whose contributions are specially and thankfully acknowledged, as they severally appear in the ensuing account:

EARLY ABUNDANCE OF OYSTERS.—The immense abundance of oysters and oyster-reefs on the western coast of Florida, astonished the earliest explorers, and their histories of explorations contain many allusions to it. Charlevoix went there (or along the reefs) two centuries ago, and writes in his *Voyages* (II, 1255):

But this Coast is the Kingdom of Oysters, as the great Bank of *Newfoundland*, and the Gulph and the River *St. Lawrence* are that of the Cod-Fish. All these low Lands, which we coasted as near as possible, are bordered with Trees, to which are fastened a prodigious Quantity of little Oysters, of an exquisite Taste: Others, much larger and less dainty, are found in the Sea in such Numbers that they form Banks in it, which we take at first for Rocks on a Level with the Surface of the water.

The trees to which Charlevoix's men found oysters attached were mangroves, and a short discussion of the service these mollusks are doing in aggrandizing the commonwealth and territory of Florida will not be out of place.

SOUTH FLORIDA.—Among these now commercially worthless reefs of oysters, various beds or "rocks" have been found, supplying those which are edible and locally put on sale, or at least sought by the shore-people from time to time. Excellent oysters, lying singly and of large size, are thus found at several points in Whitewater bay, at Cape Romano, Gordon's Pass, and in Charlotte harbor. These are the beds which supply the "shell" market of Key West*, the greater part coming from Punta Rassa (a steamer landing), and gathered in that vicinity for the most part among the mangrove islands between Pine island and Sanibel island. The average number shipped from Punta Rassa is 5,000 a week from October 1 to April 1, making 120,000 (by count) in all. At \$6 50 a thousand these are worth \$780. Occasionally lots of 5,000 to 6,000 oysters are received from Caximbus bay, which are sold at auction, generally at a value of \$5 per thousand. The total value in a season will not, however, exceed about \$125, representing 25,000 oysters. This total of 145,000 oysters in shell, by count, equals about 600 bushels, worth nearly \$2 a bushel in Key West. Unfortunately I have no record of the number of men or boats given employment.

CHARLOTTE HARBOR, LITTLE SARASOTA, ETC.—Northward of Charlotte harbor and Caximbus bay good oysters are to be had in Little Sarasota bay, and are especially recommended. At the mouth of the Manatee river there is an oyster-bar that produces the stock mainly used by the people who live at Braidentown, Manatee, and on the river banks. These are of inferior quality in both shape and taste, but would doubtless be improved by transplanting into purer and saltier water. No estimate of the irregular supply from these reefs can be made; it is of small consequence. Mr. Stearns also discovered large single oysters at Palma Sola.

TAMPA AND NORTHWARD.—The town of Tampa and the villages at the head of Tampa bay get their oysters from some famous reefs off Gadsden's point. These oysters are said to be single, and, though not of very large size, to be admirable in flavor. No planting is done in any shape, nor are any oysters sent from here to Key West. I was told that three men and three boats found pretty steady employment in oystering there, and the catch perhaps amounts to a total of 1,500 bushels a year, worth about \$500.

As fast as settlement proceeds on the shores of this low and indented coast, more and more beds of oysters are found available for local use, so that each settlement and nearly every farm, as a rule, has its particular locality or bed. These will multiply, of course, as people and explorations increase, and consequently a demand grows. Thus far, however, no beds have been discovered, bearing an edible sort, in Big Sarasota bay or in Clearwater bay, but that they formerly existed there, and at the lower end undoubtedly exist yet, is shown by the thousands of good-sized specimens mingled with other mollusks in the mounds and shell-heaps at Point Pinellos and elsewhere in this neighborhood.

About the Anclotes (inside), however, and thence, wherever they have been diligently sought for in the mouths of all the rivers and suitable localities, they exist and are used up as far as Crystal river, where is found the first real "fishery", albeit of small proportions.

Between Crystal river and Cedar Keys there is little worth mention in the way of oysters, the Homosassa and Withlacoochee beds sufficing only for local demand, supplemented by the better stock from above and below there.

* The main consumption of oysters in this reef city consists, according to Mr. F. F. Ainsworth, of canned stock from Baltimore, shipped via New York by steamer. Nearly 25,000 cans (1 and 2 pounds) are reported as used annually, the value of the sales in 1880 approximating \$1,500.

CEDAR KEYS OYSTERS.—At Cedar Keys we come upon the first considerable town in our progress up the coast, and the first harbor and railway terminus. It is not surprising to find, therefore, that here the oysters have a commercial value. The banks where they are obtained are on Cragin's bars, which are exposed at low tide, five miles south of the village; and at a still better locality to the northward of the keys that shield the harbor. There are four or five young men here who, in the season, devote themselves mainly to supplying oysters, which are sold to various shippers, and sent to Gainesville, Jacksonville, Fernandina, and lesser towns by rail. During 1880 the railway reports carrying 2,710 barrels, equal to 6,800 bushels, for which, at 65 cents a barrel, or hardly 20 cents a bushel, the catchers were paid \$1,811 50, and the shippers received \$3,387, making the average price about \$1 25 per barrel. In Jacksonville these oysters sell at from 75 cents to \$1 a bushel. If to this 6,800 bushels we add 3,200 bushels for home consumption, the total of 10,000 bushels would probably represent the whole catch at Cedar Keys.

The boats in use by the oystermen here are about 20 feet long and 8 feet wide. They are very roughly built, but well suited to their work. They have center-boards and large sails, are sea-worthy, and in smooth water will make very fair speed.

No attempt at any sort of cultivation has been made here, although it is said that the bivalves are far less plentiful here than formerly. Popular theory ascribes this to the killing effect of cold weather.

The Cedar Keys oysters have a different taste from anything I have experienced elsewhere, and one which will commend itself to those who like a saltish oyster; but there is a flavor about them, in addition to their saltiness, which distinguishes them at once (if those I ate were fair samples) from anything else. On the whole, they must be pronounced *good*; and usually they are of large size.

Here and there oysters exist in edible condition between Cedar Keys and the Suwannee river, and beyond toward Apalachicola, but they only supply the sponge-fishermen and shore-farmers, except at Saint Mark, where several large reefs impede navigation. In respect to these I quote Mr. Stearns' notes, which allege that out of the many of these reefs of worthless oysters, only one or two produce marketable stock, yet these probably fully supply the demand of Tallahassee and the neighboring Georgian towns that get their supplies from here. The beds are about five miles west of the light-house, near Shell point. The oysters are of small size, and four men, with two large fishing-boats (with a sail) are all that work at gathering them, selling about 1,000 bushels, worth \$500, annually. The tongs they use are home-made, and consist of wooden imitations of the stronger, iron-backed tongs commonly seen elsewhere.

APALACHICOLA.—Concerning Apalachicola, farther westward, Mr. Stearns also informs me:

This neighborhood has been highly favored with a large number of beds furnishing oysters of large size and fine flavor, which are easily procured and distributed by means of river steamers from Apalachicola, through a wide area inland. Besides a number of large reefs in Saint George and Saint Vincent sounds and Apalachicola bay, there are scattered all through the deeper waters a great many small beds. The depth of water here averages 7 feet, and it is brackish and full of sediment. The oysters from these beds are of superior flavor; I found none better in any part of the Gulf during my visit in 1881.

The reefs, or beds, are only an hour's sail from town; therefore the outfits or preparations for a trip need not be very great. When the tide is high the boat anchors over a bed, on which there is from 5 to 10 feet of water, and both men use tongs to bring up the oysters with. As each tongful comes up, the worthless ones are culled out and the good ones are thrown into the hold. The tongs in use here are made of iron, some galvanized and some not, in the same shape as those used on the Chesapeake. With these tongs, on a spot where the oysters are abundant, and need but little culling, two men can put 50 barrels of good oysters into the hold in one day.

If the tide is very low, as is the case during "northers", the boat is run aground on an oyster-reef, a gangway-plank is placed over the side, and the oysters are picked up by hand and carried aboard in tubs. Oystering in this manner is said to be harder and slower work than tonging them. When the boat is loaded she goes to town, and if there be a steamboat there, the oysters are turned over to the dealer on board of her; if not, they are not delivered until one does come. The oysters sell for 50, 60, and 75 cents per barrel, all ready for shipment, that is, in barrels and covered with gunny sack at the top; but the oystermen seldom get barrels or sacks, which have to be furnished by the dealer, at the rate of 10 cents for sacks and 20 cents for barrels, leaving the oysterman but 20, 30, or 45 cents per barrel for the oysters. It sometimes happens that barrels cannot be bought for any price in Apalachicola, and immense quantities of oysters must either be thrown away or lie over until barrels can be brought from neighboring towns. There are four steamboats running on this river in the winter, two of which carry the mail; but it frequently happens that the mail is not received here for two or three weeks, and large amounts of oysters and fish have to be thrown away in consequence. A few vessel-loads of oysters are taken to Saint Mark during the winter, but it is a trade of not much consequence. The shipping season lasts from November to April.

The boats in use are all small sloops of 20 or 25 feet length, carrying each two men. Last year (1878) there were twenty of these boats engaged in the oyster-fishing. With their outfit of tongs, etc., they are thought to be worth about \$2,500. Between forty and fifty men are engaged in this business, out of which they make but little more than what they spend for food while earning it. If two men who are running a boat have a good contract with the dealer, good wages can easily be made; but if they have no contract they are obliged to cut the prices down in order to sell at all, and also are kept lying at the wharf about half their time. From \$5 to \$8 per week, therefore, is an oysterman's wages when working.

The principal dealer at Apalachicola states, that he and other dealers there shipped up the river, during the winter of 1878-79, 15,000 barrels. These, at the rate of 30 cents a barrel, yielded to the oystermen \$4,500. In addition, owners of vessels disposed of about 2,000 barrels at Saint Mark at 50 cents a barrel, equal to \$1,000. The total value of the trade that winter, therefore, was \$5,500. It is only within five years that the trade has approached even this amount. Now it is improving, and new markets, such as eastern Florida towns (by steamer and rail), are opening.

SAINTE ANDREW AND CHOCTAWHATCHIE BAYS.—Saint Andrew bay is the next place where edible oysters are found. Here there are no large rivers, and the water is salt. The oysters lie in beds scattered all over the

upper parts of East, North, and West bays, and are most abundant in the deep and open water. These are the favorites of the Georgian inland towns, where they chiefly find their way.

Choctawhatchie bay, next westward, contains very few oysters, but the large shell-heaps there show that formerly they were taken in vast numbers. Now, the few that are got are found scattered over grassy shoals.

PENSACOLA.—Arriving now at Pensacola, I am again indebted to Mr. Stearns' studies for my facts. The oyster-season there begins in September and ends in April. The banks worked (only with tongs) lie in Escambia bay, and are scattering and very poorly stocked—not so well as formerly. The absence of shell-heaps on the adjacent shores show that the Indians did not resort to this for a supply of molluscan food to any great extent.

The boats serving here are open, flat-bottomed, roughly-made skiffs, not exceeding 24 feet in length, and cat-rigged or sloop-rigged. Two men form the crew, and consider from five to twelve barrels a load, satisfying themselves with one trip per week. As there are about seven boats, an averaged estimate of the season's total production would give about 2,500 bushels. The selling-price being only 35 or 40 cents per bushel, the cash proceeds will hardly exceed \$1,000, to be divided among about fifteen fishermen. A system of sharing is in vogue, by which the proceeds of each day's catch is divided into equal thirds between the boat and each of the two men who constitute her crew.

"The catch at Pensacola," Mr. Stearns says, "often fails to supply the local demand, and additional oysters are obtained from Mobile and Saint Andrew bay. Nothing of consequence has been done here in oyster-culture."

RECAPITULATION FOR FLORIDA.—A résumé for Florida will not be out of place here, and will represent the following facts:

Number of catchers and shippers	166
Number of boats engaged	110
Value of same	\$8,000
Number of bushels sold	78,600
Value of same	\$15,950

55. OYSTER-INDUSTRIES OF ALABAMA.

THE MOBILE SUPPLY.—Crossing the line into Alabama, the port of Mobile offers opportunity for the sale of many oysters, and more or less cultivation of this food-mollusk is carried on there. I can here, also, supplement my own notes by the records of Mr. Silas Stearns:

"The oysters that are brought to Mobile are obtained from natural and artificial beds in Mobile bay. Those from the natural beds are called 'reefers', which are slightly inferior in size and quality to those from the artificial beds, which are called 'plants'. They are obtained in a portion of the bay called the 'gully'; the only place where they are naturally abundant. The planted oysters are originally obtained from the salt water, near Cat island, between Mobile bay and Biloxi, Mississippi, and are deposited in front of the oysterman's land.

OYSTER-CULTURE.—"The state laws provide that any settler on its bay shores shall have the right to use for oyster-culture the water surface in front of his lands from low-water mark 600 yards outward.

"About thirty vessel-loads, or more than 2,500 bushels, are usually planted at first on new grounds, and are allowed to remain two years before they are gathered up to be sold. The next and following times that deposits are made it is not necessary to plant as many as at first; for there are many small oysters that escape the tongs which will soon grow large enough for market.

"It is calculated that in two years the small salt-water oysters will have so grown in size and so increased in numbers, that there will be about twice as many as when transplanted; but this ratio can hardly be depended upon, for it often has been proved that, to realize an increase of 50 per cent., the location and circumstances must be most favorable.

"Oysters as taken from salt water are in very poor condition, but in an incredibly short time, in fresh or brackish water, they become large and fat. Still there are times, when the bay is almost purely fresh, that certain injurious qualities in it (perhaps from the extensive swamps) either destroy oysters or turn them so red that they are unfit for market. Invertebrate animals are probably the cause of many oysters being killed, though the oystermen seem to be ignorant of it. Drum-fish are also very destructive.

OYSTER-FISHERIES.—"Besides the 'reefers' and 'plants', there is a kind of oyster called here 'sharppers', from the fact that the ends of their shells are unusually sharp. They are a natural-growth oyster of very large size (shells averaging 8 or 10 inches long) and superior flavor, that are found growing separately along the bay shores, not far from the place where 'reefers' are gathered. 'Sharppers' are always in demand, though there is some objection to them on account of their being so hard to open.

"'Reefers' and 'sharppers' are caught by men who follow no other pursuit, and who are a quite distinct class from the oyster-boatmen. They have small, flat-bottomed skiffs of the roughest description, in which they go 'a-tonging', two men occupying a boat and taking turns at tonging and culling. As fast as the stock is culled it is placed in shallow, oblong boxes holding one-fourth of a barrel each, and in these measures is sold to the boatmen or carriers at the rate (during the winter of 1880-'81) of 10 cents a 'box', or 40 cents a barrel. The carriers having

obtained a load for their sail-boats, proceed at once to the city and deliver them to the dealer, by whom they are employed to buy or with whom they have contracts. The measure, in this transaction, is the same box as before, but the price has nearly doubled, holding all last season at 75 cents a barrel. While the gatherers are paid per measure for what they catch, the profits of the boatmen are divided among the crew by a 'lay' arrangement of sharing, by which the crew pay provision bills and receive 60 per cent. of the proceeds. Of the owner's 40 per cent. remaining, the captain gets 10 or 15 per cent. additional. In a few cases the captains own their vessels, and prefer to hire their crew at \$20 or \$25 a month. There are only two or three men in the whole crew of an oyster-boat."

MOBILE OYSTER-BOATS.—"They are small, light-draft vessels," says Mr. Stearns, "ranging from 3 to 20 tons in size, and are rigged as schooners or sloops (not much attention being given to the matter) in the common American style. They are arranged so as to have as much deck and hold room as possible for the oysters; therefore, their cabins are small and uncomfortable. From the cabin bulkhead to the mast the space in the hold is uninterrupted, except by the center-board case, and there the load of oysters is carried. It is not often that the deck is heaped with oysters, but the clear, roomy space is useful in culling and handling the oysters as they are received and discharged. These vessels are not graceful or pretty, for their light draft (not more than 2 or 3 feet) and full lines destroy all intentions in that way. They are rather cheaply and roughly built, too, but as they are not intended for or used in rough water, they will last almost as long and earn quite as much money as finer and more costly ones would. Twenty thousand dollars would buy the whole fleet, and another \$20,000 represent all additional capital invested."

SALE STATISTICS FOR MOBILE.—Trustworthy statistics of the production of Mobile bay are not available. About 20,000 bushels I estimate as the sales of planted stock, and I consider that 60,000 bushels would cover the whole consumption at Mobile.

This yields the following approximate returns to the respective classes engaged:

40,000 bushels "reefers", at 15 cents a bushel profit, gives catchers.....	\$6,000
40,000 bushels "reefers", at 13 cents a bushel profit, gives carriers	5,200
40,000 bushels "reefers", at 15 cents a bushel profit, give shippers	6,000

The first value of this 40,000 bushels of "reefers", therefore, is \$6,000; the second, \$11,200; the third, \$17,200; and the retailer probably receives \$25,000 or more in dealing out to consumers. The value of the 20,000 bushels of plants is about \$17,500 to the planter and \$20,000 to the wholesaler. For our purpose we may take the carriers' price, paid by the dealer to the carrier and the planter, as our estimate, and say that the total first value of the 60,000 bushels is \$28,700. The report of the board of trade, that in 1878-'79 business in oysters to the amount of \$95,400, and in 1879-'80 to the amount of \$111,000 was done, no doubt represents sales additional to the strict limits of our inquiry in this matter.

OYSTER-TRADE OF MOBILE.—The oyster-dealing, wholesale and retail, and restaurant business in Mobile no doubt supports 100 families, chiefly of colored persons, or at least forms an important part of their annual resources. Many of these are openers, who work by the piece as work offers. Mr. Stearns refers to them in his memoranda as follows:

The oysters, having been deposited in a pile in the dealer's warehouse, are next taken in hand by the "openers", who are placed in a circle around the pile, each with his stool, bucket, and oyster-knife. These men are principally negroes and creoles of the worst character, who find it hard to obtain other employment. Still they are very expert at opening oysters, and often make fair wages. The knives used by them are all of steel, about six inches long, with heavy, flat handles, and wide, thick blades, rounded at the end. To open an oyster it is held in the left hand, lower shell down and lips outward, and the shells are quickly pried open at the hinge, the upper shell being thrust off. One more stroke severs the oyster from the lower shell, and into the bucket it goes, liquor and all. Some kinds of oysters cannot be easily opened in this way, so they are broken first on the lip edge and entered from that side with the knife. The majority of Mobile oyster-openers are very quick while opening either of these ways, but are probably more practiced in the first. The shells are thrown one side in a pile, and the "openers", if left to themselves, will throw away many good, unopened oysters, in order to hasten through their barrel, if they are opening by the barrel, or to get rid of small oysters, if they are opening by the gallon; therefore, it is necessary to have a man employed to watch them and prevent this waste.

When an "opener" has filled his bucket he takes it to a clerk to be emptied into a strainer, when the oysters are measured and placed to his credit.

The customary price paid for opening oysters is 35 cents per barrel, or 20 cents per gallon. At certain times of the year a barrel of oysters in shell will yield more opened oysters than at others; for instance, in the fall hardly two gallons are obtained, while in the winter and spring two to three gallons are taken from one barrel.

As soon as the oysters have been opened, measured, and drained of their liquor, they are emptied into a large vat that has a strainer-like bottom, and are kept cool by means of ice until needed for shipment or canning. To be shipped to any place not far inland, they are usually placed in cans varying from one to ten gallons, according to the order, that are not hermetically sealed, but are kept in contact with ice. To be shipped to more distant parts they are placed in square cans, containing from one quart to one gallon, and are hermetically sealed. This manner is more costly to the purchaser, but is the safer way, for oysters so put up will keep a long time.

Pickling oysters has been of some importance here, but there is very little done at it now. The method of treatment was, first, to steam the oysters, and then to place them in small, square tin cans with spiced vinegar, the cans afterward being soldered up airtight. It is said that this business failed because of much poorly prepared goods being put on the market. In pleasant weather, when the gatherers can work and the boats can easily get to the city with large loads of oysters, the Mobile market becomes overstocked, and it is then difficult to dispose of the catch at any price; but in stormy and cool weather the market is good, for then but few boat-loads come in, partly owing to real difficulties and partly to the indolent indisposition of the oystermen to work when discomfort attaches to it.

The oysters of Mobile bay have a high reputation for excellence. The water and soil of the bay, particularly in the eastern arm, called Bon Secour, seem especially well adapted to their growth. The planting-beds are all higher up, where the seed thrives better than below.

The foregoing operations give employment for three-fourths of the year to about 175 men, and kept afloat, in 1879, 62 vessels.

STATISTICAL RECAPITULATION FOR ALABAMA:

Number of vessels and sail-boats engaged.....	62
Value of same	\$10,000
Number of sailors (also planters) employed	250
Annual earnings of same (excluding their own sales)	\$10,000
Number of restaurant servants and openers	100
Annual earnings of same	\$4,000
Annual sales of oysters.....bushels..	104,500
Value of same	\$44,950

THE GULF OF MEXICO OYSTER COMPANY.—Early in 1880 a new concern, to be known as the Gulf of Mexico Oyster Company, began oyster-canning and shipping at Mobile, for though their factory was many miles distant, at Scranton, Mississippi, yet the officers were in Mobile, and the business contributed to the city. About 90 to 100 hands, of all ages and sexes, are employed. These live in a little village, which the company has built for the purpose, in the neighborhood of their factory. While this company does something in the fresh-oyster trade, their main business is in cooked and canned oysters, which are steamed and sealed in substantially the same way as at Baltimore. One specialty, however, is the putting up of canned fried oysters, after the following patented method:

From the supply vat, where they are kept cool, the oysters are taken and rolled in meal and fine cracker-dust, and then are dropped, a gallon at a time, into a large kettle of hot fat, which is a mixture of lard, tallow, and stearine, where they are allowed to fry crisp and brown. Next, while still hot, they are packed in small, flat, square tin boxes of about a quart capacity, and the unoccupied space is filled with hot fat. The opening in the top of the box is round, and has a cap to fit, which is firmly soldered down, making the box air-tight. Afterward these boxes are labeled and packed in cases, a dozen boxes in a case. It is asserted that oysters prepared in this manner sell readily in all parts of the country, and the demand is much larger than was at first expected.

The "cove oysters" of this company are simply fresh oysters hermetically sealed in cylindrical cans.

The capital stock of this company is \$25,000. (Another company has recently been projected with a capital stock of \$50,000.) Though the capacity of the Scranton factory is no less than 30,000 one-pound cans per day, the product at the time of my visit had been insignificant, owing to various delays in getting well under way. The company will also can shrimps, fruit, and vegetables in season, so that not all the force, capital, and fixtures can be credited to oysters alone; and, inasmuch as operations have only begun, I have not added these figures to my totals. The stock which they receive for canning is the wild "reefer" oyster, that grows in immense profusion all along the coast of Mississippi.

56. OYSTER-INDUSTRIES OF MISSISSIPPI AND LOUISIANA.

GENERAL CHARACTERISTICS OF THE OYSTER-FISHERIES OF MISSISSIPPI.—On the coast of Mississippi there are several small villages, more like watering-places than anything else, that do some business with fish and oysters. The latter trade is of the most importance, for there are one or two firms in each place engaged in it, while there is but one man on the coast who makes a business of shipping fish. The Mobile and New Orleans fishermen and oystermen are fishing or oystering in the neighborhood at all times, and these, together with unprofessionals who are striving to furnish their home tables, make quite a show, giving one an idea that the fish and oyster-business must be very important at these towns. A great many of the New Orleans boats also land their catch at these points to be shipped by rail to their home-ports.

THE MISSISSIPPI OYSTER-FLEET.—The number of oyster-vessels belonging in the state is given by Mr. Stearns as 18, worth \$3,600, to which can be added \$700 worth of oyster-sheds and tools. There are seven dealers in the state also, whose sales for 1879 were reported at 18,920 gallons. At the average price of 35 cents a gallon this would amount to \$6,622. If these figures seem too low, it must be noted that they apparently do not include the shipments in shell by express to interior towns, which from Biloxi, at least, and also from Mississippi City, Pass Christian, and Bay Saint Louis, are considerable. It would be safe, probably, in point of value, to add to the \$6,622 enough to make an even \$10,000, as an estimate of the annual yield of the coast of Mississippi, separate from the catches of the Mobile and New Orleans boats in her waters, and of the sales of her own oystermen, who take their cargoes by boat to those cities.

THE OYSTER-TRADE OF NEW ORLEANS.—At the southern metropolis, New Orleans, centers the most extensive oyster-trade of the Gulf of Mexico, and some of the stock sold in that city is of very high quality. There is no locality in the whole United States where the business presents so many picturesque features, and the oyster-landing at the levee is one of the most spirited and entertaining sights of the many half-foreign pictures to be got in that polyglot city.

My report upon the oyster-business here is made up of information communicated to me by Mr. Silas Stearns, of the Census Office, by Mr. F. F. Ainsworth, and out of my own investigations; but the necessity for my early departure for duties in Washington, prevented my staying as long in Louisiana, or working as thoroughly in that field, as I wished to do.

SOURCES OF SUPPLY.—The New Orleans market is supplied with oysters from an extent of coast comprising the whole water-front of both Mississippi and Louisiana, and embracing numerous tonging-grounds. The great majority are taken from the natural and luxurious growth of the "reefs", but the transplanting and consequent improvement of oysters is being more and more engaged in. The delta of the Mississippi river forms a partition between the two classes of oysters and oyster-localities tributary to New Orleans—a distinction which is perpetuated in the city markets. The first of these divisions to be considered, is that which lies eastward of the delta, extending from Lake Borgne, Point a la Hache, and the Chandeleur islands to Pascagoula and the end of Mississippi sound. Though the Chandeleur islands, and some other points, produce an oyster of good reputation, the general quality and size of the stock from this eastward portion is inferior to that from the western district. They are used for cooking chiefly, and it is this stock which is being bought by the canning companies lately started in the city. The best grounds seem to be the Chandeleur islands, Bayou Muscle, Bayou Bouffien near Mobile, and the shell-bank outside of Biloxi. "The Bayou Muscle oyster is peculiar. It is large, very black, and the shells are covered with hair and barnacles. The Bouffiens are round, rich, and fat, and sell very high." The *Picayune* stated that 30 boats came to the city from Biloxi and along the sound, in the winter of 1879-'80, but this seems to have understated the case, for our careful inquiries registered 50 boats of five tons and upward, and 200 boats of less than five tons, as trading along the eastern coast; many of these, however, are otherwise engaged during a portion of the year. The boats are generally small, rarely having more than two men, and will be more fully described hereafter.

Turning to the district west of the delta, we find that oysters are procured from all the marshes and bayous, nearly as far as Galveston, Texas. The *Picayune*, in an article during the winter 1878-'79, gives a fair account of this source of supply, as follows:

This portion of our state seems best suited to the propagation of the best, and Bayou Chalons, Four Bayous, and Fontenelle are known only for their oysters. Yesterday a representative of the *Picayune*, in order to place before its readers something more definite than the confused ideas generally prevailing about our oysters, visited a number of veterans in the trade. Even among them there is still some confusion regarding the merits of certain oysters, but what was agreed upon by all was taken as the basis of what we give.

There are engaged in the business of supplying the city about 120 luggers, with a carrying capacity each of 75 to 100 barrels. From Barataria, which comprises Bayou Cook, Chalons, and Four Bayous, there are eight, making at least one trip a week. From the Southwest pass, Salina, or the Salt Works below Fort Jackson, about 30 boats. From Timbalier, including Bayou Cyprian, Fontenelle, and Lake Peliot, about 15. These vessels, and the labor at the fishing banks, give employment to over 4,500 men. * * * There has been a general impression here that Bayou Cook furnishes our best oysters, but that little water course has long since given up its natural supply, and those that are now received from there are only a few that are planted.

Our best oysters come from Bayou Chalons, Four Bayous, Bayous Fontenelle and Cyprian, and a small supply from Lake Peliot. These rank the highest and are called the first-class. The Bayou Chalons oyster is a large, long oyster, with a clean shell; the Four Bayous are middling, round, and firm; the Bayous Fontenelle and Cyprian are small, hard, and round, and much preferred by connoisseurs. The Lake Peliot is a round oyster, very fat and salt, and on account of the hardness of its eye preferred for frying. The second-class oysters are the Timbaliers, where they are taken from the reef, not the one planted in the bay. They are in bunches and are long. In the same class are the Salinas, or those taken at the Salt Works near Fort Jackson. They are what are called the "summer", and by restaurateurs the "kitchen" oyster. They cook well, but are not as rich in flavor as those of the first-class. At the Southwest pass, proper, all the bivalves are dead now, but near there, at East bay, they have a very good kind, with a light-colored shell and very white inside. Then there are the Grand Lakes, from the vicinity of Fort Livingston, near Grand Terre. Although the supply is not very great there is always a demand for them, as they have a peculiar flavor.

The number of boats bringing and catching oysters in this region is counted at 205, of which 40 are of over five tons burden. Their business is mainly done during the winter, and in summer they are largely engaged in transporting fruit from the coast-plantations to the city, though some "lie up" for repairs.

LOUISIANA OYSTER-BOATS.—These Louisiana oyster-vessels are all of one class and are known, from their Mediterranean rig, as "luggers". They are in model much like the common light-draft American center-board sloops, and vary in size from 16 to 40 feet in length, the largest measuring about eight tons. Mr. Silas Stearns has described them in detail, as follows:

They are decked over forward and aft, and for a foot or eighteen inches on each side, leaving the central part of the boat open and unobstructed for freight. Hatches are usually provided to cover the undecked part from the weather. The oyster, fruit, and vegetable boats of this class have a clear hold and stow their freights from one to the other, in bulk, but the fish-carrying luggers have zinc-lined ice-boxes on each side of the center-board case, which are of the most simple arrangement, and are reached through trap-door covers, after the outside hatches have been removed. When the boats are loaded the crew sleep on deck, protected by an awning.

As to rig, they have one tall mast, placed in about the same position as a sloop's, a long yard, and a huge, nearly square, sail. When in use the sail is hoisted and stretched by the yard, and the two lower corners are secured at bow and stern by sheets, which are arranged with travelers to work across the deck. The yard is so slung to the mast that about one-third is on one side and two-thirds on the other, and the spread of canvas is so situated.

The yard is hoisted by one halliard, besides which there is very little gear of any kind. To sail close to the wind, both forward and aft sheets are hauled tight, which brings the yard and canvas nearly parallel to the boat, and also draws down the forward and short end of the yard, giving the after-part of the sail some "peak". To sail before the wind, both sheets are slacked until the yard and sail swings square. Boats rigged in this way are said to be very fast sailers, and do far better than sloops or schooners in beating to windward. Considerable skill and practice is called for in their management, since the long, heavy yard is troublesome at times, and makes the danger of a capsizé very great.

These boats are built at New Orleans and other points near by, in most cases by their owners. The average cost of one measuring six tons is about \$800, and has been nearly double that amount until within the last three years.

A large fleet of these boats gathers at New Orleans, the majority of which are engaged in carrying fruit, vegetables, and other country produce. As the oyster-season does not extend over the whole year, boats that carry oysters in that season are engaged in other work out of it. It also happens that boats engaged in the oyster-fishery one season are quite likely to be otherwise employed the next. Considering this, I place the number of boats at present engaged in oystering for the New Orleans market at 43, employing 129 men.

In respect to this same matter Mr. Ainsworth writes :

The peculiar lugger-rig of the boats (only one sail with no jib or bowsprit), the many rows of reef points, most of the sails being fitted to reef down five times, enables them to work very close to the wind. As a rule, the sailors prefer a beam-wind or one on the quarter; they cannot work well with an after-wind. On return trips up the river, the ease and quickness with which they can be handled render the luggers independent of the tug-boats, and it is only when they are in great haste to get first to market, because of a scarcity of oysters in town, that they accept the help of steam.

THE OYSTERMEN OF MISSISSIPPI AND LOUISIANA.—In going to the lower coast, writes Mr. Ainsworth, the luggers run down the Mississippi generally for about 60 miles, and then through smaller outlets and bayous into Grand Lake bayou and the various grounds on the coast. The men who are employed in this fishery, and also the sailors who own the luggers, are almost altogether Italians and Sicilians, generally of a low order. Their swarthy faces, long, curly hair, unfamiliar speech, and barbaric love of bright colors in their clothing and about their boats, give a perfectly foreign air to the markets. There is not an American style of rig seen, nor hardly a word of English spoken, in the whole gayly-painted oyster-fleet of Louisiana.

Most of the oysters brought to New Orleans are from naturally growing, uncultivated reefs, with which the whole coast is barricaded, and to which, in a large measure, it owes its preservation from the teeth of the ocean. These reefs are ridges of oysters, packed one above another, each generation supported on the compact and dead shells of the preceding. In general the oysters are found not singly but in great clusters, some of which are half as large as a barrel. When gathered in this shape there is a great waste of young oysters, for those that are attached to the large ones are not separated until after the boat has left the grounds or is at town, when they are thrown away as useless. At certain stages of low water such oysters as these can be picked up by hand. In other places, ordinarily in the open bays, oysters are found in a more scattering condition, but are more readily gathered and require less culling. In most cases they are procured with oyster-tongs from the lugger, as she lies at anchor over the bed. One man uses the tongs while the other culls them; or, if there are three in the crew, two use tongs and the third culls for both.

This is the method with all the smaller boats which tong their own cargoes. They have to go far from home, and often the men do not get home once a week, or even every two weeks, and must lie exposed to many hard storms, both when at the reefs and in going back and forth the 40, 60, or 100 miles to market. The owners of the larger vessels, however, generally buy their cargoes direct of men who live in the vicinity of the reefs, and by making more trips, having fleet vessels, can in a season make considerable money. In the summer time, those who have been prosperous sometimes take their vessels down the river about 65 miles, and pass through tortuous channels into Mississippi sound, and lay up for the summer season in the vicinity of Biloxi, Alabama.

There is a "lay" system in vogue in many of these boats for the distribution of profits, by which the boat and each man receives an equal share, after the bills are paid.

OYSTER-CULTURE.—Oyster-planting amounts to very little along the coast now under view, and what is done is of the simplest character. I can form little notion of its extent or the number of planters. The reef-oysters are taken from the natural beds by tongs in June and carried up the half-fresh bayous, or inshore, where they are laid out between tides until time to sell them in the fall. This improves them somewhat, but seems to be chiefly serviceable in making them more readily accessible for market, and so saving time. The *Picayune* said that in 1878, 4,500 men were employed in making and assisting in making such transplantings.

OYSTER-MARTS IN NEW ORLEANS.—There are three separate landing places and marts for oyster-boats in New Orleans: the Old Basin, the New Basin, and the French market levee.

To the Old and New Basins (chiefly the former), in the rear of the city, reached by canals from Lake Pontchartrain, come the boats from the eastward, bringing "lake" and "reef" oysters, generally of inferior quality, and intended to be sold to the canning establishments, or to be opened for cooking purposes. The boats average smaller than those used in the river westward, and usually carry only two men. The price of the oysters—frequently measured out in quarter-barrel boxes similar to those in use in Mobile—depends upon the state of the market as governed by the supplies received from the West, and often goes down to 50 or 60 cents a barrel, at which price there is no profit, and the oystermen stop running until a rise occurs. The average price, however, is said to have been \$1 50 per barrel last winter; and 65,000 barrels is said to have been the total of receipts on this side of the city. This would equal about 170,000 bushels, at 39 cents a bushel. The men who bring oysters from the eastward

say they must have higher prices than formerly, on account of the growing scarcity of oysters, and the longer time it takes to get their load. Many more are oystering now than before the war.

At the levee opposite, or just below the famous old French market, is the other and greatest oyster landing-place, mustering about 205 boats, with 615 men or more in the crews, and the picturesque scene I have heretofore described. The estimate of annual receipts there at present gives 50,000 barrels, or 125,000 bushels, commonly sold at \$2 to \$3 50 per barrel. All of these come from westward of the delta, and being larger and finer are, as a rule, bought by the saloons and restaurants, and served to their customers on the shell.

WHARFMEN ON THE LEVEE.—A peculiar feature of the business on the levee, consists of an organization of wharfmen, who form a species of close-corporation to do the work of carrying the oysters from the boats to the wagon of the purchaser, who pays them 15 cents a barrel for the service. The boatman having sold his cargo, he then has no further concern; his boat being taken in charge by the carrier, who might be called a 'longshore man, and who delivers all the oysters and sweeps the vessel and puts her in proper condition for the crew. While there is no society of these carriers, strictly speaking, they manage to make their business a close-corporation, since no one is allowed to discharge a cargo of any kind from the luggers—oysters, oranges, or fruit—except one of the members of the body. There is a man who is called the foreman, who receives all the money for the carriers and who divides the proceeds equally among the different carriers, but just how this is regulated, as well as many other of the details of this quasi-organization, is kept as mysteriously secret as possible. The body is an old one and now consists of about 50 men in all, mostly Sicilians and low-grade Italians, and, as near as I can judge, the annual receipts for the carriers amount to about \$35,000, levied on the oysters, oranges, melons, and various fruits. Some years ago the city designated a man to act as foreman, and he held the post for twenty-two years, not giving it up until his death, when he was succeeded by his son, who now has the place. The system is beginning to be felt as an unwarranted incubus on the trade, and a monopoly which should be opposed. In consequence it doubtless will soon be broken up, and each purchaser will land his own oysters, or the boatmen deliver them to the wagons at less cost than now. The levees are leased by the city to a firm, who collect \$20 a year wharfage from the luggers.

SHIPMENTS OF OYSTERS FROM NEW ORLEANS.—The shipment of oysters inland from New Orleans has hitherto been of very small amount, and principally of fresh oysters. Now, however, at least two canning establishments have been started in the city, which make a large item in their general preserving business of cooked and hermetically sealed oysters, prepared substantially as in Baltimore. Several brands have been put upon the market with good satisfaction, selling at \$2 50 per dozen two-pound cans for first quality, and \$1 80 for second, and at \$1 10 for one-pound cans. About \$100,000 worth of these canned oysters are said to have been put up during 1880, nearly all of which were taken by the trade of the city and immediate neighborhood. The capital invested is, perhaps, \$75,000, but is applied to shrimp-, lobster-, and fruit-canning as well as oysters. In these establishments only about 30 male adults are employed, the openers being girls, about 100 in number, all white and chiefly German and American in nationality, who are paid from 4 to 6 cents for each kettleful, a "kettle" holding two quarts. Work is irregular, because of the difficulty of getting oysters in sufficient quantity and when needed (owing mainly to the indisposition of the oystermen to work in bad weather), and the total earnings of the openers and employes during the "oyster-run" in the factories, will probably not exceed \$20,000. These factories have not been long enough in progress to furnish more exact information than is here given. Their capacity is far in advance of their present product, and they anticipate a highly successful future, confident that they can secure the trade of the lower Mississippi valley, to the exclusion of oysters canned in northern cities.

STATISTICS FOR NEW ORLEANS.—In summary, we have the following statistics for New Orleans:

Total number of boats employed	165
Value of same	\$13,750
Value of shore-property and tools, about	\$23,000
Total number of oystermen	1,300
Number of shoresmen	100
Annual product, about	295,000 bushels
Value of same, about	\$200,000
Average price per bushel, about	\$0 70
Number of carriers	50

57. OYSTER-INDUSTRY OF TEXAS.

RECEIPTS AT GALVESTON.—At Galveston, Texas, the receipts of oysters are composed in the main of small, medium-flavored stock, obtained in Galveston bay and brought to the city in small boats. Mr. F. F. Ainsworth writes me, also:

A considerable number are received by steamers, being brought in sacks from points to the west of Galveston, such as Indianola and Corpus Christi. A few are brought also from Morgan City and points on the Louisiana coast, these last being very fine and of good flavor, bringing rather better prices.

PLANTING AT GALVESTON.—Formerly, at Galveston, it was the custom during the summer to plant oysters from the reefs in the numerous bayous, where they would fatten. This branch of oyster-industry was nearly killed by the recent passage of a state-law prohibiting the gathering of oysters during the summer, from May 1 to September 1. The oysters in October, and even until January, are for the most part poor and with little flavor, so that it is not until February and March that they are really fine. The greater part of the receipts are sent inland.

THE OYSTER-BUSINESS OF GALVESTON BAY.—Concerning the business of Galveston bay, Mr. Ainsworth reports that the boats used are smaller than the New Orleans luggers, the largest being of only about 40 barrels' capacity, and the average 18 barrels. Their average value is \$90. They make about 25 trips each between October and April, and carry two men. These and other facts contributed by Mr. Ainsworth appear as follows:

Number of boats	70
Value	\$6,750
Men employed as sailors	140
Men employed on shore	100
Receipts of oysters from bay	bushels.. 85,000
Value	\$45,500
Receipts from Louisiana	bushels.. 625
Value	\$450
Receipts by steamer	bushels.. 2,500
Value	\$1,800
Total receipts	bushels.. 95,625
Value	\$47,750
Average value per bushel (nearly)	\$0 50

S. THE PACIFIC COAST.

58. OYSTER-INDUSTRIES OF CALIFORNIA.

SOURCES OF INFORMATION.—The writer was not allowed time from his other investigations to visit the Pacific coast of the United States. He must, therefore, rely for an account of the oyster-industries there, upon what he has been able to gather through the reports of the special agents of the Fish Commission and Census, Messrs. Jordan, Gilbert, and Lockington; from correspondence, and from conversation with gentlemen who are engaged in business at San Francisco, or are otherwise familiar with the matters upon which information was sought. Under these circumstances, the indulgence of the critical reader is sought, should errors find their way into this chapter.

PACIFIC OYSTERS AND THEIR EARLY UTILIZATION.—The oysters of the Pacific coast of the United States, as might be expected, are of different species from those common in our Atlantic waters. Instead of the large *Ostrea virginiana*, we find in California the little *Ostrea conchophila* (of which "varieties" *rufoides* and *expansa* are recognized by conchologists), and the more northern *Ostrea lurida*, commonly known as the Shoalwater bay oyster.

When the settlement of California first began, the oysters growing in San Francisco bay were used, but were considered of small consequence. In March of 1850 was discovered a new locality for oysters at Shoalwater bay, on the coast of Washington territory, just north of the mouth of the Columbia river. Though not as good as eastern oysters, these were better than the very small ones of California, and began at once to be brought to San Francisco. From a newspaper of that date, it appears that of Shoalwater bay oysters there were taken to San Francisco 2,000 baskets in 1850, 1,700 baskets in 1851, and 21,052 baskets in 1853. These went by sailing-vessels. The business then became well organized and highly productive at that point, and the towns of Oysterville and Bruceport rose out of it, where from two to three hundred men had steady employment. The census of 1860 gives the value of oysters in Washington territory at \$44,597. Besides San Francisco, Portland, Oregon, and numerous small ports and inland villages were supplied.

OYSTER-PLANTING IN SHOALWATER BAY.—The Shoalwater bay oysters were planted at home to some extent—that is, they were raked off the natural beds and allowed to lie a few months on staked-out beds nearer shore; but they were also brought to San Francisco in their wild condition and replanted there, supplanting the local stock. A variety of accidents occurred, however, to interfere with the success of these undertakings. In 1862, it is reported that a freshet on the Sacramento and San Joaquin brought in so much fresh water and mud that all the oysters died. In 1867 a blight seemed to come upon the bay oysters, and they nearly all shriveled up as though cooked. Next year came the great earthquake of 1868, and the death of the oysters was attributed to the consequent heating of the bottom. Earthquake shocks have killed the western oysters, and left the thicker shelled eastern stock unhurt. Since that time the northern "plants" have been poor when they came, and have to fatten, as previously they had done. Now they grow steadily poorer. In the face of this they had to contend with the recultivation of San Francisco oysters, with newly found plants of large size from Yaquina bay and from Puget's sound, and, worst of all, with the importation of oysters from New York, which was begun when the Pacific railways gave a through line across the continent.

The lack of quality of the Shoalwater bay oysters was not only noticeable in those sent to California, but became sadly apparent at home, and the local business began to decline. In 1874, before these effects had made much progress, it was stated in the *San Francisco Bulletin*, "that not much less than half a million of dollars is invested in working the beds and gathering the oysters at this point and in bringing them in schooners to San Francisco. The four companies interested in these beds imported 125,000 sacks last year, at a wholesale cost of \$20 a barrel. About 150 men are employed in gathering the oysters at Shoalwater bay, and perhaps as many more in working the beds and on the vessels". Each sack contained nearly two bushels, so that 200,000 bushels would not be an overestimate. To bring these, required fifty trips of schooners, carrying 4,000 bushels each—an important item of coast commerce. Now, I am told, the Shoalwater bay oyster-beds have largely ceased to be productive, and such oysters as are got are of poor size and flavor. In place of the large exports of half a dozen years ago, there are now produced less than 15,000 bushels, and the price paid to the planters is only from 50 to 75 cents. All that are brought to the metropolis come by steamer, at the rate of about 100 sacks a week for half the year. What is the cause of this sudden and excessive decay of the Shoalwater oyster-beds, no one can say. Of that stock which is planted three-fourths now dies.

SHIPMENTS FROM THE ATLANTIC COAST: HISTORY.—Upon the completion of the transcontinental railways an important epoch began in the history of the California oyster-business, by the introduction of living oysters from the Atlantic coast. Whether this was at the instigation of Californian or eastern men, I am unable to determine, further than that I was told in New York that it originated through A. Booth & Co., of Baltimore and Chicago, who own extensive salmon-canning houses on the west coast. In the *San Francisco Bulletin* for April 14, 1871, I find the following:

Some months ago the *Bulletin* published the particulars of an experiment made to grow a better kind of oysters in the bay of San Francisco, than the native breeds of this coast. Mark Winant and son brought young New York oysters across the continent by rail, transplanted them somewhere on the Alameda side of our bay, and after a year found that they had increased wonderfully in size, while retaining to the full the delicacy and richness for which the New York bivalves are famous. A company styled the Pacific Oyster Company was then formed, with a capital of \$20,000, for the purpose of going into the business permanently, on a small scale. * * * There is no doubt that the business of growing oysters in our bay will become one of great importance, and there is cause for congratulation in the fact. The native oysters obtained along the coast, except the few brought at great expense from Mexico, are small in size, coppery in flavor, and relatively scarce and dear. The addition to our markets of an article equal to the eastern breeds, will be a fact of much value to our *menage* and our commerce.

These first shipments were only experimental, at any rate, for it was needed to know whether the Atlantic "seed" would grow inside the Golden Gate, whether it retains its natural flavor or acquires a bad one, and whether it could be sold at a profit at the close of the process. It was not until 1875, therefore, that any San Franciscan dealers felt justified in ordering large quantities, but in that year large shipments began, which have been continued with regularity and slowly increasing amount ever since, until now something like \$560,000 worth (a lading freight to first cost) are annually transported across the breadth of the American continent—an almost unexampled movement of living food. The shipping season is from the middle of October until the middle of November, and again from March 15 to the middle of May. In the spring the cost in New York is a little higher than in the fall, but the average at present is about \$3 a barrel.

PRESENT METHODS OF SHIPPING FROM THE EAST.—The oysters sent to California are all procured from beds in the neighborhood of New York, and are sent exclusively by the firm of J. & J. W. Ellsworth, by whose kindness and permission I am able to present the exact figures appended.

The oysters sent are of two classes: first, those of marketable size and designed for immediate use; and second, those intended to be planted.

For the first purpose stock is selected from York bay, Blue Point, Staten Island sound, Rockaway, Norwalk, and occasionally from Virginia, and from Egg Harbor and Maurice cove, New Jersey; but the whole amount of this class constitutes less than one-fifth of the total shipment. These oysters are either placed on sale at once in the California markets, or are "bedded-down" for a few days, to await a favorable sale.

The class of oysters sent as "seed" is entirely different, and is derived chiefly from Newark bay and the North river, stock from there standing the journey better than the East river oysters, which otherwise seem preferable. Beside these is sent seed from Raritan river, New Jersey, and Prince's bay, Staten Island. This seed is so small that a barrel holds from 3,000 to 5,000; this number, of course, includes even the "blisters", or oysters so young that you cannot easily detect the double character of the shell, which looks like your finger-nail. Although the average time of passage is only eighteen days by the fast-freight lines, it is expected that about one-fourth of each barrefull will prove dead or too weak to survive transplanting at the end of the journey. The "blisters" will be found to have died far more frequently than the larger oysters, none of which, however, are older than a few months and larger than a silver quarter. The cars in which they are carried are double-walled, so as to preserve an equality of temperature, so far as possible, and 22,000 pounds is the limit of the cargo allowed by the company. The freight charges at present are about \$10 a barrel. This makes it unprofitable to import any seed except that which is very small, and which by growth can add very greatly to their size and consequent value.

PLANTING BEDS IN SAN FRANCISCO BAY.—The planting beds are situated in various parts of the bay, and nearly all go dry at low water. Some of the localities mentioned are: Millbrae, Saucelito, Alameda creek, Tomales bay, Belmont, Oakland creek, and San Leandro. Sheep island, I believe, is no longer planted. The state owns the bottom and sells it by auction to the highest bidder, the purchaser being given a patent title in perpetuity. The state's nominal price was \$1 25 an acre, but most of the suitable ground was taken up long ago, and must now be bought at second-hand. Portions of it have been sold thus for \$100 an acre. The growth is extremely rapid—fully three times as rapid as ordinarily takes place in eastern waters—and this growth tends toward the fattening of the flesh rather than to greater weight of shell, a result highly desirable; but the mollusk is not considered so hardy here as at the East. The seed remains on the beds from two to four years before selling.

PRACTICAL FAILURE OF EASTERN PLANTS.—From the very first, however, it was noticed that all attempts to make them spawn and propagate beds of the eastern species in San Francisco bay, were frustrated by the death of the intended parents. The state of the case was well described in the *Bulletin*:

Every effort to breed the eastern oyster in San Francisco bay has resulted in signal failure. The grown oyster begins to fatten as soon as it is laid down, and this process goes on very rapidly for about six months, when the oyster suddenly dies, apparently of plethora. The young oyster, or the oyster-plant, as it is called, develops quite as well as on the beds from which it was taken, and in due course attains its growth and a fatness and exquisite flavor not possessed by its brother at home. But the experience of the dealers, which is confirmed by observations taken under the auspices of the Academy of Sciences, is that these oysters *will not spawn in this bay*. The most careful investigation has failed to detect any indications of spat on the adult oyster; and the reason is plain enough. It is an axiom of oyster-culture, as we have already pointed out, that oysters breed in salt water on a clean bottom, while they fatten in brackish water on a muddy or marly bottom. *Fattening oysters do not breed where there is much mud*. Now, the two great rivers which empty into San Francisco bay bring down a vast amount of muddy deposit, which forms a layer over very nearly the whole bottom of the bay. This deposit is fatal to the breeding of the large oyster, though it is most conducive to fattening. At the same time the fresh water of these rivers is very detrimental to the breeding process. The mud-flats at Oakland were experimented upon for four or five years, but entirely without success. The same was the result of experiments made at Vallejo. All efforts to breed the eastern oyster on this coast have now been abandoned, and the companies devote their attention to transplanting for fattening purposes.

While the facts above given are true in a commercial way, whatever may be thought of the explanation, it is equally true, however, that a few young eastern oysters are now and then found. The excessive fatness is no doubt due to the thick nutritiously muddy water of the bay, but I should say that this had only a secondary effect on the spawning, which was repressed first by the shock of the long railway journey, and secondly by the unnatural coldness of the water to which they are transplanted. It is a parallel fact to the failure to spawn, in the case of southern oysters carried to northern waters on the Atlantic coast. The summer temperature of the water at San Francisco is much lower than that of the water around New York, although the mean winter temperature may be higher. It is said, however, that considerable eastern spat caught and grew on beds of native oysters near San Leandro last year. I am not sure of the truth of this.

PRICES OF EASTERN OYSTERS IN SAN FRANCISCO RETAIL TRADE.—The price of eastern oysters in San Francisco at first was \$15 a hundred; now they have come down to \$2 50, \$2, and \$1 to \$1 50 a hundred, according to grade. "The shoal-water bays," writes Jordan, "sell at about \$2 50 per sack of a thousand. The Olympia oysters sell at about \$2 50 per sack of the same size, but, being smaller, there are 1,400 or 1,500 in a sack. In 1876-'77 they were about \$4 per sack; in 1870-'71, and '72, \$5 to \$6. Previously they had been as high as \$16 per sack. This business, like almost every other in California, has been overdone. More oysters are now planted than can be readily sold, and the sharp competition keeps the prices low, and the sales are disproportionately small for the amount of capital invested. Oysters are a luxury, and with the hard times now in California, luxuries have to be lopped off. The retail dealers refuse to reduce their prices proportionally, and the people go without oysters. The reduction in prices made by the wholesale dealers increases the consumption but little, as the retail dealers and restaurant keepers do not follow. There are now enough oysters planted to supply the whole coast for some time to come. The half a dozen dealers in San Francisco are ambitious for a large business, and it takes but very little of anything to overfill the Pacific coast market. There is scarcely anything in the line of food which can be profitably exported in case of oversupply. The ruling wholesale price for eastern oysters is now \$15 to \$25 or \$30 per thousand, and the whole business is stagnant. No oysters are canned on the Pacific coast in any amount. All are shipped alive in the shell, and little is done except in winter."

MEN AND CAPITAL.—The number of men supported in San Francisco and on the bay by the wholesale oyster-trade is about 75 during the whole year, with an additional force in the busiest season. About half of these are married, so that we may estimate from 200 to 250 as the number of persons dependent upon this wholesale trade and production there. Only four firms, all in the market on California street, handle eastern oysters. There are two other wholesale dealers, but their business is in "Shoalwater", "Yaquina", "Natard Bay", and "Olympia" oysters, to the extent of only \$20,000 or \$25,000 a year combined.

The data furnished by Mr. Jordan give an estimate of \$570,000 capital invested by these six firms; total sales of \$900,000, and amount of oysters sold (by count) at 45,000,000. It seems to me that this last item is much too high. I cannot find warrant for sales exceeding half that, or at the very most 25,000,000 oysters of all kinds, equal at most to only 125,000 bushels; and at an average price of \$23 a thousand, this would yield as the total value of cash sales only \$575,000. It is probable an even half-million would cover it.

STATISTICS OF SHIPMENT FROM NEW YORK, 1874-'80.—A tabulated statement of the oysters shipped from New York to San Francisco between 1874 and 1880, inclusive, is given herewith:

Statement of oysters shipped from New York to San Francisco since 1874.

Kind of oysters.	1875.	1876.	1877.	1878.	1879.	1880.	Total of each.	Purpose.
York Bays.....barrels..	659			177	61	145	1,042	Market.
Newark Bays.....do.....	13,064	2,063	2,094	2,615	143	3,701	23,680	Planting.
Raritan Rivers.....do.....	1,212	105	122	26		425	1,890	Planting.
North Rivers.....do.....	573	338	1,123	266	707	18	3,025	Planting.
Natural Growth.....do.....	248	171					419	Planting.
Blue Points.....do.....	5				2		10	Market.
Sounds.....do.....	1,132	584	137	290	1,293	92	3,530	Market.
Maurice Rivers.....do.....	133						133	Market.
Virginias, etc.....do.....	83		15	3			101	Market.
East Rivers.....do.....		1,289	1,871	2,910	878	848	7,796	Half planting, half market.
Princes Bays.....do.....		16					16	Planting.
Rockaways.....do.....					1		1	Market.
Egg Harbors.....do.....					126		126	Market.
Total annual shipment.....do.....	17,109	4,569	5,362	6,287	3,213	5,229	41,769	
Total shipment in car-loads.....do.....	78	50	60	72	39	63	362	

OYSTERS SOUTH OF SAN FRANCISCO.—To the southward of San Francisco bay no oysters of sufficient size and flavor to have commercial importance occur, except in the bay at San Diego, where Mr. Jordan notes that near La Punta, at the south end, some are got for use. These are of small size and “coppery” taste, however. Eastern oysters have been tried there, but seem not to have succeeded.

MEXICAN OYSTERS IN CALIFORNIA.—Concerning another proposition, namely, the introduction of Mexican oysters, much was said a few years ago. I am not informed as to the practical outcome, but judge it to have been of little or no account, since Mr. Jordan's notes contain no allusion to the matter. It will be well to review the newspaper discussion, nevertheless. In a copy of the *Bulletin*, about March, 1875, I find the following facts:

As long ago as 1850 Dr. Johnson, now a resident of Sinaloa, tried the experiment, but although his vessel had a short passage, few of the oysters reached this port alive. Captain William Randall, formerly master of several vessels plying between San Francisco and Guaymas, made several attempts in the same direction, but without success. The oysters, however, frequently remained alive from fifteen to twenty days. When the steamers first began to run between this port and the Gulf of California, hardly a trip passed without some futile attempt being made to bring Mexican oysters here alive. But the first systematic attempt at importation was made by a company which sank \$16,000 in the enterprise, without any return. [The *Alta California* credits this to a Captain Scoofey.] Tanks holding about one ton each of oysters were placed on the deck of the steamer, and refilled with pure salt water twice every twenty-four hours. The oysters were taken on board at Guaymas; thence across the Gulf of California until Cape Saint Lucas was reached, the sea was smooth and there was no violent motion of the water in the tanks. The oysters remained in good condition, and were observed to be feeding whenever the tanks were replenished. Just after the vessel passed Cape Saint Lucas the tanks were refilled. But now the vessel encountered a head sea, and the water in the tanks was continually swashing back and forth. It soon became foul, and the result was that few oysters arrived alive in San Francisco, and these were in a condition hardly fit for consumption. The enterprise was abandoned after a heavy loss to the projectors.

Many people will remember the circumstances under which C. J. Janson's oyster-expedition came to an untimely end. The steamer *Forward*, which he fitted out and sent down to Mexico, was taken possession of by a party of revolutionists, and was afterward captured and destroyed by the United States steamer *Mojican*, as a pirate. Emerson Corville, the well-known oyster-dealer of this city, organized the latest Mexican expedition. His plan was to ship the oysters from Point Altata to Cape Saint Lucas, from which point they were to be transported by steamer to San Francisco. Both the Holladay line of gulf steamers and the Pacific Mail Company's steamers were running at that time. Mr. Corville's agent encountered the greatest difficulties on account of the revolution then going on in the country. It was only after several months that he succeeded in getting a few oysters across the Gulf to Cape Saint Lucas by an eight days' voyage. But the heat of a broiling sun pouring down upon the deck of the vessel, had killed nearly all of the bivalves. Those that were saved were laid down in this bay, where they fattened very rapidly. Had the agent had a vessel at his own disposition, flying the American flag, the enterprise might very likely have succeeded.

The feasibility of breeding the Mexican oyster in San Diego bay, and also in several other of the bays, estuaries, and lagoons along the coast of this state, has been pretty thoroughly discussed, and the prospect is now good that some practical results will soon flow therefrom. A gentleman who has long taken great interest in the subject, and who was for many years a resident of the coast of the Gulf of California, made an effort to get a legislative appropriation last winter to transport oysters from Mazatlan, to plant in San Diego bay. He was not successful in this, but an act was passed “to encourage the planting and cultivation of oysters”, which is intended to afford protection to the rights of those who may lay down oysters in any of the bays, rivers, or public waters of the state, and to secure them in the ownership of the property thus acquired.

This gentleman points out that the raccoon oyster, which is the native Lower California oyster, a bivalve of no mean merit, is found in great abundance in San Diego bay. There is far less fresh water there than in San Francisco bay, and the bottom is of that peculiar character so much esteemed at the East for oyster-breeding. He says that in those parts of Lower California where the raccoon oyster is indigenous, the oyster of the Mexican gulf coast is found to thrive equally well. He is also confident that the Mexican oyster would breed and thrive in numerous other bays along the coast of the state, notably at Wilmington, False bay, Trinidad, and San Buenaventura. In fact, anywhere that there is a lagoon, the water of which is regularly changed by the tides, he thinks that the Mexican oyster-cultivation

might be profitably carried on. He is not of opinion that foreshore cultivation will ever become anything like as extensive here as on the coast of France and other European countries, because there is not the requisite rise and fall of the tide.

Oysters can be had in unlimited quantities on the Mexican coast, from San Blas to Guaymas, for the mere cost of taking them away. The people and the authorities are anxious to aid in the development of the industry. It can now be undertaken with more favorable prospects of success than ever before. Every fourteen days a steamer leaves Mazatlan, and within four or five days afterward touches at San Diego. There are two estuaries between Mazatlan and San Blas, one distant thirty and the other sixty miles from Mazatlan, where oysters can be had in any quantity desired. The bivalves might be temporarily bedded at Mazatlan to await shipment. The gentleman above referred to estimate that oysters, equal in size and flavor to the best eastern, can be laid down here at a cost of less than \$25 per ton, while it costs \$100 a ton to get them here from New York. To insure success, he thinks that the projectors should have at their entire command a schooner of from 25 to 40 tons, the cost of victualing and manning of which would not exceed \$125 a month. The cost of gathering the oysters and putting them on board ship he estimates at \$3 per ton; cost of boxes, \$2 50; cost of shipment to Mazatlan, \$2 50 per ton; freight to San Francisco or San Diego, \$10 per ton; total, \$18 per ton; and the boxes could be used several times. If it were decided to bed the oysters in San Diego, they might, when nearly grown, be taken up and transplanted to this bay, where they would perhaps become fatter and finer flavored than if brought directly to market from San Diego. The canning of turtle could be made an adjunct to the business, for green turtles of the finest kind are found in the same lagoons with the oysters.

Another plan suggested of getting the Mexican oysters here, is to ship them from La Paz by the Colorado line of steamers, which makes the trip in seven or eight days. The experiment of transplanting oysters from the opposite coast of the Mexican gulf and bedding them at La Paz, has already been successfully tried. By this plan of shipment, Mexican oysters could be laid down at San Francisco every twenty days.

It is to be hoped that the effort will be once more made, under the remarkably favorable condition now existing, to give our people the benefit of the boundless supply of splendid oysters possessed by our southern neighbor. It is quite possible that the Mexican oyster may yet drive its eastern competitor out of our market, and thus the money which is now being expended at the East be retained at home.

Commenting on the same subject, the *Alta California* (February 13, 1874) said that there was every evidence that the Mexican oyster, "famous for its great size and fine flavor," would thrive in the bay of San Diego, and asks:

But who will venture the experiment? Not our own oystermen, certainly, for though the successful introduction and breeding of Mexican oysters might benefit the people of the state of California, it would be more than likely to take money out of the pockets of those who now enjoy the monopoly of the overland oyster-trade, by raising up a wholesome competition that would naturally reduce the prices of oysters in California, and more than probably make this an important state industry. Because our own bay is not favorable to the breeding of oysters, this may not be the case with any other of our bays, harbors, and lagoons. These last, especially, should be tried, and particularly the lake at Oakland; this could, with flood-gates, perhaps, be made an excellent place for the breeding of both fish and oysters, and there are many other similar lagoons along our coast. Oysters can be brought from the coast of Mexico to San Diego in four days, and at a cost of \$25 per ton, which is less than they can be bought for in the cities of New York.

A year later (January 27, 1875) the *Bulletin*, of San Francisco, announced the forming of a company "for the purpose of transplanting oysters from the Mexican coast", which had selected San Diego as their principal depot:

The capital stock is placed at \$1,000,000, divided into 10,000 shares. The Mexican oysters are now in fine condition, and will remain so until the rainy season sets in, in July. Beside stocking the bay of San Diego with plants and laying down a quantity of large oysters for summer supply, it is proposed to ship direct to San Francisco. Auxiliary to the shipping of live oysters, it is proposed also to dig oysters for the China market, and eventually to can and pickle them for the interior of Mexico. The Mexican officials are favorable to this enterprise.

T. UTILIZATION OF OYSTER-SHELLS.

59. SHELL-LIME AND OTHER APPLICATIONS OF OYSTER-SHELLS.

USES OF SHELLS.—The utilization of oyster-shells is extensive and various. They serve as "metal" for roads and foot-paths; as "filling" for wharves, low lands, fortifications, and railway embankments; as cultch or stools for new oyster-beds; as ballast for vessels; as material for lime; and as a spreading for exhausted fields, or a component in mixed fertilizers, besides some minor uses, such as food for poultry, etc.

HISTORICAL NOTES.—In Rees' *Cyclopaedia* of 1819, it is stated that a Mr. Homberg had found them to be a valuable medicine in case of acid stomach, and gave the following prescription for their preparation:

Take the hollow shells of the oysters, throwing away the flat ones as not so good; wash them perfectly clean, and then lay them to dry in the sun; when they appear dry beat them to pieces in a marble mortar; they will be then found to contain yet a large quantity of moisture; lay them again in the sun till perfectly dried, and then finish the powdering them, and sift the powder through a fine sieve. Give twenty or thirty grains of this powder every morning, and continue it three weeks or a month.—*Mem. Acad. Par.*, 1700.

One is astonished, upon first going to an oyster-locality, to see the huge piles of shells, and discover what spacious areas have been raised above tide-level or otherwise filled in with these animal structures. If there are 23,000,000 bushels opened annually in the United States, that is an equal measure of shells, and amounts to no less than 243,390,000 cubic feet. More than half of these are devoted to this purpose, and would spread three feet deep over a space more than 450,000 yards square, which would fill in a very respectable shallow.

The next largest portion of the emptied shells are converted into lime. Time was when no other lime was used by the early colonists. It is my opinion, from a careful examination, that the oldest structure of civilized masonry in North America, the famous Tower of the Northmen, at Newport, Rhode Island, is laid up with shell-lime.

What is supposed to be the earliest "poem" written in Pennsylvania, by one John Holme, celebrates the industry in language more explicit than flowery :

A few years since, it's known full well,
Here lime was burnt of oyster-shell,
No limestone in these parts was found,
But since by searching in the ground
Great store was seen in a short time,
Of which some now make good stone lime,
Which in its goodness doth excell
That which was made of oyster-shell,
And much cheaper 'tis at this time
Than we paid for oyster-shell lime.

In New England, relics of its use abound in all the ancient settlements. At East Haven, Connecticut, for example, stands a church one hundred and four years old, the stones of which broke sooner than the oyster-mortar, when repairs were sought to be made upon the wall.

Kalm says it was abandoned in Philadelphia as soon as lime-stone was discovered, because of its tendency to absorb water. "The people shewed me some houses," he says, "in this town which are built of stone, and to the mason-work of which the lime of oyster-shells had been employed. The walls of these houses were always so wet, two or three days before a rain, that great drops of water could plainly be perceived on them; and thus they were as good as hygrometers."

SHELL-LIME AS A FERTILIZER.—At the present time it is as a fertilizer that shell-lime finds utilization, either by direct application upon the land, or by mixing it with barn-yard manure in the compost heap. This application of oyster shells, either whole or after burning, is so important a matter, that I may be pardoned for quoting at considerable length the investigations made into its value at the Connecticut agricultural experiment station, in charge of Prof. S. W. Johnson, at New Haven. Samples were given them in November, 1879, of oyster-shell lime and screenings made by H. A. Barnes & Co., Fair Haven:

The slacked and unscreened lime which these two samples represent [says the report, in Bulletin 36, February 7, 1880] is sold by measure and not by weight. The price in November, 1879, was 8 cents per bushel at the work, and 9½ cents per car-load, shipped in bulk at the railway depot. The average weight of the screened slacked lime used for building purposes is stated to be 47 pounds per bushel. As the screenings amount to 3 to 5 per cent. of the total, it is not far from the truth to assume that the unscreened will weigh 50 pounds per bushel. The cost of this lime would be accordingly 16 cents per 100 pounds, at the kilns, or \$3 20 per ton. Shipped in casks holding 16 to 25 bushels, the lime cost about 1½ cents more per bushel, and the casks cost \$1 each, which would bring the cost of a ton up to about \$6 40, two casks included.

The screenings consist largely of imperfectly burned shells, entire or in fragments. They are not shipped, but are sold at the kilns for 4 to 6 cents per bushel.

The unslacked lime, of which we have no analysis, is stated to weigh on the average 70 pounds per bushel, and is sold in bulk at the railroad depot for 17 cents per bushel, or about 24 cents per 100 pounds, or \$4 80 per ton. Shipped in casks, its price is 19 cents per bushel, the casks costing \$1 each, which would make the ton cost \$7 70.

Analyses of oyster-shell lime and screenings.

	Sample No. 328.	Sample No. 329.	Sample No. 330.		Sample No. 328.	Sample No. 329.	Sample No. 330.
Lime	64.47	53.60	53.82	Chlorine	0.04	0.02	0.01
Magnesia	0.41	0.32	0.24	Phosphoric acid	0.17	0.19	0.15
Oxide iron and alumina	1.50	1.43	1.14	Silica	2.24	2.41	} 6.12
Soda	0.16	0.27	0.15	Sand	5.08	2.85	
Potash	0.04	0.06	0.03	Coal	0.65	0.94	2.60
Carbonic acid	7.79	8.89	22.34	Water (by difference)	16.93	28.33	13.17
Sulphuric acid	0.52	0.69	0.23		100.00	100.00	100.00

In the subjoined statement are given the proportions of the various chemical compounds that probably exist in the samples :

	Sample No. 328.	Sample No. 329.	Sample No. 330.		Sample No. 328.	Sample No. 329.	Sample No. 330.
Carbonate of lime	17.45	19.73	50.52	Sodium chloride (common salt)	0.07	0.03	0.02
Hydrate of lime	68.64	52.34	33.29	Oxide of iron and alumina	1.60	1.43	1.14
Sulphate of lime	1.12	1.48	0.49	Silica			} 6.12
Phosphate* of lime	0.37	0.41	0.33	Sand	5.08	2.85	
Silicate of lime	4.33	4.66		Coal	0.65	0.94	2.60
Magnesia	0.41	0.32	0.24	Water	0.60	15.29	4.97
Carbonate of potash	0.06	0.09	0.04				
Carbonate of soda	0.22	0.43	0.24		100.00	100.00	100.00

*The small amount of phosphorus in oyster-shells causes them sometimes to be phosphorescent, and it is said that they become distinctly so by being thoroughly calcined. A kind of commercial phosphorus, known as Canton's, was anciently made of them, which had peculiar properties, and was not so delicate as some other sorts.

On referring to the results of these analyses, we notice that the two samples of lime contain about 9 per cent. of sand and coal, or of substances mostly derived from them, viz, oxide of iron, alumina, and silica. We have small quantities of potash, soda, magnesia, phosphoric and sulphuric acids, altogether amounting to 1.5 per cent. Both samples contain also nearly equal quantities of carbonic acid, viz, 8.3 per cent. Lime, the chief ingredient, varies from 64.5 to 53.6, or nearly 11 per cent., and water from 17 to over 23, also 11 per cent. Looking now to the statement of the proportions of the compounds probably existing in the samples, we see that in the two samples of slacked lime the chief ingredient is hydrate of lime (or calcium hydroxide); next to this in quantity comes carbonate of lime (or calcium carbonate), followed by silicate of lime 4.05 per cent., sulphate 1.03 per cent., and phosphate 0.4 per cent.

THE CHEMISTRY OF LIME MANUFACTURE.—A brief review of the chemistry of the lime manufacture may be serviceable. Clean oyster-shells consist chiefly of carbonate of lime. As they are used in lime manufacture they contain probably about 7 per cent. moisture and organic matter, about 6 of soil and sand, and 87 per cent. of carbonate of lime. In passing through the kiln the carbonic acid is mostly expelled. If completely expelled the loss would be 38 pounds of carbonic acid for 100 pounds of shells, leaving 49 pounds of quicklime (calcium oxide). With this would of course remain the sand, mud, etc., that originally adhered to the shells, together with the ashes of the coal used in burning. The lime thus obtained is slacked by throwing on water, in order to reduce it to a powder. In this process of slacking, water and lime enter into chemical combination, the 49 parts of lime becoming 64 parts of hydrate of lime. In practice some carbonate of lime remains undecomposed by the burning, and, in the slacking process, the use of insufficient water may leave some quicklime unconverted into hydrate, or excess of water may remain as moisture, as is the case with sample 329. When applied to land, oyster-shell lime may act as a fertilizer, strictly speaking, or as an amendment. Commonly, both kinds of action are exerted, and the distinction between fertilizer and amendment is not generally recognized in practice, although very important in considering the effects of this substance. Lime is used as an amendment on heavy clay soils, two to three or more tons being sometimes applied per acre. On loams or light lands 1,000 pounds, or 20 bushels of oyster-shell lime, applied once in two or three years, is a usual application, equivalent to the addition of 300 to 500 pounds to the acre annually. It is evident that the small quantities of potash, magnesia, and phosphoric acid contained in such doses of oyster-shell lime can have no sensible effect upon crops. It is the lime alone, therefore, to which any benefit must be ascribed. A consideration of the modes of action of hydrate of lime, when applied as a fertilizer, will make it evident that it is one of the most valuable aids to the farmer, and deserves more attention from Connecticut land-owners than it has received. Our cultivated crops contain, on the average, as much lime as potash. The necessity for the application of potash salts is fully recognized, but probably the lack of lime is as common a cause of unfruitfulness; for while potash seldom wastes from the soil to any serious extent, and is found in spring, well, and river waters in extremely small quantities, lime freely dissolves in water and rapidly wastes from the soil, so that, other things being equal, there is more need for its restoration.

ANALYSIS OF SHELL-MARL AND MARINE-MUD.—Diverging slightly from this, Professor Johnson analyzes in the same report samples of shell-marl and marine-mud, which it was proposed to put on sale as manures, and it seems worth while to quote the result of his important studies, as follows:

The sample of shell-marl examined came from West Cornwall, and was found to be composed of—

Moisture.....	23.92
Silica, sand, and insoluble matter.....	16.88
Oxide of iron and alumina.....	1.55
Lime.....	27.99
Magnesia.....	0.97
Soda.....	0.59
Potash.....	trace.
Sulphuric acid.....	0.46
Phosphoric acid.....	trace.
Carbonic acid.....	21.77
Organic matters * by difference.....	5.87
	100.00

This shell-marl consists of carbonate of lime to the extent of 40 per cent., and contains 2 per cent. of carbonate of magnesia, also 0.9 per cent. of sulphate of soda, and 0.25 per cent. of carbonate of soda. The organic matter includes nearly 0.5 per cent. of nitrogen, in organic combination. There can be no doubt that its employment, in liberal quantities, viz, one or more tons per acre, especially upon grass lands, would often be attended with decided and long-continued benefit, but, in most cases, its action upon grain crops would not appear at once in so decided a manner as is very commonly the case with good superphosphates or guanos.

The fertilizing effects of this shell-marl, as well as its commercial value, may be safely measured by the percentage of lime which it contains. Its effects on crops would be in general quite similar to those of oyster-shell lime, although somewhat less pronounced, since carbonate is a less energetic agent than hydrate of lime. Its content of lime, 28 per cent., is less than one-half as much as that of the two samples of slacked unscreened oyster-shell lime described on a previous page, whose average is 59 per cent. As 1,000 pounds of the latter costs, at New Haven, shipped in casks, \$3 20, it is evident that the proposed price of the marl, \$15 per ton, is much too large, even after making the most liberal allowance for cost of handling.

A sample of black mud, containing some seaweed from salt water at Saybrook, was sent to the station by George M. Denison, esq., who states that it is exposed at low tide, and can be got upon the land for about 25 cents per load. Chemical analysis assigned to it, of—

Water.....	71.32
† Organic and volatile matters.....	2.79
Sand, clay, and substances insoluble in acid.....	20.82
‡ Oxide of iron and alumina.....	2.62
Lime.....	0.26
Magnesia.....	0.52
Soda.....	0.60
Potash.....	0.17
Chlorine.....	0.51
Sulphuric acid.....	0.39
Phosphoric acid.....	trace.
	100.00

* Containing organic nitrogen, 0.44.

† Contains nitrogen, 0.14 per cent.

‡ Most of the iron exists as protoxide.

This mud, says Professor Johnson, contains, in fertilizing elements, the small amounts of nitrogen, lime, magnesia, soda, potash, chlorine, and sulphuric acid given in the analysis, altogether amounting to about $2\frac{1}{2}$ per cent. of the total. But stable manure—the standard fertilizer—contains about the same amount of plant-food, and of the same kinds, except that it has less sulphuric and more phosphoric acid, less soda and more potash. The mud, when used judiciously, will prove an excellent fertilizer. Doubtless other samples might contain more phosphates. In any case, the mud, used copiously, together with fish, which are rich in nitrogen and phosphates, and with seaweed, which contains abundant potash, will supply all the plant-food that crops require, and serve to maintain or increase fertility of the soil to the fullest degree. The only drawback to the use of the marine mud lies in the considerable proportion of soluble salts, mostly common salt, which it contains, being nearly 1 per cent. If thrown out in heaps and exposed to the rain this salt will be mostly removed. The mud may also be applied directly to the root-crops or grass in moderate quantities, without damage, if well distributed. As an amendment the fine mud must have an excellent effect on coarse-textured soils.

SHELL-HEAPS AND THEIR USE.—In Florida and the Gulf states, the best farms and gardens are those located upon the shell-mounds, where the finest trees grow; and in the northern states these old heaps have long been resorted to by farmers as a store-house of top-dressing for their fields. The immense banks at Damariscotta, described in the chapter on the Gulf of Maine, are constantly utilized for this purpose. The shells are first burned, and the remains of various rude kilns exist, one of which greatly excited the antiquarians who first exhumed it, who were sure they had hit upon an aboriginal, prehistoric home, until they found half a brick in the bottom. Within a few years Mr. Charles Metcalf has built a more substantial kiln and has burned there a large quantity of shells; but he was unable to give me any estimate of what this manure cost him, or the probable value of the heaps, if used for this purpose. He had never sold any shell-lime either for use in mortar or on the fields. Hereafter these deposits may prove an important aid to agriculture in the district, and they are practically inexhaustible. Similar great heaps of half-decayed shells exist in northern New Jersey, from one of which an immense mass of material has been hauled for road-making, and also to be used as ballast in oyster-vessels bound for the Chesapeake bay, where it would be thrown and serve as the best cultch for any spat which might float by.

II. THE NATURAL HISTORY OF THE OYSTER.

U. GENERAL NATURAL HISTORY.

60. THE GROWTH AND HABITS OF THE AMERICAN OYSTER OF THE ATLANTIC COAST.

NUMBER OF SPECIES ON THE ATLANTIC COAST.—The question of the specific unity of all the oysters of our Atlantic coast has probably been placed beyond dispute now, and it is settled that the name *Ostrea virginiana* includes the whole. Says Verrill, in his *Invertebrates of Vineyard Sound*:

All the various forms of this species, upon which the several nominal species, united above, have been based by Lamarek and others, often occur together in the same beds in Long Island sound, and may easily be connected together by all sorts of intermediate forms. Even the same specimen will often have the form of *borealis* in one stage of its growth, and then will suddenly change to the *virginiana* style, and, perhaps, later still, will return to the form of *borealis*. Or these different forms may be assumed in reverse order. Great variations in the number and size of the costæ and undulations of the lower valve occur, both in different specimens from the same locality, and even in the same specimen, at different stages of growth. All these variations occur in precisely the same way in the shells taken from the ancient Indian shell-heaps along our entire coast, from Florida to Maine.

In another place he alleges:

I am unable to find any specific differences between the northern and southern oysters, such differences as do exist being due merely to the circumstances under which they grow, such as the character of the water, abundance or scarcity of food, kind of objects to which they are attached, age, crowded condition, etc. All the forms occur both among the northern and southern ones, for they vary from broad and round to very long and narrow; from very thick to very thin; and in the character of the surface, some being regularly ribbed and scalloped, others nearly smooth, and others very rough and irregular, or scaly, etc. When young and grown under favorable conditions, with plenty of room, the form is generally round at first, then quite regularly oval, with an undulated and scalloped edge and radiating ridges, corresponding to the scallops, and often extending out into spine-like projections on the lower valve. The upper valve is flatter, smooth at first, then with regular lamellæ or scales, scalloped at the edges, showing the stages of growth. Later in life, especially after the first winter, the growth becomes more irregular and the form less symmetrical; and the irregularity increases with the age. Very old specimens, in crowded beds, usually become very much elongated, being often more than a foot long, and perhaps two inches wide.* In the natural order of things this was probably the normal form attained by the adult individuals, for nearly all the oyster-shells composing the ancient Indian shell-heaps along our coast are of this much-elongated kind. Nowadays the oysters seldom have a chance to grow to such a good old age as to take this form, though such are occasionally met with in deep water. The young specimens on the rocks are generally mottled or irregularly radiated with brown.

GEOGRAPHICAL DISTRIBUTION.—The geographical distribution of the oyster along our coast has already been learned in detail, and need only be sketched. It is to be found almost without interruption—except at wholly unsuitable localities—from Florida, and the northern shores of the Gulf of Mexico, to Massachusetts bay; local farther north, off Damariscotta, Maine, and in the southern part of the Gulf of St. Lawrence, at Prince Edward island, in Northumberland straits, and bay of Chaleur. “Not found along the eastern shores of Maine, nor in the bay of Fundy. Abundant in the ancient Indian shell-heaps on the coast of Massachusetts, on the islands in Casco bay, and at Damariscotta. The shells, in a semi-fossil state, have been dug up from deep beneath the mud in the harbor of Portland, Maine, in large quantities, but native oysters appear to be entirely extinct in Casco bay. Very abundant in Long Island sound; in the upper part of Buzzard’s bay; rare and local in Vineyard sound; very abundant on the shores of Maryland and Virginia. Mouth of St. John’s river, and in Tampa bay, Florida (Conrad). Texas (Rømer).”

FOSSIL OYSTERS.—In the history of the world, as shown by the record of the rocks, the oyster has long played a part. The oldest fossil of this family known was discovered by Professor Winchell in carboniferous strata, and

* “The large oyster taken by Xavier François, while oystering on Monday last, was brought up from the wharf on a dray last evening. An oyster measuring 3 feet 1 inch in length, and 23½ inches across the widest part of it, is a curiosity.”—*Mobile (Ala.) Register*, April, 1840.

“An East river oyster,” says De Voe, “was opened by Braisted, of Jefferson market, New York, January 27, 1865, which contained a butter-fish [*Poronotus triacanthus?*] measuring 6 inches in length. It was quite dead.”

named *Ostrea patercula*. Ascending to the Jurassic, oysters are found to have been somewhat plentiful, and, in the Cretaceous, the family reached its culmination. Never before nor since have these mollusks been more abundant in point of species or numbers of individuals, or more widely differentiated in their characteristics. They are of large size, also. In subsequent ages the *Ostreae* were abundant, but the kinds were few, many genera, for example *Gryphæa* and *Exogyra*, disappearing altogether with the close of the Mesozoic era. The fossil remains of these old oysters are found everywhere throughout the world where the ancient oceans had their margins, and in the United States coextensively with the range of brackish-water formations, from the Cretaceous upward.

ANATOMY OF THE OYSTER.—The brief sketch of the anatomy of the oyster which follows, was written by my friend Dr. W. K. Brooks, of the Johns Hopkins University, of Baltimore. It prefaced his account of his successful embryological studies upon the oysters of Chesapeake bay, and is the best and most recent description of this mollusk with which I am acquainted. Therefore I prefer quoting it to writing an imperfect duplicate of the facts. As Dr. Brooks says, it is hardly possible to write such a description without using a few technical words, such as “anterior”, “posterior”, “dorsal”, and “ventral”, but these can all be found in any dictionary, and will present no difficulty to any ordinary reader, however unaccustomed to scientific terms. “As the end of the body where the mouth is placed is not marked by a head, it must be spoken of as the *anterior end*, not as the ‘head’, and the opposite end as the *posterior*. As the oyster lies on one side, the top and bottom of its body do not correspond to the regions which occupy these positions in an upright mussel or clam, and it is most convenient to speak of that part of the oyster’s body which answers to the upper surface of a clam as *dorsal*, and the opposite as *ventral*.”

Dr. Brooks’ anatomical outline sketch* is as follows:

The general structure of an oyster may be roughly represented by a long narrow memorandum book, with the back at one of the narrow ends instead of at one of the long ones. The covers of such a book represent the two shells of the oyster, and the back represents the hinge, or the area where the two valves of the shell are fastened together by the hinge ligament. This ligament is an elastic, dark-brown structure, which is placed in such a relation to the valves of the shell that it tends to throw their free ends a little apart. In order to understand its manner of working, open the memorandum book and place between its leaves, close to the back, a small piece of rubber to represent the ligament. If the free ends of the cover are pulled together the rubber will be compressed and will throw the covers apart as soon as they are loosened. The ligament of the oyster-shell tends, by its elasticity, to keep the shell open at all times, and while the oyster is lying undisturbed upon the bottom, or when its muscle is cut, or when the animal is dying or dead, the edges of the shell are separated a little.

The shell is lined by a thin membrane, the mantle, which folds down on each side, and may be compared to the leaf next the cover on each side of the book. The next two leaves of each side roughly represent the four gills, the so-called “beard” of the oyster, which hang down like leaves into the space inside the two lobes of the mantle. The remaining leaves may be compared to the body or *visceral mass* of the oyster.

Although the oyster lies upon the bottom, with one shell above and one below, the shells are not upon the top and bottom of the body, but upon the right and the left sides. The two shells are symmetrical in the young oyster, but after it becomes attached, the lower or attached side grows faster than the other, and becomes deep and spoon-shaped, while the free valve remains nearly flat. In nearly every case, the lower or deep valve is the left. As the hinge marks the anterior end of the body, an oyster which is held on edge, with the hinge away from the observer and the flat valve on the right side, will be placed with its dorsal surface uppermost, its ventral surface below, its anterior end away from the observer, and its posterior end toward him, and its right and left sides on his right and left hands, respectively.

In order to examine the soft parts, the oyster should be opened by gently working a thin, flat knife-blade under the posterior end of the right valve of the shell, and pushing the blade forward until it strikes and cuts the strong adductor muscle, which passes from one shell to another and pulls them together. As soon as this muscle is cut the valves separate a little, and the right valve may be raised up and broken off from the left, thus exposing the right side of the body. The surface of the body is covered by the mantle, a thin membrane which is attached to the body over a great part of its surface, but hangs free like a curtain around nearly the whole circumference. By raising its edge, or gently tearing the whole right half away from the body, the gills will be exposed. These are four parallel plates which occupy the ventral half of the mantle cavity and extend from the posterior nearly to the anterior end of the body. Their ventral edges are free, but their dorsal edges are united to each other, to the mantle and to the body. The space above, or dorsal to the posterior ends of the gills, is occupied by the oval, firm, adductor muscle, the so-called “heart”. For some time I was at a loss to know how the muscle came to be called the heart, but a friend told me that he had always supposed that this was the heart, since the oyster dies when it is injured. The supposed “death” is simply the opening of the shell when the animal loses the power to keep it shut. Between this muscle and the hinge the space above the gills is occupied by the body, or *visceral mass*, which is made up mainly of the light-colored reproductive organs and the dark-colored digestive organs, packed together in one continuous mass.

If the oyster has been opened very carefully, a transparent, crescent-shaped space will be seen between the muscle and the visceral mass. This space is the pericardium, and if the delicate membrane which forms its sides be carefully cut away, the heart may be found without any difficulty, lying in this cavity, and pulsating slowly. If the oyster has been opened roughly, or if it has been out of water for some time, the rate of beating may be as low as one a minute, or even less, so the heart must be watched attentively for some time in order to see one of the contractions.

The heart is made up of two chambers, a loose, spongy, transparent *auricle*, which occupies the lower part of the pericardium, and receives blood from the gills through transparent blood-vessels, which may usually be seen without difficulty, running from the gills toward the heart, and a more compact white *ventricle*, which drives the blood out of the pericardium through transparent arteries, which are usually quite conspicuous.

The visceral mass is prolonged backward over the pericardium and the adductor muscles, and here contains the rectum, surrounded by prolongations of the white reproductive organs. Still farther back, on the middle of the posterior face of the adductor muscle, is the anus, a long, vertical slit, opening into the space between the lobes of the mantle and above the posterior ends of the gills.

* Report of the Commissioners of Fisheries of Maryland, January, 1880; Annapolis, W. T. Inglehart & Co., State Printers, 1880, pp. 5-10.

In front of the gills, that is, between them and the hinge, there are four fleshy flaps—the lips—two on each side of the body. They are much like the gills in appearance, and they are connected with each other by two ridges which run across the middle of the body close to the anterior end, and between these folds is the large oval mouth, which is thus seen to be situated, not at the open end of the shell, but as far away from it as possible. As the oyster is immovably fixed upon the bottom, and has no arms or other structures for seizing food and carrying it to the mouth, the question how it obtains its food at once suggests itself. If a fragment of one of the gills is examined with a microscope, it will be found to be covered with very small hairs, or *cilia*, arranged in rows. Each of these cilia is constantly swinging back and forth, with a motion something like that of an oar in rowing. The motion is quick and strong in one direction and slower in the other. As all the cilia of a row swing together, they act like a line of oars, only they are fastened to the gill, and as this is immovable, they do not move forward through the water, but produce a current of water in the opposite direction. This action is not directed by the animal, for it can be observed for hours in a fragment cut out of the gill, and if such a fragment be supplied with fresh sea-water, the motion will continue until it begins to decay. While the oyster lies undisturbed on the bottom, with its muscle relaxed and its shell open, the sea-water is drawn on to the gills by the action of the cilia, for although each cilium is too small to be seen without a microscope, they cover the gills in such great numbers that their united action produces quite a vigorous stream of water, which is drawn through the shell and is then forced through very small openings on the surfaces of the gills into the water-tubes, inside the gills, and through these tubes into the mantle cavity, and so out of the shell again. As the stream of water passes through the gills the blood is aerated by contact with it. The food of the oyster consists entirely of minute animal and vegetable organisms and small particles of organized matter. Ordinary sea-water contains an abundance of this sort of food, which is drawn into the gills with the water, but as the water strains through the pores into the water-tubes, the food-particles are caught on the surface of the gills by a layer of adhesive slime which covers all the soft parts of the body. As soon as they are entangled the cilia strike against them in such a way as to roll or slide them along the gills toward the mouth. When they reach the anterior ends of the gills they are pushed off and fall between the lips, and these again are covered with cilia, which carry the particles forward until they slide into the mouth, which is always wide open and ciliated, so as to draw the food through the œsophagus into the stomach. Whenever the shell is open these cilia are in action, and as long as the oyster is breathing, a current of food is sliding into its mouth.

The cilia and particles of food are too small to be seen without a microscope, but if finely powdered carmine be sprinkled over the gills of a fresh oyster, which has been carefully opened and placed in a shallow dish of sea-water, careful observation will show that as soon as the colored particles touch the gills they begin to slide along with a motion which is quite uniform, but not much faster than that of the minute-hand of a watch.

This slow, steady, gliding motion, without any visible cause, is a very striking sight, and with a little care the particles may be followed up to and into the mouth.

In order to trace the course of the digestive organs, the visceral mass may be split with a sharp knife or razor. If the split is pretty near the middle of the body, each half will show sections of the short, folded œsophagus, running upward from the mouth, and the irregular stomach, with thick semi-transparent walls, surrounded by the compact, dark-greenish liver. Back of the liver and stomach the convoluted intestine will be seen, cut irregularly at several points by the section.

The coils of the intestine are imbedded in a light-colored mass of tissue—the reproductive organ—which forms the greater part of the visceral mass. The reproductive organ varies greatly according to the season, and forms most of what is known as the “fat” of the oyster.

There are no accessory organs of reproduction, and the position, form, and general appearance of the reproductive organ is the same in both sexes. There is no characteristic by which a male oyster can be distinguished from a female, without microscopic examination. As the reproductive organ has an opening on each side of the body, it is usually spoken of as double, but in the adult oyster it forms one continuous mass, with no trace of a division into halves, and extends entirely across the body and into all the bends and folds of the digestive tract.

REPRODUCTION AND EMBRYOLOGY.—An account of the life-history of the oyster should begin with the beginning—the egg—out of which this mollusk, like everything else from mussel to man, is born. And in this matter of oyster-breeding, I must rely upon and again quote at length the researches of Dr. Brooks, since he is easily in advance of all students in his knowledge of this subject. During the summer of 1880, at his seaside laboratory, Crisfield, Maryland, and subsequently, Dr. Brooks made microscopic studies on the embryology of the oyster, which were published, with figures, in the Report of the Maryland Fisheries Commission for 1880, and in the Memoirs of the Johns Hopkins University. These investigations were of the most painstaking description, and may be accepted as satisfactorily portraying the true method of reproduction of the American oyster, *Ostrea virginiana*, although showing it to be essentially different from that of the oyster of Europe *Ostrea edulis*. It is my duty as well as pleasure, consequently, to set forth with as great accuracy as condensation and a popular treatment of the subject will permit, the statements of Dr. Brooks.

If several oysters are opened during the breeding-season, which varies, as will hereafter be shown, a few will be found with the reproductive organ greatly distended and of a uniform opaque white color. These are oysters which are spawning or ready to spawn, that is, to discharge their eggs. Sometimes the ovaries will be so gorged that the ripe eggs will ooze from the openings of the oviducts before the mass is quite at the point of being discharged. If the point of a knife be pushed into the swollen ovary, a milk-white fluid will flow out of the cut. Mixing a little of this with sea-water and placing it on a slide underneath a cover, a lens of 100 diameters will show, if the specimen is a female, “that the white fluid is almost entirely made up of irregular, pear-shaped, ovarian eggs (Figure 49), each of which contains a large, circular, transparent germinative vesicle, surrounded by a layer of granular, slightly opaque yolk.” Perfectly ripe eggs will be seen to be clean, sharply defined and separate from each other. If the specimen be male, a glance through the microscope shows something quite different from the fluid of a female. “There are no large bodies like the eggs, but the fluid is filled with innumerable numbers of minute granules (Figure 48), which are so small that they are barely visible when magnified one hundred diameters. They are not uniformly distributed, but are much more numerous at some points than at others, and for this reason the fluid has a cloudy or curdled appearance. By selecting a place where the granules are few and pretty well scattered,

very careful watching will show that each of them has a lively dancing motion, and examination with a power of 500 diameters will show that each of them is tadpole-shaped (Figure 50), and consists of a small, oval, sharply defined 'head', and a long, delicate 'tail', by the lashing of which the dancing is produced." These are the *spermatozoa*, or "male cells", whose union with the eggs or *ova* of the female is necessary to the fertilization of the latter, and the consequent hatching of living oysters.

Again quoting from Dr. Brooks :

The number of male cells which a single male will yield is great beyond all power of expression, but the number of eggs which an average female will furnish may be estimated with sufficient exactness. A single ripe egg measures about one five-hundredth of an inch in diameter, or five hundred laid in a row, touching each other, would make one inch; and a square inch would contain five hundred such rows, or 500 by 500 = 250,000 eggs. Nearly all the eggs of a perfectly ripe female may be washed out of the ovary into a beaker of sea-water, and as they are heavier than the sea-water, they soon sink to the bottom, and the eggs of a medium-sized female will cover the bottom of a beaker two inches in diameter with a layer of eggs one-twentieth of an inch deep. The area of the bottom of a beaker two inches in diameter is a little more than three square inches, and a layer of eggs one-twentieth of an inch deep, covering three square inches, is equal to one three-twentieths of an inch deep and two square, and as a single layer of eggs is one five-hundredth of an inch thick, a layer three-twentieths of an inch thick will contain seventy-five layers of eggs, with 250,000 eggs in each layer, or 18,750,000 eggs. It is difficult to get the eggs perfectly pure, and if we allow one-half for foreign matter and errors of measurement, and for imperfect contact between the eggs, we shall have more than nine millions as the number of eggs laid by an oyster of average size, a number which is probably less than the true number.

Möbius estimates the number of eggs laid by an average European oyster at 1,012,925, or only one-ninth the number laid by an ordinary American oyster, but the American oyster is very much larger than the European, while its eggs are less than one-third as large, so the want of agreement between these estimates does not indicate that either of them is incorrect.* Another estimate of the number of eggs laid by the European oyster is given by Eyton (*History of the Oyster and Oyster Fisheries*, by T. C. Eyton, London, 1858). He says, p. 24, that there are about 1,800,000, and therefore agrees pretty closely with Möbius.

An unusually large American oyster will yield nearly a cubic inch of eggs, and if these were all in absolute contact with each other and there were no portions of the ovaries or other organs mixed with them, the cubic inch would contain 500³, or 125,000,000. Dividing this, as before, by two, to allow for foreign matter, interspaces and errors of measurement, we have about 60,000,000 as the possible number of eggs from a single oyster.

Although each male contains enough fluid to fertilize the eggs of several females, there does not seem to be much difference in the number of individuals of the two sexes. When a dozen oysters are opened and examined, there may be five or six ripe females and no males, but in another case a dozen oysters may furnish several ripe males but no females, and in the long run the sexes seem to be about equally numerous. Oystermen believe that the male may be distinguished from the female by certain characteristics, such as the presence of black pigment in the mantle, but microscopic examination shows that these marks have no such meaning, and that there are no differences between the sexes except the microscopic ones. It is not necessary to use the microscope in every case, however, for a little experience will enable a sharp observer to recognize a ripe female without the microscope. If a little of the milky fluid from the ovary of a female with ripe or nearly ripe eggs, be taken upon the point of a clean, bright knife-blade, and allowed to flow over it in a thin film, a sharp eye can barely detect the eggs as white dots, while the male fluid appears perfectly homogeneous under the same circumstances, as do the contents of the ovary of an immature female, or one which has finished spawning. When the eggs are mixed with a drop of water, they can be diffused through it without difficulty, while the male fluid is more adhesive and difficult to mix with the water. By these indications I was able, in nearly every case, to judge of the sex of the oyster before I had made use of the microscope.

SEXUAL DIFFERENCES.—This question of sex, and the condition under which impregnation takes place in oysters, must next be considered. To this question Dr. Brooks devoted himself with special attention.

About all the published information upon the subject referred to the European species, and stated that, by means of spermatozoa, discharged into the water by neighboring oysters, and sucked within the shell, the eggs are fertilized inside the body of the parent, and that the young are carried inside the parent shell until they are quite well advanced in development and provided with shells of their own; that they swim about after they are discharged from the parent until they find a place to attach themselves, but that they undergo no change of structure between the time when they leave the parent and the time when they become fixed. Misled by these statements, Dr. Brooks opened many oysters during the summer of 1878, and carefully examined the contents of the gills and mantle chambers, but found no young oysters. "I concluded," he says, "that the time during which the young are carried by the parent must be so short that I had missed it, and I entered upon the work this season with the determination to examine adult oysters every day, through the breeding-season, in search of young, and at the same time to try to raise the young for myself by artificially fertilizing the eggs after I had removed them from the body of the parent." The result of a diligent practice of the first of these resolutions surprised him. In the first place he proved anew the generally admitted doctrine, that oysters are not hermaphroditic; in other words, that each oyster is, at the breeding-season, either a male or a female. He writes:

During my investigations I submitted more than a thousand oysters to microscopic examination. My studies were carried on during the breeding-season, and I did not find a single hermaphrodite. The male cells are so small compared with the eggs, that it would be impossible to state that a mass of eggs taken from the ovary contained no spermatozoa, although they could not escape detection if they were at all abundant.

On the other hand, a single egg in the field of the microscope, in a drop of male fluid, would be very conspicuous, and could not escape detection; and the fact that not a single case of this kind occurred, is sufficient to establish the distinctness of the sexes at the breeding-season.

* Möbius' measurement, from 0.15 to 0.18 millimeters, is given (Austern und Austern-wirtschaft, 1877) as the diameter, not of the egg, but of the embryo, but his figures show that the European oyster, like the American, does not grow much during the early stages of development, but remains of about the same size as the egg.

Further than this, he discovered that although the American oyster seems well adapted to follow the European species, and various other marine and fresh-water Lamellibranchs, to draw into its mantle chamber, with the sea-water, the spermatozoa discharged from the mantle chambers of neighboring oysters, and thus to bring about the fertilization of the eggs inside the cavity of the shell, this does not seem to occur. He affirms this very positively, and scientific men generally have accepted the conclusions as facts. I quote the words of one paragraph relating to it:

I have carefully searched the gills and mantles of more than a thousand oysters, at a time when the reproductive organs were plainly seen to be discharging their ripe contents, and have not found a single fertilized egg or embryo in any part of the mantle chamber, in or on the gills, or anywhere else inside the shell. This negative evidence, together with the fact that the eggs can be hatched after they have been artificially removed from the ovaries, seems sufficient to prove, in the absence of all evidence to the contrary, that the eggs of the American oyster undergo development in the open ocean.*

That is to say, during all the period when the young of the European oyster is being safely nurtured inside the mantle-cavity of its parent, and protected from all harm by its strong shells, our infant oysters swim at large in open ocean—if lucky enough to get himself born at all from the egg which is sent abroad unfertilized, to meet a chance male cell and so become impregnated and start into life, if fortune favors.

EXPERIMENTS IN ARTIFICIAL FERTILIZATION.—As has been hinted, Dr. Brooks spent much of his time and efforts at the laboratory in experimenting upon the artificial fertilization of oysters, by mixing eggs extracted from a female with spermatozoa from a male. He found it an easy matter to secure their union, and made his embryological studies from eggs and embryos thus cultivated, in a watch crystal or in a glass beaker. He gives minute directions as to the proper method for repeating these experiments, which those having a microscope can easily undertake, but which may be omitted as not pertinent here.

DEVELOPMENT OF THE YOUNG OYSTER.—The next step, having got the eggs, or learned their nature, is to examine their fertilization and development. Dr. Brooks writes:

The body of the oyster, like that of all animals, except the very simplest, is made up of organs, such as the heart, digestive organs, gills, and reproductive organs, and these organs are at some period in the life of the oyster made up of microscopic cells. The eggs shown in Figures 49 and 53 will answer to illustrate the character of the cells which compose the body. Each of these consists of a layer of protoplasm around a central nucleus, which, in the egg, is a large, circular, transparent body known as the germinative vesicle. Each cell of the body is able to absorb food, to grow and to multiply by division, and thus to contribute to the growth of the organ of which it forms a part. The ovarian eggs are simply the cells of an organ of the body, the ovary, and they differ from the ordinary cells only in being much larger and more distinct from each other; and they have the power, when detached from the body, of growing and dividing up into cells, which shall shape themselves into a new organism like that from whose body the egg came. Most of the steps in this wonderful process may be watched under the microscope, and owing to the ease with which the eggs of the oyster may be obtained, this is a very good egg to study.

About fifteen minutes after the eggs are fertilized they will be found to be covered with male cells, as shown in Figure 51. In about an hour the egg will be found to have changed its shape and appearance. It is now nearly spherical, as shown in Figure 1, and the germinative vesicle is no longer visible. The male cells may or may not still be visible upon the outer surface. In a short time a little transparent point makes its appearance on the surface of the egg, and increases in size, and soon forms a little projecting transparent knob—the *polar globule*—which is shown in Figure 3 and in succeeding figures.

Recent investigations tend to show, that while these changes are taking place, one of the male cells penetrates the protoplasm of the egg and unites with the germinative vesicle, which does not disappear, but divides into two parts, one of which is pushed out of the egg and becomes the polar globule, while the other remains behind and becomes the nucleus of the developing egg, but changes its appearance so that it is no longer conspicuous. The egg now becomes pear-shaped, with the polar globule at the broad end of the pear, and this end soon divides into two parts, so that the egg (Figure 6) is now made of one large mass and two slightly smaller ones, with the polar globule between them.

The later history of the egg shows that at this early stage the egg is not perfectly homogeneous, but that the protoplasm which is to give rise to certain organs of the body has separated from that which is to give rise to others.

If the egg, at the stage shown in Figure 6, were split in the plane of the paper, we should have what is to become one half of the body in one part and the other half in the other. The single spherule at the small end of the pear is to give rise to the cells of the digestive tract of the adult, and to those organs which are to be derived from it, while the two spherules at the small end are to form the cells of the outer wall of the body and the organs which are derived from it, such as the gills, the lips, and the mantle, and they are also to give rise to the shell. The upper portion of the egg in this and succeeding figures is to become the ventral surface of the adult oyster, and the surface which is on the right side in Figure 6, is to become the anterior end of the body of the adult. The figure, therefore, shows the half of the egg which is to become the left half of the body. The upper portion of the egg soon divides up into smaller and smaller spherules until at the stage shown in Figures 24, 25, and 26 we have a layer of small cells wrapped around the greater part of the surface of a single large spherule, and the series of figures shows that the latter is the spherule which is below in Figure 6. This spherule now divides up into a layer of cells, and at the same time the egg, or rather the embryo, becomes flattened from above downward, and assumes the shape of a flat oval disk. Figures 29 and 30 are views of the upper and lower surface of the embryo at about this time. In a sectional view, Figure 31, it is seen to be made up of two layers of cells; an upper layer of small transparent cells, *ec*, which are to form the outer wall of the body, and which have been formed by the division of the spherules which occupy the upper end of the egg in Figure 25, and a lower layer of much larger, more opaque cells, *g*, which are to become the walls of the stomach, and which have been formed by the division of the large spherule, *a*, of Figure 25.

* Writing concerning his work in 1881, Mr. John A. Ryder remarks: "No evidence to show that our oyster is hermaphrodite was found during the entire season, nor were my searches for embryo or eggs in the mouth or in the gills, more successful than those carried on two years before by Professor Brooks. There is no doubt whatever that the oyster of Europe nurses its young on its mantle or gills for some time, nor can we well question the very high authority of Möbius, for saying that in most cases the sexes are separate, and that only one kind of products, viz, either eggs or spermatozoa, are at any time found in the generative organs. Lacaze Duthier's observations seem to confirm the conclusions of Möbius."—*Report of T. B. Ferguson, a commissioner of fisheries of Maryland, January, 1881, p. 14.*

This layer is seen in the section to be pushed in a little toward the upper layer, so that the lower surface of the disk-shaped embryo is not flat, but very slightly concave. This concavity is destined to grow deeper until its edges almost meet, and it is the rudimentary digestive cavity. A very short time after this stage has been reached, and usually within from two to four hours after the eggs were fertilized, the embryo undergoes a great change of shape, and assumes the form which is shown in three different views in Figures 32, 33, 34, and 35.

A circular tuft of long hairs, or cilia, has now made its appearance at what is thus marked as the anterior end of the body, and as soon as these hairs are formed they begin to swing backward and forward in such a way as to constitute a swimming organ, which rows the little animal up from the bottom to the surface of the water, where it swims around very actively by the aid of its cilia. This stage of development, Figure 32, which is of short duration, is of great importance in raising the young oysters, for it is the time when they can best be siphoned off into a separate vessel and freed from the danger of being killed by the decay of any eggs which may fail to develop. On one surface of the body at this stage, the dorsal surface, there is a well-marked groove, and when a specimen is found in a proper position for examination, the opening into the digestive tract is found at the bottom of this groove. Figure 33 is a sectional view of such an embryo. It is seen to consist of a central cavity, the digestive cavity, which opens externally on the dorsal surface of the body by a small orifice, the primitive mouth, and which is surrounded at all points, except at the mouth, by a wall which is distinct from the outer wall of the body. Around the primitive mouth these two layers are continuous with each other.

The way in which this cavity, with its wall and external opening, has been formed, will be understood by a comparison of Figure 33 with Figure 28. The layer which is below in Figure 28 has been pushed upward in such a way as to convert it into a long tube, and at the same time the outer layer has grown downward and inward around it, and has thus constricted the opening. The layer of cells which is below in Figure 23 thus becomes converted into the walls of the digestive tract, and the space which is outside and below the embryo, in Figure 23, becomes converted into an inclosed digestive cavity, which opens externally by the primitive mouth.

This stage of development, in which the embryo consists of two layers, an inner layer surrounding a cavity which opens externally by a mouth-like opening, and an outer layer, which is continuous with the inner around the margins of the opening, is of very frequent occurrence, and it has been found, with modifications, in the most widely separated groups of animals, such as the starfish, the oyster, and the frog, and some representatives of all the larger groups of animals, except the *Protozoa*, appear to pass during their development through a form which may be regarded as a more or less considerable modification of that presented by our oyster-embryo. This stage of development is known as the *gastrula* stage.

Certain full-grown animals, such as the fresh-water hydra and some sponges, are little more than modified gastrulas. The body is a simple vase, with an opening at one end communicating with a digestive cavity, the wall of which is formed by a layer of cells, which is continuous around the opening with a second layer, which forms the outer wall of the body. This fact, together with the fact that animals of the most widely separated groups pass through a gastrula stage of development, has led certain naturalists to a generalization, which is known as the "gastrula theory". This theory or hypothesis, is that all animals, except the *Protozoa*, are more or less direct descendants of one common but very remote ancestral form, whose body consisted of a simple two-walled vase, with a central digestive cavity opening externally at one end of the body.

The edges of the primitive mouth of the oyster continue to approach each other, and finally meet and unite, thus closing up the opening, as shown in Figure 36, and leaving the digestive tract without any communication with the outside of the body, and entirely surrounded by the outer layer. The embryo shown in Figures 32 and 36 are represented with the dorsal surface below, in order to facilitate comparison with the adult, but in Figure 37, and most of the following figures, the dorsal surface is uppermost, for more ready comparison with the adult. The furrow in which the primitive mouth was placed still persists, and soon a small irregular plate makes its appearance at each end of it. These little plates are the two valves of the shell, and in the oyster they are separated from each other from the first, and make their appearance independently.

Soon after they make their appearance, the embryos cease to crowd to the surface of the water, and sink to various depths, although they continue to swim actively in all directions, and may still be found occasionally close to the surface. The region of the body which carries the cilia now becomes sharply defined, as a circular projecting pad, the *velum*, and this is present and is the organ of locomotion at a much later stage of development. It is shown at the right side of the figure in Figure 37, and in Figure 45 it is seen in surface view, drawn in between the shells, and with its cilia folded down and at rest, as they are seen when the little oyster lies upon the bottom.

The two shells grow rapidly and soon become quite regular in outline, as shown in Figures 37 and 44, but for some time they are much smaller than the body, which projects from between their edges around their whole circumference, except along a short area, the area of the hinge, upon the dorsal surface, where the two valves are in contact.

The two shells continue to grow at their edges, and soon become large enough to cover up and project a little beyond the surface of the body, as shown in Figure 44, and at the same time muscular fibers make their appearance and are so arranged that they can draw the edge of the body and the velum in between the edges of the shell, in the manner shown in Figure 45. In this way that surface of the body which lines the shell becomes converted into the two lobes of the mantle, and between them a mantle cavity is formed, into which the velum can be drawn when the animal is at rest. While these changes have been going on over the outer surface of the body, other important internal modifications have taken place. We left the digestive tract at the stage shown in Figure 36, without any communication with the exterior.

Soon the outer wall of the body becomes pushed inward, to form the true mouth, at a point (Figure 37) which is upon the ventral surface, and almost directly opposite the point where the primitive mouth was situated at an earlier stage. The digestive cavity now becomes greatly enlarged, and cilia make their appearance upon its walls, the mouth becomes connected with the chamber which is thus formed, and which becomes the stomach, and minute particles of food are drawn in by the cilia, and can now be seen inside the stomach, where the vibration of the cilia keep them in constant motion. Up to this time the animal has developed without growing, and at the stage shown in Figure 36 it is scarcely larger than the unfertilized egg, but it now begins to increase in size. The stages shown in Figures 44 and 45 agree pretty closely with the figures which European embryologists give of the oyster-embryo at the time when it escapes from the mantle chamber of its parent. The American oyster reaches this stage in from twenty-four hours to six days after the egg is fertilized; the rate of development being determined mainly by the temperature of the water.

Soon after the mantle has become connected with the stomach, this becomes united to the body wall at another point a little behind the mantle, and a second opening, the *anus*, is formed. The tract which connects the anus with the stomach lengthens and forms the intestine, and, soon after, the sides of the stomach become folded off to form the two halves of the liver, as shown in Figure 44.

Various muscular fibers now make their appearance within the body, and the animal assumes the form shown in Figures 44 and 45.

All my attempts to get later stages than these failed, through my inability to find any way to change the water without losing the young oyster, and I am therefore unable to describe the manner in which the swimming-embryo becomes converted into the adult, but I hope that this gap will be filled, either by future observations of my own or by those of some other embryologist.

Such is the scientific history of the oyster-embryo. The practical utility of the knowledge, however, to the most of us, is that the American oyster lays a vast number of eggs, but that they are exposed to dangers so constant and innumerable, that under ordinary conditions few ever come to life, or at any rate succeed in living long enough to anchor themselves and take on the protection of shells. This is only another example of a fact well known to naturalists, and occurring widely among animals of low grade. The number of eggs laid, or even of individuals born, has very little to do with the abundance of a species, which is "determined, mainly, by the external conditions to which it is exposed".

LIFE OF THE YOUNG OYSTER.—The young American oyster leads a peculiarly precarious time, since it is first thrown out an unfertilized egg, and the chance that it will immediately meet with a male cell must be very slight; yet if it does not it will perish, for the sea-water destroys unimpregnated eggs within a few minutes after contact with it. Having by good chance become fertilized by meeting a male cell, the next period of great danger is the short time during which the embryos swarm to the surface of the water. They are so perfectly defenseless, and so crowded together close to the surface, that a small fish, swimming along with open mouth, might easily swallow, in a few mouthfuls, a number equal to a year's catch. They are also exposed to the weather, and Dr. Brooks found that a sudden cold wind or fall in temperature, as occurred several times during his experiments, killed every embryo in his care. The number which are destroyed by cold rains and winds must be very great indeed. As soon as they are safely past this stage and scatter and swim at various depths, their risks from accidents and enemies are greatly diminished. Up to this point, which is reached in from twenty-four hours to six days, there is no difficulty in rearing them in an aquarium, provided uniform warm temperature be preserved. "Möbius," according to Brooks, "has estimated the number of adults which spawn each year, and multiplying this number by the average number of eggs laid by each, and dividing by the number which grow up, he reaches the conclusion that each oyster which is born has $\frac{1}{1,145,000}$ of a chance of reaching maturity. In the case of the American oyster the number of eggs is very much greater and each one's chance of survival is accordingly very much less, and it is evident that the great fertility of the oyster will not protect a bed from destruction by excessive dredging."

In all these early stages, both as egg and as larva, the young swimming oyster is designated popularly as a "spat", "spawn", or "set". Perhaps *spawn* is the best of these terms to be used for our purpose, covering the time from the discharge of the egg until the oyster has attached himself and appears with shells, as a visible speck upon the shell or other anchorage which he has chosen. From this time until he distinctly shows the double *bivalvular* character of his shells and is an oyster, the infant is usually spoken of most expressively as a "blister".

DISTRIBUTIONS OF SPAWN BY WIND AND TIDE.—Regarding now only the vicissitudes of wind and weather, how far will the spawn drift from the parent, under favorable conditions, before it is destroyed, or else sink down and attach itself? This is one of the subjects in respect to which we have small accurate information, and about which there is necessarily much mystery. A few years ago it was accepted as true, that masses of spat were drifting back and forth with the tides and currents all around the coast, and it was only deemed needful to place something on the bottom for this spat to attach itself to, in order to catch a full "set" and obtain thousands of bushels of young oysters. In case of failure, the currents were blamed in an indefinite way for not bringing spawn to the beds. We have seen, though, how delicate and sensitive to harm Dr. Brooks ascertained the young oyster to be, and furthermore, that, even after the vivifying influence of fertilization, it would float only a few hours before becoming ready to attach itself to some support. Now, under ordinary circumstances, the summer drift of tidal currents does not exceed half a mile to a mile an hour, and there would, therefore, not be time for the spat to be carried a very long distance before its turn. If the aid of a strong wind is called in, it must be remembered that any harsh breeze would kill the spawn.

Observation has shown, moreover, in many cases, that a district contiguous to an existing bed of natural or transplanted oysters caught a set, while another area not far away did not, the opposite being never true. When a region—at least everywhere outside of Chesapeake bay—has become depleted of its natural growth of oysters, it is extremely rare that any spawn ever catches there, though on each side close by and in the line of direct currents, there may be productive tracts; by "close by", I mean within two or three miles. Such an instance is found in Warren river, Rhode Island, where there has not been a "set" for ten years. Men there will explain that it is only once in several years that "the right combination of temperature and degree of saltness in the water happens at the moment when the spawn comes in", but it is evident that formerly a growth of young oysters occurred regularly every season, and no "combination" was required. The simple truth is, that there are now no parent oysters native to Warren river, or acclimated in it, to furnish spawn, which does not now drift in from the outer bay. Practical men, therefore, in planning their work, put little trust in fickle currents and the feeble vitality of drifting spawn, while some deny wholly that it drifts at all. One of these latter theorists—and the view is too extreme, I have no doubt—who lives at Providence, Rhode Island, showed me at his wharf in the Seekonk river a float containing a hundred bushels of oysters. The tide was running beneath it and beside it with great force, as, evidently, it always does at that spot. On the 1st of August, 1877, he had that float filled, as now, with native oysters that he had brought from this bed. Suddenly he saw one shoot out a milky substance. "There's an oyster spawning," he cried out, and called his son to witness it. In an instant another exuded the spawn, shot it far out, and then,

as though by concerted action, all began to throw out the spawn until all the float was white with it, hiding the bottom beneath a milky cloud. He continued to watch, and in fifteen or twenty minutes the cloud had disappeared, and the few inches of water in the float had resumed its former clearness.

In the autumn of 1878, about fourteen months after this occurrence, some men begged permission to rake beside the wharf, and found there a solid bank of oysters of small size. There could not be a shadow of doubt, that they were the direct growth of the spawn emitted by the oysters in the float the preceding year, which had sunk straight down, despite the swift current of the out-going tide, unless we are to believe it had floated out into the bay and been brought back again—the more difficult alternative of the two, I think. Three hundred bushels were taken of these young oysters under this old float, within a space 100 feet square.

PREPARING BEDS FOR THE RECEPTION OF SPAWN.—It has come to be the wise practice, therefore, in preparing beds of cultch for the catching of spawn and the rearing of oysters artificially, to place upon the bed of cultch a quantity of adult breeding-oysters called “spawners”. These are sometimes placed in a group athwart the tidal current at that place, and sometimes are scattered about the bed promiscuously. The quantity varies, but it is considered that one bushel of spawners to ten bushels of shells or other “stool” is quite enough. Experiments in this practice are alluded to in the preceding chapters on Narraganset bay, on New Haven, and on the East river; and it is there shown, that even with these precautions, a planter cannot count on catching any mentionable quantity of spawn more than 20 rods away from his spawners, even in a swift tideway, so soon does it settle or perish. Within this limit, however, the catch of an abundance of infant oysters is almost certain. The elaborate processes of oyster-culture carried on in France and the channel-coast of England, are based upon the practice of placing mother-oysters under the most favorable conditions that can be devised for their health, and then closely surrounding them with objects and surfaces—such as tiles stacked loosely over each one—best calculated to offer immediate opportunity for attachment to the spat as soon as it is emitted. The difference in the nature of our mollusks precludes the following of these foreign methods, but it is certain that they may be imitated with profit, so far as the placing of spawners along with the cultch is concerned.

NATURE OF BEST BOTTOM FOR OYSTER-BEDS.—It has long been well understood that the infant oyster, swimming about in search of a resting-place or anchorage, never chooses a soft, muddy bottom, or a surface which is slimy and foul; or, if the volition implied makes the use of the word “chooses” objectionable (we do not know how much control the larva has over the matter), let me say, that whenever the little creatures settle upon such a soft or slimy surface, they do not attach themselves, or, unable to go farther, perish. Little better than the shifting, soft mud is a bottom of clay, with its soapy consistence. Gravel, on the other hand, offers advantages to the oyster whenever it is clean; therefore a hard gale or an unusually high tide, or any other marine disturbance calculated to scour the bottom of a piece of water tenanted by oysters, is greatly welcomed just before their breeding-time. About 1867 a terrible storm cleaned all the ground in the mouth of the Housatonic river, Connecticut, right in midsummer. The result was, that where there had rarely been profitable oystering before, was originated the present great “Stratford” seed-bed. The ridge-like character of most old oyster-reefs, breaking the slow and even flow of currents, and so tending to increase their force, no doubt causes them to be kept better cleaned than the adjacent lower bottom, and thus helps to make these reefs the best of all natural oyster-growing spots.

In fact, there is no doubt that the great secret for a successful spat is extreme cleanliness. Given this quality, there seems to be nothing to which infant oysters will not adhere—the shells of their neighbors and of other mollusks, living crabs, turtles, and terrapins, rocks and pebbles on the shore.

“On shell or stone is drop'd the embryo seed,
And quickly vegetates a vital breed.”—*Crabbe*.

Equally well, also, on the piles supporting bridges and piers; on rafts, boat-bottoms, and floating timber; on buoys and stakes, and in enormous abundance on the leafless head of a tree fallen into the water, or on the roots and limbs of living trees (as notably in the case of the “mangrove oysters” of Florida); on sedges and eel-grass (whence in the south they drop off to make fine “cove” and “single” oysters, and in the north to be frost-bitten and perish in winter); and upon all sorts of odd objects, gravel (valuable in producing single, round stock), bricks, bottles, broken crockery, tinware, shoes, anything, and everything, the surface of which is free from that slippery coating, partly sediment, partly organic growth, which so rapidly accumulates under sea-water, especially in some localities.

ARTIFICIAL STOOLS.—It was long ago understood, therefore, that when artificial beds for the capture of spawn were proposed to be prepared, the substance of the cultch did not so greatly matter as its position and condition at the time of spawning. In Europe, rough stones set on edge or piled in loose stacks, crib-work of tiles or slate or strips of stone, suspended bundles of faggots, called “fascines”, the bushy heads of dead trees, and various other “stools”, were employed. In America it is customary to use nothing but oyster-shells, which sometimes have accumulated on the bed in sufficient numbers, and sometimes are expressly provided for the purpose, as has been described in the body of the present report.

The chief reason for this adherence to oyster-shells, is probably found in their cheapness and convenience.

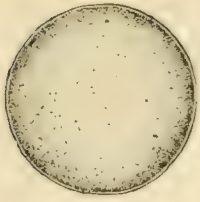


Fig. 1.



Fig. 2.

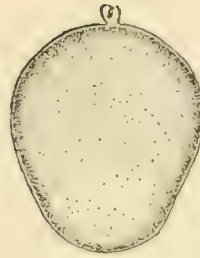


Fig. 3.



Fig. 4.

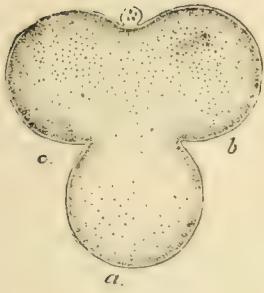


Fig. 5.

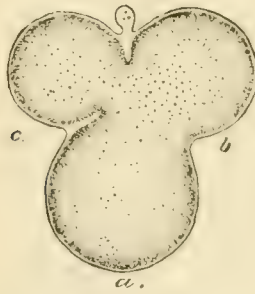


Fig. 6.

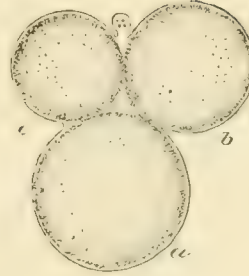


Fig. 7.

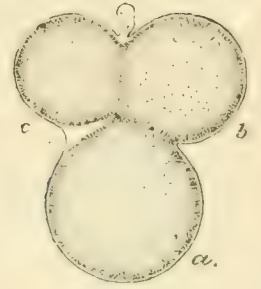


Fig. 8.

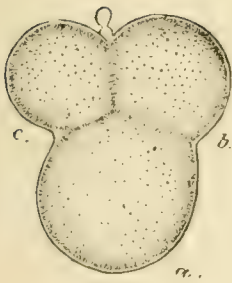


Fig. 9.

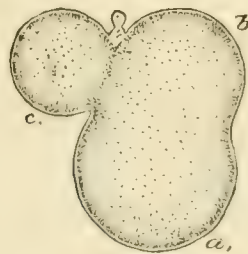


Fig. 10.

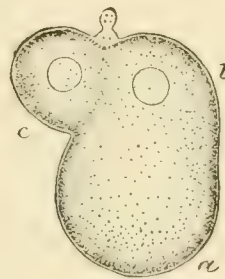


Fig. 11.

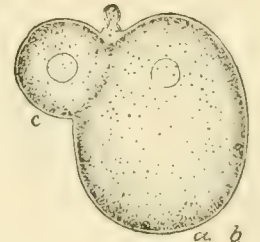


Fig. 12.



Fig. 13.

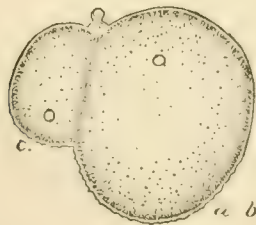


Fig. 14.

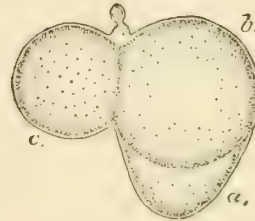


Fig. 15.

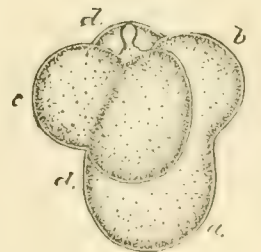


Fig. 16.

Figures of the egg of the oyster and the young oyster in progressive stages of growth, illustrating the studies of Dr. W. K. Brooks.
[From the report of T. B. Ferguson, commissioner of fisheries for Maryland.]

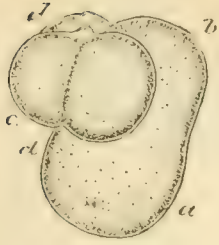


Fig. 17.

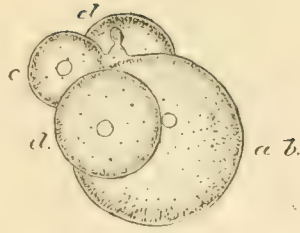


Fig. 18.

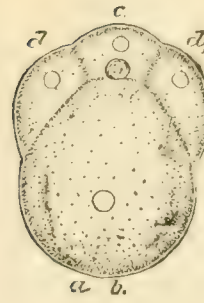


Fig. 19.

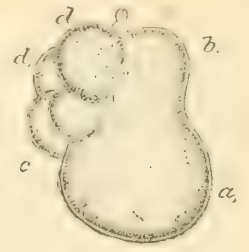


Fig. 20.

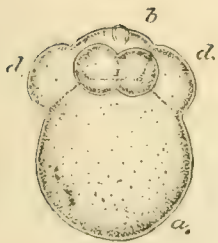


Fig. 21.

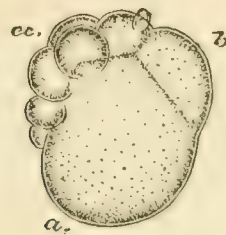


Fig. 22.



Fig. 23.



Fig. 24.



Fig. 25.

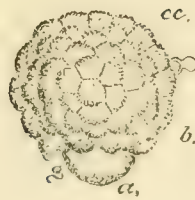


Fig. 26.

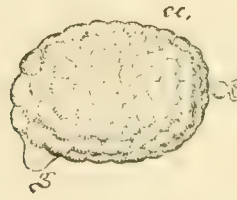


Fig. 27.

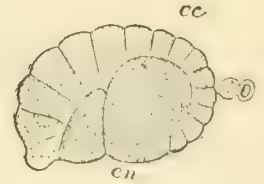


Fig. 28.



Fig. 29.

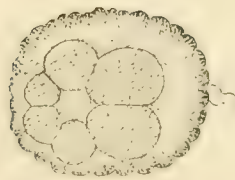


Fig. 30.



Fig. 31.

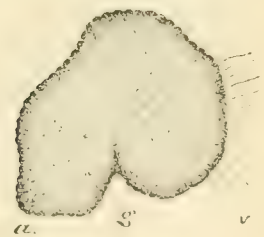


Fig. 32.

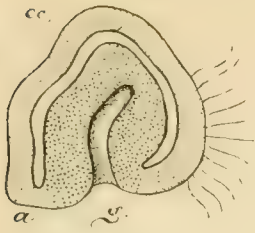


Fig. 33.

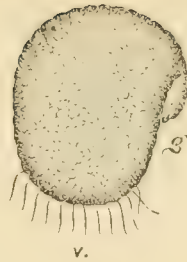


Fig. 34.



Fig. 35.

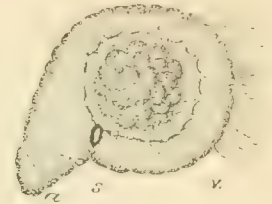


Fig. 36.

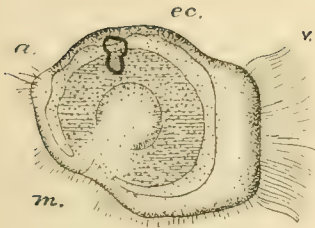


Fig. 37.

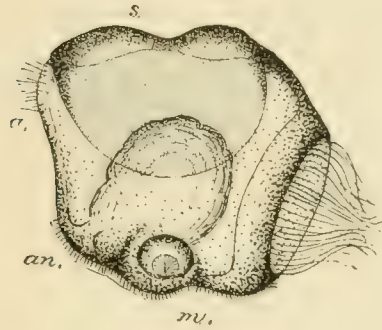


Fig. 38.

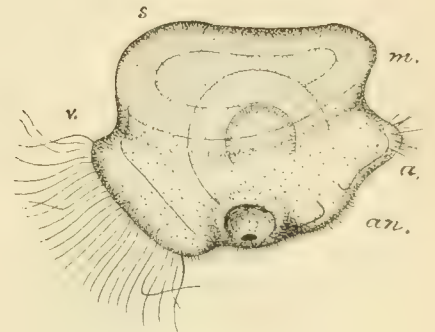


Fig. 39.

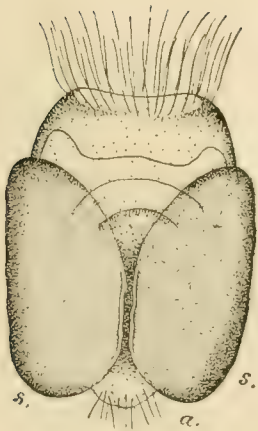


Fig. 40.

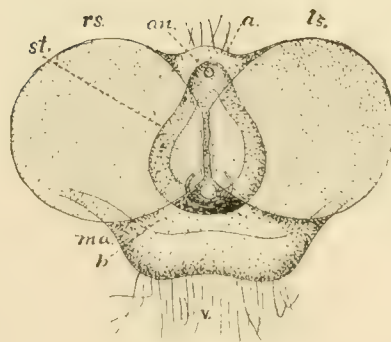


Fig. 41.

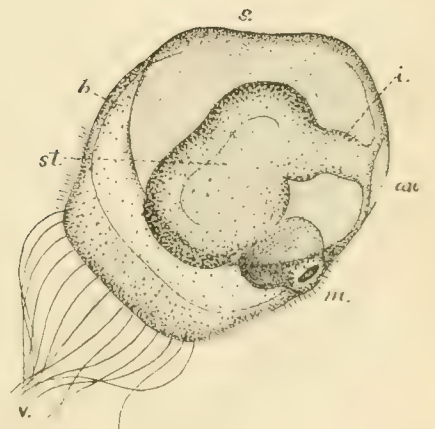


Fig. 42.



Fig. 43.



Fig. 47.

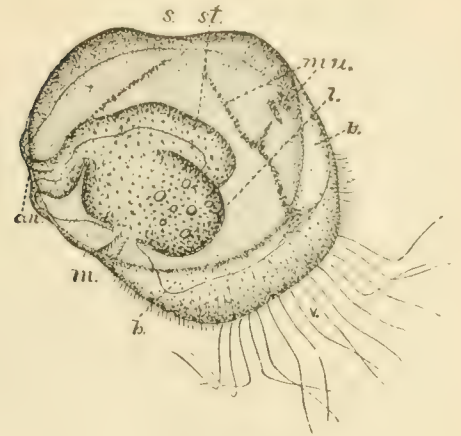


Fig. 44.

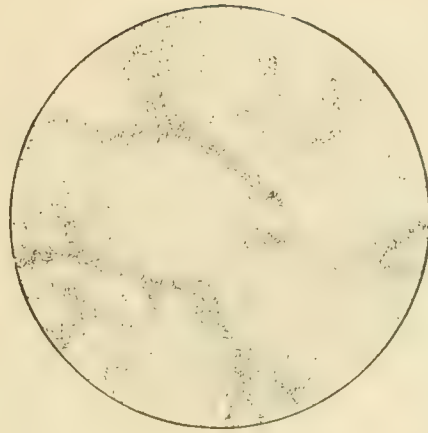


Fig. 48.



Fig. 46.

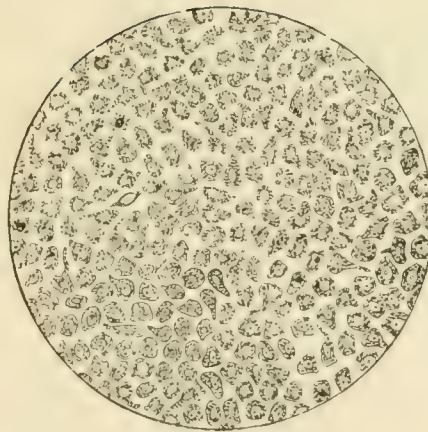


Fig. 49.

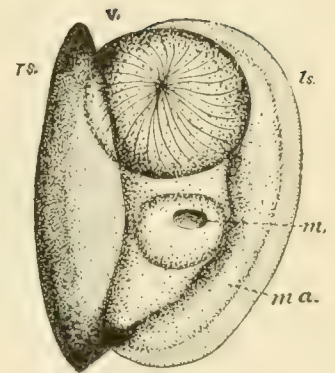


Fig. 45.

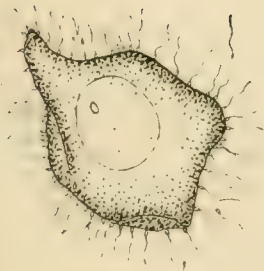


Fig. 51.



Fig. 50.

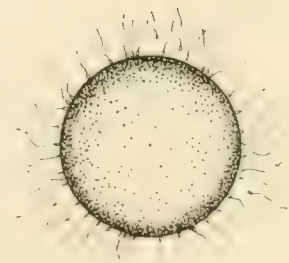


Fig. 52.



Fig. 54.



Fig. 55.



Fig. 56.



Fig. 57.



Fig. 58.

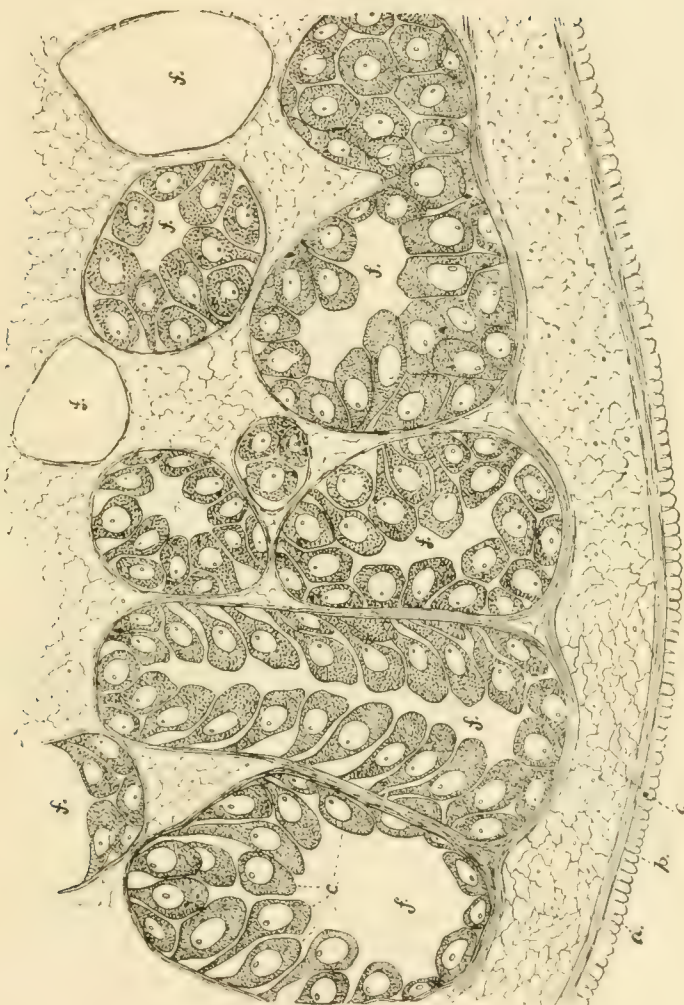


Fig. 53.

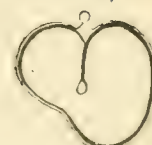


Fig. 59.



Fig. 60.



Fig. 61.



Fig. 62.



Fig. 63.



Fig. 64.



Fig. 65.



Fig. 66.

Figures of the egg of the oyster and the young oyster in progressive stages of growth, illustrating the studies of Dr. W. K. Brooks.
[From the report of T. B. Ferguson, commissioner of fisheries for Maryland.]

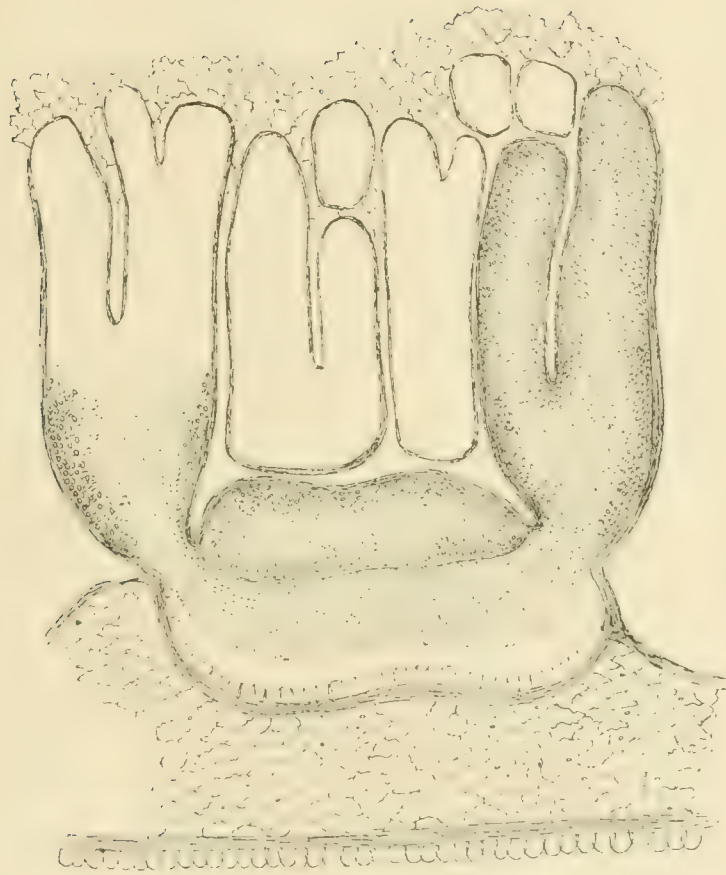


Fig. 67.

Some more fragile shell, such as a scallop or mussel or jingle (*Anomia*), is certainly better, because the growth of the attached oysters wrenches the shell to pieces, breaking up the cluster and permitting the singleness and full development to each oyster that is so desirable; or, if the old shell does not break of itself, the culling of the bunch it supports is far more easy than when the foundation is as thick and heavy as an oyster's or clam's shell. To aid this same end, tiles have been used as collectors of oyster-spat, which were covered with a certain composition which easily peels off, but which is firm enough to hold the young. When they have attained a size and age fit for removal, they can be stripped off without difficulty, removed to other quarters, or deposited in the localities used for growing or fattening, and the tiles can be re-covered with the composition and used again. (In the Chesapeake it is found that the under-side of the tiles catch the most spat.) Possibly, for a permanent bed, nothing is better than the natural shells, but, to catch the floating spawn, something of this sort might be tried to advantage, especially when it is desirable to move the young oysters, either to protect them from enemies or to grow them separately. The anchoring of an old seine at the bottom, the suspending of scallop, cockle, or other thin shells in the water, by stringing them from stake to stake a little way under the surface, or the copying of the French "fascines", would be other means to the same end. One of my correspondents in Long Island suggests inclosing small beds of oysters, just before spawning, by a high board fence, "with plenty of shells or scraps inside to catch the spawn, which thus could not float away". This idea is substantially followed in France, where stakes of wood are driven into the bottom in a circle around a pyramid of oysters placed on stones in the center; and on the Ile de Ré dikes are built of open stone work, so as to divide the bottom into beds, each of which is owned by a private proprietor; and other stone partitions or walls are run across, and upon these stones the spawn fastens. There are 4,000 of these beds or *parcs*.

The early experiments in making these artificial beds failed, through the error of placing the cultch in the water too soon. Before the oysters near them had spawned, the insidious but rapid deposit of the water had coated them with a greasy slime, which made them as unfit for the attachment of the larvæ as any part of the surrounding bottom. Thus it was learned that the cultch must be deposited as short a time before the emission of the spawn as possible.

TIME OF SPAWNING.—The time of spawning was found to be variable at different latitudes, in different depths of water, and according to diverse conditions of weather, etc. It seems to depend primarily upon temperature; hence, in the south, it begins as early as the heat of summer comes on, and follows it northward. In Chesapeake bay spawn has been collected from April until October. In the report of Master Francis Winslow, of the United States navy, concerning his surveys of Pocomoke and Tangier sounds, in the *Palinurus* in 1878, it is stated that there the spawning lasted from May to August, but occurred chiefly in June and July. "All opinions coincided that the oyster in shoal water spawned first, but differed as to whether, the depth being the same, all oysters on the same bed spawned at or about the same time, as many being for as against the theory." In regard to this point I will insert a statement from the *London Standard*, September, 1888, to the effect, that at the oyster pines on the Ile de Ré, France, "every bed has its own time for spatting; thus, one division of the Ré beds may be spatting on a fine, warm day, when the sea is like glass, so that the spat cannot fail to fall, while on another portion of the island, the spat may fall on a windy day, be thus left to the tender mercy of a fiercely receding tide, and so be lost, or fall, mayhap, on inaccessible rocks a long way from shore". Mr. Winslow was also told that currents had no effect upon the spawning, yet that heavy freshets were very destructive to the "spat" in Pocomoke sound, driving it out into the bay, and large schools of fish, especially trout and taylor, devoured a good many every spring and summer. I have seen it asserted, in reference to the French and English coast, that the spatting of the oyster there does not depend on the weather at all, but it certainly does here, to a certain extent, a wet or warm spring hastening the beginning of the spawning-season, though it would not shorten its duration.

EFFECT OF TEMPERATURES UPON TIME OF SPAWNING.—The difference, too, in the time of spawning between the oysters in deep water and those in shoal, is probably due to temperature, the deep water being cold and so retarding the function. As showing how temperature affects this matter, let me say that experience on the northern coast shows, that when cold, windy days occur at spawning-time, there will probably be no emission at all; but when this weather changes and a night of warm rain is followed by a hot morning, thousands of oysters will be seen "shooting their spawn" at once. "The selection," says Winslow, "of the lower sides of the tiles and the interior of the 'boxes' may be an effort of nature to provide some protection for the young brood by, to a certain extent, inducing them to seek dark and secluded points for attachment, or the large number found in such places may be due to the inability of the various enemies of the spat to get at them when thus protected".

AGE OF SPAWNING OYSTERS.—It is pretty satisfactorily proved, that oysters begin to spawn when only one year old (or even much less, occasionally), though I found the popular impression in the northern states to be, that they must be three years of age before emitting spat. How long they continue to spawn, or whether there is any cessation before death, is not known. We are ignorant, indeed, of the age to which an oyster would live undisturbed; but old oystermen believe that it never exceeds twenty years, and that death is finally caused by a continued growth of shell, until its weight and thickness become too great for the venerable animal within to handle, whereupon he starves to death.

In Long Island sound it is considered that from the 5th to the 10th of July is the time when shells should be spread, with the design of immediately catching the spawn, which is not emitted to any extent before that date in those northern waters. The method of making these artificial beds is described in the chapters relating to that region.

SEASONAL VARIATIONS IN ABUNDANCE OF SPAWN.—But the most intelligent care is not always rewarded with a profitable catch, nor does every season bring a uniform addition of young to the natural growth on the native reefs. This variability is all the more marked in regions where oystering has been extensively pursued, and natural conditions and environment are disturbed. Nor are these variations widespread along a whole coast; they seem essentially local, confined, often, to very limited areas, indeed, and are marked by occasional seasons of extraordinary fertility, followed by total blanks or only a partial "set". Thus the last highly productive season in the Monument river, Massachusetts, was in 1874; at Pocasset, Massachusetts, 1876; in the Somerset, 1877; yet all these localities are close together. This failure may not always be a failure to spawn, but generally, perhaps, a waste and loss of all or nearly all the young, through rough weather or an unclean condition of the shores where they should have found resting places. Nevertheless, as Mr. Winslow observes, many persons of experience are of opinion, and I now concur with them in thinking, that not only the attachment of young may not be general nor occur each year, but that the emission of the products of generation may also be frequently confined to partial areas, and that by a combination of circumstances there can be a total failure of impregnation on all beds of any locality. Further, on this head, Mr. Winslow records some quotable observations, as follows, as resulting from his Chesapeake studies:

We have only been able to investigate the spatting of three seasons, and it may be found by subsequent observations, that two similar seasons of success, moderate success, or failure, will follow each other, but so far this has not been the case, and in the period of three years we have, comparatively to the other seasons, one at least of successful attachment.

I can see no reason for supposing that there is any regular recurrence of the spatting-seasons, but am inclined to believe that the success or failure is due to two causes—variations of temperature and variations of density. I have no means of ascertaining either the changes of temperature or density in the years preceding those in which I have been engaged upon this investigation, and in both seasons I arrived in the sounds too late for the temperatures or determinations of density obtained by the party to be of practical value.

Oysters will and do live in very dissimilar temperatures, and in waters of very different densities, as is shown by their existence in the waters of North America, from Nova Scotia to the Gulf, and on both the Atlantic and Pacific coasts. That the mature oyster is a hardy animal, readily adapting itself to new conditions and environment, is shown by the ease with which it is transplanted from the warm waters of the Chesapeake to the colder ones of New England; from the dense and salt waters of the ocean and bay to the brackish waters of the creeks and rivers, or *vice versa*, and from soft bottoms to hard or the reverse, but naturally this hardiness is not a quality of the immature oysters or the swimming embryos.

The influence of increased or diminished temperature upon the formation of the ova and spermatozoa, must be very serious and very considerable, and, judging by analogy, it would seem probable that the formation would be more rapid during a warm spring than during a cold one.

Whether the formation has been late or early, when once formed a sudden change of density or of temperature may so affect the oyster or the generative matter, that the latter would not be expelled, and only upon this hypothesis can be explained the retention of the products of generation noticed in so many oysters, and which is said to be so common, for none of the other conditions are subject to violent changes, such being peculiar to the density and temperature alone.

Probably the influence of changes of environment, especially of density and temperature of the water, is most severely felt by the embryos when in their free swimming state, and, in connection with the want of success of the spatting-seasons in the sounds, it is noticed that the temperature curves show a maximum change about the time when it is supposed that the young would attach in largest numbers, or about the period when they were swimming about in the water. It is also worthy of notice that Professor Brooks, about this time, met with the maximum amount of success in his efforts to artificially raise the embryos.

In consideration of the foregoing, I am of the opinion that the success or failure of any spatting-season is dependent upon the equability of the temperature, and that the higher the temperature during the spring months, the earlier the advent of the spawning-season, and that an increased temperature will also hasten the development of the spat, and of the young oysters after they have become attached. I also infer that sudden and extensive changes of density will likewise affect the advent, duration, and success of the spawning, though to a less extent.

Subsequent to the attachment of the animal, changes of the condition surrounding it are not of so much importance, though naturally such changes will more severely affect the delicate organism of the young oyster than that of the older and more hardened adult. During the first six months of its existence, the oyster is exposed to the greatest danger from the numerous enemies which surround it. The thin, delicate shells, from one-sixteenth of an inch to one inch in diameter, are readily bored by the drills or torn off by the crabs, and the immense numbers of both of these, leave no room to doubt their destructive effects. The inspection of the spat-collectors in the Big Annemessex river, shows that during the early months of their existence about 50 per cent. of the young oysters are destroyed, and future inspections of the hurdle will, I hope, give the rate of decrease in other periods of time.

Naturally, as the animal progresses, it becomes more hardy and better able to resist the attacks of enemies and changes of environment, and thus we find on the unworked beds, where the oysters are practically in a natural state, that the decrease in passing from young growth to mature oysters is about 30 per cent., or about one-third of a given number perish in passing from the first to the fourth year of their existence.

Here our information ceases, but enough has been gathered to indicate the proportion which nature has assigned as necessary between the young and the mature oysters. For every 1,000 of the latter there should be 1,500 of the former, if the number of brood-oysters necessary to maintain the fecundity of the beds is to be kept up, and though this proportion is based upon *data* which is not quite sufficient, yet, as I have said, it is all that has been afforded as yet, and may be accepted within certain limits. Certainly, whatever it should be, the number of the rising generation of the animals should never be less than that of the older, or there should always be as many young as mature on any bed. A greatly increased proportion of young to mature oysters would show either one of the two things—that the mortality in passing from youth to maturity was much greater than shown by the dredging results in the bay, or that a very large number of mature oysters had been removed by other than natural causes.

In considering these several beds, the question of food and other necessary supplies has not been considered, as it is evident that

when an oyster-bed is formed and exists naturally, all the conditions for its successful life are probably present, and any failure of an important supply would be followed by a speedy extinction of all the oysters on the bed. Such determinations of the quality and quantity of the food, character of bottom and water, and other matters, are only of interest and desirable for the purpose of comparing one locality with another. Such was not the purpose of this investigation, and consequently the determination of those points has been but incidental to the work.

Probably the fecundity of a bed is increased to a certain extent by working upon it. The dredges or other implements used open the bed and spread it, thus giving more room for development, and allowing a greater amount of food to reach the animals. The mortality is great in all thickly-populated tracts and in any closely-united community, and it is evident that the removal of any of the brood-oysters could not be effected without destroying the fecundity of the bed, did not this very removal influence the mortality among the young, so as to allow a larger number to come to maturity. But this removal of brood-oysters may become so great that the most violent exertions of nature to supply others are unequal to the demand. It must also be evident, that as soon as the number of brood-oysters is thus diminished, even to the slightest extent, the fecundity of the bed is impaired.

This impairment constantly increases, influencing, as it does, both old and young. As the number of the latter decrease, so will the number of the former, and as that number is again and again diminished, the number of young produced by them must constantly diminish. Thus the cause for the destruction of the fecundity of the bed, and the gradual extinction of the animals upon it, can be readily understood and as easily comprehended, as the fact that the fecundity and preservation of the productive powers of a bed depends upon the number of mature, spawn-bearing oysters upon it. It is not meant by this, that none but the mature oysters are capable of reproduction, as such is not the case, oysters of even six or nine months' growth having been observed by me with ripe ova and spermatozoa in them, but the main dependence must be placed upon the adults in the community, as the spawn of the young growth is not considerable when compared with that of the other class.

Without a knowledge of the number of oysters on a bed, it is impossible to say what number should be removed, and as an attainment of the knowledge of the number on the bed is almost impossible, all that can be done is to keep the proportions between the young and the mature as nearly the same as on natural beds, and this should be the aim and result of all laws having the protection of the beds in view.

DEVELOPMENT OF THE OYSTER-SHELL.—The way in which the oyster's shell is developed in the embryo, has been shown by the quotations from Dr. W. K. Brooks' paper. It is increased with the growth of the oyster during the warm months of the year, but receives few additions in winter. These are supplied by the delicately-fringed mantle which, with the gills, forms the "beard" in popular phrase. From the ruffled edge of the mantle are deposited very fine particles of carbonate of lime, till at last they form a substance as thin as silver-paper, and exceedingly fragile. To these are added, more and more, until a satisfactory thickness and hardness is secured. When oysters are growing their shells they must be handled very carefully, as the new growth of the shell will cut like broken glass; it is said, also, that a wound on the finger from an oyster-shell is often very poisonous. If this be true, it is probably owing to the minute organisms adhering to the shell, which are left in the wound and produce a local fever. These shells are to the creatures they contain what his bones are to man. They support and protect the soft parts. Like the bones in the higher animals, they are composed of two substances, the one animal, the other earthy. The animal part resembles gelatine; the earthy part is principally carbonate of lime. They contain, however, small quantities of phosphate of lime, a little potash, and soda and acid. In one hundred parts of oyster-shells there will be found—

Water	17
Animal matter	2
Carbonate of lime	75
Phosphate of lime	3
Other salts	3
	100

MATERIALS FOR THE GROWTH OF THE SHELL.—The materials for its shell, like its food, are supplied by the sea-water; and where, by reason of there being a scarcity of these ingredients in the shores of the sea, the water at any one place lacks them, or is feebly supplied, oysters will not flourish, or will produce light and easily-broken shells. Such was the case on Nantucket. "If the shell is thin, or if it is formed very slowly, the danger from enemies and accidents is greatly increased; and those oysters which are able to construct their shells with the greatest rapidity, are the ones which survive and grow up. The amount of dissolved carbonate of lime which the ocean contains is unlimited, but the amount which can reach each oyster is not very great; and if all the oysters which attach themselves were to survive, there can be no doubt that they would exhaust the available supply of lime before they failed to obtain enough organic food." It is well known to conchologists that coral reefs and limestone islands are richest in all sorts of mollusks; and one reason, no doubt, why the young oysters thrive best on the natural oyster-bed is, that the old dead shells are soon corroded, and in a few years entirely dissolved, by the sea-water, affording an abundance of new shell-material for the survivors. The vast amount of dissolved lime poured into the Gulf of Mexico by the Mississippi and other rivers, doubtless largely accounts for the abundance of mollusks, marine worms, and radiates that throng in its waters. Varying conditions will cause much difference in the shells of oysters from various localities. Naturalists at first thought these differences amounted to specific distinction, and experienced dealers can pick out oysters from different regions not only, but from different beds in the same region. Mr. Winslow notes that, in the Chesapeake, oysters found upon beds that have been much worked differ materially, being single and broader, in comparison to their length, round and with blunt bills.

“They are usually dark in color, and have a considerable amount of mud and sand on the shells. The sponges do not appear to be as abundant, and the amount of dredging on any bed may always be known by the appearance of the oysters brought up. Upon an overdredged and almost exhausted bed the oysters will be large and single, blunt-billed, with dirty shells, and an almost entire absence of sponges, barnacles, and *Crepidula* will be noticed, but the shells will be covered with *Tubicola* and bored in many places by the *boring pholad*.”

OYSTER PEARLS.—As in other mollusks, pearls are likely to be found in our common oyster, but, unfortunately, these are usually discovered in the mouth after the oyster has been cooked, and the value of the pearl thus destroyed. In the Peabody Museum at Yale College is a hollow, tear-shaped pearl taken from a common oyster at New Haven, which is a third of an inch in length. Mr. Henry C. Rowe, of the same city, showed me several large, round pearls, and told me he had had a hundred or so in the course of his life. As a rule, however, they have little market value.

OYSTER-BEDS.—Inasmuch as oysters can only exist under certain conditions, to be found only in restricted areas of sea-bottom, it is naturally to be expected that they will be found in colonies having a boundary defined with more or less exactitude. These restricted localities, because of their usual shape and appearance, are called “beds” and “banks” in the northern states, and “bars” or “rocks” in the southern, while in the Gulf of Mexico you hear only of “oyster-reefs”. Although in waters so populous with this mollusk as Chesapeake bay, a floating plank or bush will be found covered with small oysters in almost any part of the bay, it would be far from the truth to conclude that even in that most favored region the bottom was paved with the bivalves. On the contrary, the beds there, as elsewhere, are so well marked that they can be laid down on a chart or staked out with buoys; and even in the best oyster-regions they occupy such an inconsiderable part of the bottom that any one ignorant of their position would have very little chance of finding oysters by promiscuous dredging. At the same time, it is not always apparent why an oyster bank should occur where it is found, rather than at some other place; or why many areas, seemingly highly suitable, are not furnished with them. In the beginning, the character of the bottom has the greatest influence of all upon the location of a bed, undoubtedly, for a young oyster will not live except in certain suitable situations. Accident having fixed an oyster in a certain spot, however, and good fortune granted him safe growth, the growth of a bed there follows speedily, and with widening area augments in strength, until nearly beyond the reach of natural destructive agencies. The living and dead shells of the adult oysters furnish the best surfaces for the attachment of the young, and for this reason the points where oyster-beds are already established, are those where the young have the most favorable surroundings and the best chance for life, and the beds thus tend to remain permanent and of substantially the same size and shape. An idea of their extent, under favorable circumstances, may be had from the report to the Coast Survey, that in Tangier sound, Maryland, alone, there are 28 beds, whose united area is 17,976 square nautical miles, with twice as much additional bottom where oysters are occasionally caught.

EFFECT OF SEDIMENTARY DEPOSITS UPON THE BEDS.—The welfare of the beds is interfered with, seemingly, by few natural influences outside of living enemies. Mr. Winslow investigated the question of sedimentary deposits upon the beds of a portion of the Chesapeake, and reports in respect to Tangier sound as follows:

Those beds lying in deep water are particularly free from an undue proportion of mud on the bottom, the shoalest beds having the thickest mud-covering. If there was a constant and increasing deposit upon the beds, they would long ago have disappeared, or at least have become of much smaller area, but the reverse is the case, the beds increasing in area constantly.

They are, however, exposed to one species of deposit which is very injurious. Heavy gales occurring in winter and summer frequently tear up the large quantities of grass, sea-weed, and sponge on the sand shoals about the sound and deposit it upon the beds. If this occurs in summer, when there are a smaller number of dredgers at work, the effect is very injurious, the “cultch” being covered, and the young, if spawned, smothered by the grass, weeds, sand, and mud which it collects. The California rock, Piney Island bar, and Manokin beds are those most subject to this evil. The gales also have the effect of covering the scattered oysters on the leeward sands, which process is called “sanding”, and, from what I could learn, appears to be a very injurious one. The oysters are buried, and the bottom becomes smooth and hard. Where at least thirty bushels of oysters could be taken previous to a gale, not one oyster could be found subsequent to it. The winter gales have the greatest effect, owing probably to their greater severity and direction, which is from the northward and westward. The “sand” oysters are found in largest numbers on the eastern shores of the sound, and about Kedge’s and Hooper’s straits, consequently they would feel a northwesterly gale much more than one from the opposite direction. They are said not to recover from the “sanding” for several months, and upon their reappearance are noticeable on account of the whiteness of their shells.

In respect to Pocomoke sound, more harm was disclosed:

The fact that on nearly all the beds, and especially those in the vicinity of the creeks and rivers and in the upper part of the sound, there is a light covering of mud more or less thick over the oysters, would lead to an inference that there must be a deposit of that character going on. On most of the beds the substratum of the bottom was hard, and the thickness of the surface covering gradually decreased as the entrance to the sound was approached. * * * The Pocomoke river, draining an extensive tract of the peninsula, would bring down a large amount of sediment, which the strong ebb-current would carry directly over the beds in the upper part of the sound. The amount in any given period of time would be difficult to ascertain, but the character will be shown to some extent by an examination of the specimens of bottom. Whether the amount of matter deposited is sufficient in quantity to seriously affect the beds is a matter of conjecture. I should judge that it was not, and my opinion coincides with that of all the oystermen I was able to interrogate.

That it must have some effect cannot be doubted, and the evident deterioration of the beds in Pocomoke sound may be accounted for, to some extent, by the supposition that the effect is injurious; but so many other and more direct causes exist for the deterioration, that it is difficult to eliminate their influence. The fact that the beds have existed and have been worked since the first settlement of the country, would lead to an inference that the effect, if prejudicial, was very slightly so.

The scattered oysters lying on the sands and those beds in the vicinity of sand-shoals and in shallow water, the Muddy marsh and Beach island rocks particularly, are exposed to damage by "sanding" in a manner similar to certain beds in Tangier sound, and which has already been described. The large amount of grass, sponge, and sea-weed growing on the sand-shoals, especially the one to the east of Herne island and south of the Guilford channel, is frequently torn up by the heavy gales and deposited on the beds with the same injurious effect that it had in Tangier sound. Heavy southerly gales will sometimes cover the beds above the Buoy spit and Shell rocks with mud for a short time, but not sufficiently long, it is said, to affect the oysters seriously.

EFFECTS OF ICE ON THE BEDS.—This account is typical of what might be said of oyster-beds in general along the whole coast. About the only other injurious agency is that of ice. In the Chesapeake heavy winter gales from the northward have the effect of diminishing the depth of water by piling up any floating ice upon the leeward shores and cutting away parts of the shores. Few beds are exposed, however, by the lowest of these tides, and it is rare that ice grounds, doing damage at these times only to a small extent, unless it remains for a long time in contact with the beds. In respect to this, Winslow has some interesting remarks:

If it [the ice] only touches in a few places, not much harm is done; indeed, it is supposed to protect the majority on the bed by covering them, but where there is a contact all over the "rock", the oysters are killed in a short space of time. * * *

The winter gales break up the ice-fields and pile them up in immense masses on the leeward shores and over the adjacent beds. The Shark's Fin bed suffers particularly in this respect. A good deal of damage is done to the shores by the ice, and the oysters feel the effect, showing it by becoming what is called "winter killed", or poor and weak, having a slimy, sickly appearance when opened. Many die on the beds from this cause, and after the disappearance of the ice, ten days or two weeks must elapse before they are fit for marketable purposes. Ordinary cold weather and a moderate amount of ice is said to improve the fishing, the oysters appearing to be drawn more to the surface of the bed and the shells to sink more toward the bottom. My informants said this effect was quite noticeable. No one that I was able to interrogate had ever seen an oyster frozen *in the water*, and the impression was, that so long as the oysters were covered they would recover from any ill effects of ice or ordinary cold weather.

In northern waters, such as Long Island sound and Narraganset bay, the oysters seem much more hardy in the endurance of cold than those of the Chesapeake. This would naturally be expected. Nevertheless, drifting ice often plows up the beds, both natural and artificial, to a ruinous extent in exposed situations, or, resting upon, freezes great areas of loose, single oysters into its under surface, and then, on a rising tide and before a brisk wind or strong current, moves off, bearing thousands of bushels away to scatter them over new ground, or hold them until they perish. This sort of action is an agency to be remembered in studying the geographical distribution of oyster-beds, since the mollusks will survive a long journey of this kind, and, finally, by the grounding or thawing of the floe, may be dropped all together in some favorable spot at a long distance from any other colony. The existence of such an isolated bed might easily be used as an argument, to show the great distance to which spawn travels, when, in fact, the colony owed its origin to nothing of the kind, but to having its progenitors carried there, as adults, by floating ice.

The question of the influence which ice has upon the existence of oysters as a race, in a certain region, becomes of great moment, when the locality is as nearly arctic as the gulf of St. Lawrence. I asked many questions on this point when at Prince Edward island, and also as to the effect of low temperature generally on the mollusks of that coast.

TEMPERATURE OBSERVATIONS.—The only observations on temperature that I could learn of having been made in the gulf of St. Lawrence were in 1872, by Prof. J. F. Whiteaves, of Montreal, who recorded them in an article in volume VI of the *Canadian Naturalist*.^{*} After describing the character of the bottom, this writer goes on to say:

Attempts were made to endeavor to ascertain the approximate temperature of the deep-sea mud. When the dredge was hauled up, its contents were emptied as quickly as possible into a large shallow tub, and this was covered with a tarpaulin and placed in the shade. An ordinary thermometer, with a metal case and perforated base, was then plunged into the mud, and the whole was kept carefully shaded for a time. With one exception the temperature of the mud was found to be from 37° to 38° Fahr., and this not alone in deep water; for sand brought up from 25 fathoms on the north shore of the St. Lawrence also made the mercury sink to 35° or 37° Fahr.

Again, the same author writes:

In the deepest parts of the river, on the south shore, between Anticosti and part of the Gaspé peninsula, the thermometer registered a few degrees higher. Sand dredged on the north shore in 25 fathoms also made the mercury sink to 35° or 37°.

Elsewhere he mentions that off Port Hood, Cape Breton, the temperature of the bottom ranged from 40° to 42° Fahr.; but adds, that not a trace of oysters are found living on that part of the coast. These are summer records.

Such notes were unsatisfactory, since they referred to an area outside of the oyster's range, and I therefore essayed to learn something of the temperature of the water upon the beds themselves—but I had no better means than an ordinary thermometer, which I believed to be not far from true—at various points where it was possible. It will be seen by the record of these observations below, that the temperature is higher than would naturally be suspected on a coast where the Gulf Stream is the other side of a polar current, that brings hosts of icebergs to the northern shores of Prince Edward and Cape Breton, and fills Northumberland sound with immense flows of dense,

* WHITEAVES, J. F. Notes on a deep-sea dredging expedition round the island of Anticosti, in the gulf of St. Lawrence. *Canadian Naturalist*, VI (new series), pp. 86-100.

blue arctic ice. The observations were made at various hours of the day, sometimes in sunshine, sometimes under a cloud, and at different stages of the tide. They are only to be taken as a mere indication of the general warmth of the water on the surface of the beds in that region, in the autumn. It is worth mention that the fishermen thought the water now about midway between its greatest cold and greatest warmth; but I can hardly believe this true.

Table of temperatures (Fahrenheit).

	Degrees.
September 18, 1879, Shediac: Temperature of surface water; ebb tide	61
18 Temperature of air; ebb tide	58
19 Temperature of air (raining)	54
19 Temperature of shore water; low tide.....	55
19 Temperature of surface, $\frac{1}{2}$ mile out in the bay	56
19 Temperature of bottom, on oyster bed, 12 observations	58
19, Point du Chêne wharf: Bottom water, 2 fathoms	57
20, Summerside, Prince Edward island: Bottom water, 2 fathoms, ebb tide, 10 a. m	52 $\frac{1}{2}$
20 Bottom water, 2 fathoms, incoming tide, 10 a. m	55
20 Bottom water, 2 fathoms, high tide, 4 p. m.....	59
20 Bottom water, 2 fathoms, tide going out, 5 p. m., and deeper water.....	58
21 Bottom water, dead low tide, air chilly	56
22, Richmond bay: Bottom water on bed, 4 p. m., ebbing tide.....	58

However, I had no opportunity to learn the minimum temperature which these oysters would survive. It would not be safe to say that the sole reason why oysters did not grow off Port Hood, for instance, was that the bottom water was as cold as 40° or 42° Fahr. There are probably various other reasons. I was told by fishermen on the island, and at Shediac, that they did not think the water could be too cold, short of actual freezing. They were united in the opinion, however, that ice had been the direct cause of the extinction of many of the beds. As I have said in my chapter descriptive of that district, however, I am sure that ice, or nature at large, has had less to do with this misfortune than the heedless greed of the oystermen themselves.

FOOD OF THE OYSTER.—The question of proper and sufficient food is also one of great importance, in considering the question of oyster-growth, whether in natural or artificial beds. The anatomical arrangement of the oyster's mouth and stomach, have already been explained, and the general character of his microscopic, floating food alluded to. Some further details in respect to this may be of importance. In a paper published in the report to the British government on oyster-culture in Ireland, in 1870, Prof. W. K. Sullivan, of Dublin, remarked, that independently of the mechanical constitution of the shore and littoral sea-bottom, *i. e.*, deposition of sediment, the currents, the temperature, etc., the nature of the soil produces a marked influence upon the food of the plants and sedentary animals that inhabit the locality, as well as upon the association of species. Especially is it the case with oysters, that the soil exerts so much influence on the shape, size, color, brittleness of shell, and flavor of the meat, that an experienced person can tell with great certainty where any particular specimen was grown. "Were we able to determine the specific qualities of the soil which produce those differences in the qualities of oysters, it would be an important step in their cultivation. Again, soils favorable for the reproduction of the oyster are not always equally favorable for their subsequent development; and, again, there are many places where oysters thrive but where they cannot breed. This problem of the specific influence of the soil is, however, a very difficult and complicated one. First, because it is almost impossible to separate the specific action of the soil from those of the other causes enumerated; and next, because, though much has been written on the subject of oysters, I do not know of any systematic series of experiments carried out upon different soils, and for a sufficient length of time, to enable accidental causes to be eliminated, which could afford a clue to the determination of the relative importance of the action of the several causes above enumerated, at the different stages of development of the oyster. * * * I believe the character and abundance of *Diatomacea* and *Rhizopoda*, and other microscopic animals, in oyster-grounds, is of primary importance in connection with oyster cultivation. The green color of the Colchester and Marennes oyster shows how much the quality may be affected by such organisms. It is probable that the action or influence of the soil of oyster-grounds upon the oyster, at the various stages of its growth, depends mainly upon the nature and comparative abundance of the *Diatomacea*, *Rhizopoda*, *Infusoria*, and other microscopical organisms which inhabit the ground. I have accordingly always noted where the mud appeared to be rich in *Diatomacea*, *Foraminifera*, and other microscopic organisms. A thorough study of a few differently-situated oyster-grounds, exhibiting well-marked differences in the character of the oyster from this point of view, by a competent microscopist, acquainted with the classes of plants and animals just mentioned, would be of great scientific interest and practical importance."

Of all the edible matter afloat in the water where the oyster lives, probably none is of greater importance to this and other mollusks than the *Diatoms*—microscopic forms of aquatic plants which, in almost infinite variety, swarm in both salt and fresh water, in the pond and ditch, in river and estuary, and throughout the open ocean. The distinguishing feature of the *Diatoms* is their indestructible skeleton of flint, in the shape of a pair of

transparent glassy plates united at their edges. When the plant dies and the soft parts decay, this flinty skeleton falls to the bottom, but is not destroyed. Century after century they accumulate and form immense beds, contributing myriads of skeletons to the rocky mass.

THE GREEN OYSTERS OF EUROPE.—The *Diatoms* are brown, when they possess any color at all. It is not due to them, therefore, but to eating the chlorophyll-tinted spores or the whole plants of other species, that the “greening” of oysters, or the “green-gill”, is due. This has frequently been ascribed to some metallic absorption, which rendered the oyster unfit to eat. I am, therefore, glad to be able to quote Professor Sullivan again on this point. He says:

As the green color of the mantle of oysters from certain localities just referred to is commonly attributed to copper, and as such oysters are consequently believed very generally to be poisonous, and their value therefore greatly depreciated, I made the most careful search for traces of that metal in the muds which I had received from grounds known to produce green-bearded oysters. Oysters and other mollusca placed in solutions containing copper and other metals absorb them, and retain them in their tissues. I have had two or three opportunities of examining oysters which had assimilated copper owing to mine-water containing it being allowed to flow into estuaries at places close to oyster-beds. In every case the copper was found in the body only of the oyster, which it colored bluish green, and not in the mantle or beard, *which was not green*. In the green-bearded oysters which I have had an opportunity of examining, the body was not green, and no trace of copper could be detected in any part of the animal. The color, too, was not the same as that of the true copper oysters, but rather that which would result from the deposition of chlorophyll or other similar chloroid vegetable body in the cells.

In the oysters at Arcachon, France, a violet tint has been observed, sometimes, which is due to a similar cause, although referred to the iodine and bromine of sea-water. Certain reddish algae were found, when washed in fresh water, to impart to this a brilliant violet tint; and by careful observation it was ascertained that even the spores of these plants, which constitute a not inconsiderable portion of the nutriment, were similarly colored. In ordinary seasons, the dilution of the salt water by the rains in the Arcachon basin is sufficient to wash out the color of the spores of the algae, but when the brine is strongly concentrated, there is no such appearance about the gills of the oyster as has been described.

RATE OF GROWTH IN OYSTERS.—It is, of course, largely upon their supply of food and of lime that their growth depends. This growth, however, is very variable, depending on the season, and in some years the increase is very slight. In general, transplanting young oysters in water similar to that in which they were born, causes them to grow more rapidly; but if they are carried into different temperature and other strange conditions, they will grow slowly. Thus in New York bay, the East river, and Newark bay “seed” far outgrows that brought from Virginia. In the Chesapeake, no doubt, the reverse would be true. But the conditions affecting growth may vary greatly within the same district. At Bird island, in Boston harbor, for instance, bedded oysters grow but very little, while those on the muddy shores of Winthrop, in fresher water, add a great length to their shells, but improve very little in flesh, making them very profitable to sell by the barrel, but not to open.

EFFECT OF WEATHER.—The weather affects their health somewhat. When heavy winds blow in from the sea, making high tides and cold, salt water, the oysters shut their shells and will not feed, but during off-shore winds they fill up well. Though a hard winter leaves oysters in a weak condition, the losses on the beds by death are greatest when the weather is changeable and high winds are frequent.

A Baltimore correspondent writes:

Thunder sours milk and kills oysters. You may load a vessel to its utmost capacity, start for market, and one good round clap of thunder will kill every oyster in the vessel immediately. Pounding with an ax upon the deck of a vessel, when oysters are thereon, or pounding upon the side of a vessel with a heavy weight, will kill every oyster that feels the jar.

I am not sure of the precise truth of this last assertion; but I know, that on the Massachusetts oyster-schooners no wood-chopping is allowed, and I have heard it argued that steamers could never be used in transporting Virginia oysters northward to the planting-beds, because of the jar of the machinery. How sensitive oysters are to feeling, appears from the fact, that they almost invariably close, the instant a boat comes near the bed. It has been said that they see the shadow; but to dispose of this, it is simply necessary to remind the reader that oysters have no eyes. It is by perceiving the jar in the water that they are apprised of the approach of some body, and, acting on instinctive presumption that it is an enemy, they drop their visors.

DESCRIPTION OF THE FLORIDA BAYS AND REEFS.—On the other hand, how oysters contribute to the advancement of the world of humanity, apart from the nourishment which men and various animals derive from their juicy bodies, is well illustrated on the western coast of Florida and elsewhere in the Gulf of Mexico. The extent to which organic, living agents are adding to the coast-line of this portion of the United States is remarkable, the more so as we hardly expect results so large and substantial from any means short of volcanic or geologic methods.

All along the western or gulf coast of Florida, particularly at its southern end, are great numbers of bars of oysters, worthless (in their natural growth) for civilized humanity, but beloved of the raccoons, which nightly come to eat them, and hence called “coon-oysters”. Many of these reefs go bare at low tide, and you may walk about on them. They consist of nothing but masses of oysters so crowded and compact, that a solid and level surface (seamed by frequent shallow channels and spaces a few inches wide) covers over the whole reef, which may be

several hundred yards long and forty or fifty yards in breadth. You may count up the number of individual oysters, when I tell you that a square foot will often contain a hundred.

When the reef has attained such a height that its crest is exposed to the air at low tide longer than it is visited by the water of the high tide, the oysters will cease to grow there, while still flourishing around the edges. The dead shells, growing brittle, are soon broken to pieces by the waves, and finally reduced to such small fragments, that they are like a shingle beach, or even like sand. Such a reef also, opposing the flow of the currents, furnishes lodgment to all sorts of drifting sea-wrack, receives a growth of the algae and grasses which frequent such half-submerged levels, and is all the time built up at the top by the washing upon it of fragments broken from its edges. It is not long, therefore, before a sort of shelly soil is formed, and some floating mangrove stem or seed takes root there, and manages to get so firm a foothold that the storms do not tear it away.

THE OYSTER AS A REEF-BUILDER.—This done, the far-reaching and tangled roots of the bush form an eddy which deposits sand and floating stuff, until more mangroves have room to root themselves, and the bar ceases to be a "reef"; it has become a "mangrove key". Now, the mangrove (of which there are several kinds) is a very curious tree. It has a low, branching stem, and is thus pretty much all head; you cannot see anything as you approach but a compact mass of brightly green, thick, shining leaves, trailing to the ground. A nearer view discloses another very curious feature. From the main trunk, near the ground, extend out on all sides, and at varying height, some branches which do not go upward and bear leaves, but turn downward, enter the ground, and become roots. There are dozens of these stays surrounding every stem, and holding it, like so many cables, against the fury of the storms which sometimes hurl both wind and waves against the groves. But this is not all. Every low branch produces a considerable number of thick, leafless, straight twigs, which elongate straight downward through air and water, until they penetrate the soil and become rooted. The mangrove is not only braced upon a score of roots, therefore, but anchored from every one of its lower and larger arms. A perfect tangle and net-work of these roots and rooted stems thus surround each tree and every islet with an abatis often several rods in width.

Such a network speedily verifies its likeness to a basket by catching outside matter. Along the solid edges of the key itself, and everywhere in the neighborhood, are living oysters which annually send forth a cloud of young to seek new quarters. The mangrove stems afford capital resting-places, and speedily become encased in oysters which increase in size and number very rapidly. This suspended kind is known as the "mangrove oyster"; but I do not see that they are anything but progeny of the coon bars. Barnacles, too, in vast numbers, muscles, bryozoa, and many forms of minute water-animals cling to these half-submerged branches or flourish under their shelter, where the hard sand and the bare angles of oyster-rock are being buried under a coating of mud and decayed vegetation, which the basket-work of mangrove roots and salt-grass has caught and confined.

An especially noteworthy member of such a colony is a marine worm of small size, which forms about itself a tubular, twisted case of lime very like that of the *serpula*. Along certain portions of the coast, south of Tampa bay, these worms are extremely numerous; and they build up their cases so closely together that they join one another, and so cover the foundation upon which they grow with limy tubes somewhat larger than a darning-needle, the partially coiled bases of which are in unison, but the enpurpled mouths a fraction of an inch apart from one another, forming a solid mass of lime with a bristling (and, at high tide, very animated and beautiful) surface. Without being sure that I am right, I suspect that these worms survive only a single year, and then dying, leave their indestructible cases to serve as the foundation upon which their progeny may rear their tier of tubes. Thus, by the additions of successive generations (as in the case of the coral-growth, only through a different history), this worm-structure increases into an extensive mass of heavy rock. I have seen pieces many yards square and two feet or more thick. Growing irregularly, its crannies afford a haunt for many species of mollusks and crustaceans that like to hide away in holes; and its mass is further enlarged by the growth of bunches of oysters and the filling of all its interstices with sand and broken shells, which become solidified along with the worm-tubes by the production of a native cement. Thus millions of tons of solid limestone, most useful for building purposes, is every decade added to the Floridian coast by despised worms.

Attracted by the excellence of the hiding-places offered, and by the abundance of "small deer" lurking there, come to the mangrove roots many predatory sorts of aquatic animals in search of food—conchs, whelks, boring sea-snails, crabs of several species, and mollusk-eating fish, like the sheep's-head. Where there is teeming life, death is frequent, and thousands of empty shells and fleshless skeletons sink into the animated ooze, and rapidly fill it up, until the water no longer covers it, except at the highest tide, and then leaves an important toll of drift-wood, and the adventurous water-loving mangroves must push their roots farther and farther into the sea.

Meanwhile a similar process has been raising the center of the island. Decay of grass and salt weeds, and mangroves and drifted wood finally brings a surface permanently above the water. Huge flocks of water-birds daily alight upon it to rest and feed, and their droppings increase and enrich the soil. Various seeds are wafted or floated from the mainland and build up its stock of vegetation; various land animals, chiefly reptilian, make the new key their home. They die and are buried there. The simple mangrove swamp is succeeded by an intermixture of oak, pine, and palmetto, and their rotting logs gradually make a wide extent of solid ground. Discovering this, Indians get into the habit of landing there to open and feast upon oysters, clams, and conchs, and from the *debris*

of these feasts accumulate mounds or ridges hundreds of yards long and perhaps forty feet high. When the white man comes along, he discovers the largest trees and most luxuriant undergrowth upon these mounds of shells. Recognizing the excellence of the soil, it is there he places his house and plants his farm. The old oyster bar is an island with a name on the maps.

Now, the formation of keys just in this way has long been going on, and clusters of them abound all the way from Apalachicola to Key West. A group of islands, near such a coast as Florida's, acts like the interlacing roots of a single mangrove key; the currents are stopped, tides slackened, shell-débris, drifted matter, and sand deposited, and great shoals, mud-flats, and sand-bars result. Given such an archipelagic condition, a straight sand-bar, or outer beach, is a natural result, and this, once it is formed, contributes still more to the shoaling of the channels inside, until they eventually become largely obliterated, and many of the islands join together and finally unite with the mainland.

But, as I have said, this is wholly the work of animal life. Not until the oysters and their neighbors have really formed a "key", do the mangroves, with their train of aids, take up the work; and not until this has long proceeded does the drifting of sediment down the rivers, or the washing up of bottom-sand by the outer waves, increase the bulk of the islands that soon add their well-prepared areas to the general coast.

V. FATALITIES TO WHICH THE OYSTER IS SUBJECT.

61. LIVING ENEMIES OF THE OYSTER.

THE STARFISH.—No creatures are so dangerous enemies of oysters, either in their wild state or when transplanted, as the members of the spiny-skinned tribe which naturalists term *Echinoderms*. This tribe contains many members, but the one that concerns us as oyster-growers is the starfish.

The starfish passes under various names among fishermen and oystermen. In England he is known most frequently as the "crossfish", "sun-star", and "sea-star". In this country the name most often heard, is "five-fingers" north of Cape Cod, and southward of there "starfish", "sea-star", or simply "star", to which it is abbreviated in the vicinity of New York.

None of these names, however, distinguish between the various species, except in the case of the "basket-fish" of Massachusetts bay, which is sufficiently different from the ordinary five-fingers to attract everybody's attention; and the smaller varieties are often mistaken for the young of a larger sort. While this is unfortunate ignorance, it practically does not matter to the oysterman, since all the different members of the family are alike enemies, to the full extent of their individual powers and opportunities.

The common name of the animal well describes its general form. "As there are stars in the sky so are there stars in the sea," remarked old John Henry Link, a century and more ago. From a central disk of small dimensions radiate five pointed arms, composed of a tough substance unlike anything else that I remember anywhere in the animal kingdom. "When it is warm in one's hand," wrote Josselyn, that quaintest of America's advertisers, in his *New England's Rarities*, 16, "you may perceive a stiff motion, turning down one point and thrusting up another." This was all right, but he adopted an error when he added: "It is taken to be poisonous."

Examining the starfish more closely, you perceive that it has an upper and a lower side, essentially different. The upper side, or back, presents a rough surface of a greenish, brownish, or reddish-green hue, which, when it is dried, turns to a yellowish-brown. This is the leathery membrane covering the skeleton of the animal, which consists of small limestone plates united together at their edges by a sort of cartilage, so that they can move in a slight degree. This forms the frame-work of the arm, and acts as a chain-armor to encircle and protect all the soft parts within. Underneath, on the lower side of the starfish, this frame-work terminates in two series of larger plates, which are braced against one another like rafters, and sustain the whole structure by a sort of arch. This armor is sufficiently flexible to allow the starfish to bend himself clumsily over or around anything he is likely to wish to climb upon or grasp.

Scattered everywhere upon the upper side are a large number of blunt, short spines, which seem to have no special arrangement, and are longest and thickest at the edges of the rays, and upon the plates bordering the lower side of each ray. Each one of these spines swells at its base, where are fixed, in a wreath, several curious little appendages called *pedicellaria*, whose odd forms and movements can only be understood underneath a powerful microscope, on account of their diminutive size. They consist of a little pedicel which waves about, bearing upon its top a pair of (for it) huge toothed jaws, like the claw of a lobster, which waves about in a very threatening manner. Now and then it happens that some little particle of food or sea-weed will accidentally get caught by these valiant guardsmen of the spine, that towers up in their midst; but this to annoy rather than gratify them, and their functions are not yet explained. They occur in some form or other in all echinoderms, yet seem to contribute no service whatever to the animal. Outside of them, forming a second circle about each spine, is a set of water-tubes, whose functions will be explained presently. Near the center of the disk, on the back, notice the *madreporic body*, a small, smooth protuberance, filled with openings, like a sprinkler, and then turn the starfish over,

Though so tough and tuberculous above, on the under side it is soft and almost white in tint, except where the strong spines along the edges of each ray protect the soft parts between. In the very center of the disk is the opening of the mouth. It contains no teeth, but is surrounded by an elastic tube and guarded by the hard edges of the skeleton-plates which hem it in. From this center run five furrows, one down each of the arms.

Throughout all this branch of the *Radiates*, observes Professor Forbes, the reigning number is five. "Among the problems proposed by that true-spirited but eccentric philosopher, Sir Thomas Browne, is one, 'Why, among sea-stars, nature chiefly delighteth in five points?' and in his *Garden of Cyrus* he observes: 'By the same number (five) doth nature divide the circle of the sea-star, and in that order and number disposeth those elegant semicircles or dental sockets and eggs in the sea hedge-hog'. Among the lower and the typical orders we find this number regulating the number of parts. Every plate of the sea-urchin is built up of pentagonal particles. The skeletons of the digestive, the aquiferous, and tegumentary systems, equally present the quinary arrangement; and even the cartilaginous frame-work of the disk of every sucker is regulated by this mystic number."

But this is a digression. To return: Each furrow is filled, with the exception of a narrow path down the middle, with small fleshy tubes, terminating in a disk, which are so evidently its means of locomotion, that you at once call them *feet*. This is true enough so far as their function is concerned, for Five-fingered Jack certainly does walk by means of them; but entirely wrong anatomically. No *Radiate* has "feet" properly speaking. In order to see how the little beast makes use of these hundreds of walking appendages we must dissect him. Having done this, it appears, that through the sieve-like surface of the madreporic body, on the back of the disk, enters a constant current of pure sea-water. This is received into a system of circular canals, which branch out, on each side of every ray, and send out through minute openings in the broad plates on the lower side of the arm's fibers, which, when swelled full of water, appear as the rows of feet-tubes already mentioned. These feet-tubes are called *ambulacræ*, the grooves along each side of the arm, where they spring and where they are supplied with water from the main canal underneath, the *ambulacral grooves*, while the plates themselves, and the whole concave under-surface between the spiny processes bordering the rays, form the *ambulacral tract*.

Now, the starfish's body is always full of water; beside the large stream flowing in through the madreporic body, a constant inflow seems to take place by absorption through the thousand minute water-tubes that wreath about each spine, notwithstanding no microscope has yet been able to detect any opening in them. This insures that the *ambulacræ* shall always be full of water; but the creature can control these, and when he wishes to take a step forward he places one, a dozen, or a score of these feet-tubes a little forward, and draws a slight amount of water from each, which causes a contraction of their sucker-disks, and gives them a firm hold. By a reverse process he lets go with his other feet, and by main strength drags his body up as far as he can. This operation frequently repeated would give a continuous movement to his body which is not ungraceful, as he dips down into a hollow or bends himself slowly over some obstacle. His movements are very deliberate, and he moves hardly as fast as the second-hand of a watch. It is to the fullness of this water-system that the animal owes its plump appearance. Take him out of the sea and the water will pour out all over him, in a fierce perspiration, which soon leaves him flat and thin on your palm. I may as well say here, that any one can handle them without fear; the old idea that they were poisonous was a worthless superstition.

In addition to this water-system, for locomotion, starfishes have a heart and system of blood-vessels. This consists of two circular vessels, one round the intestine, and one round the gullet, or heart, intervening between them. "There are no distinct respiratory organs, but the surfaces of the viscera are abundantly supplied with cilia, and doubtless subserve respiration; the sea-water being freely admitted into the general body-cavity by means of numerous contractile ciliated tubes, which project from the dorsal surface of the body." (Nicholson.) There is a nervous system, also, in this apparently immovable and insensible denizen of the deep. A gangliated cord surrounds the mouth and sends filaments out along the center of each arm, to the little red speck discernible at the tip, which is the eye. How much they can see with these eye-specks is doubtful; but there seems no doubt that they can perceive obstructions in their path, for they begin to get ready to mount them before actually striking against them.

The mouth, as I have said, is a mere circular opening, without teeth. The stomach is reached through a short gullet, and of itself is not large, so that it is difficult to understand how the tremendous gluttony for which this fellow is famous can be accommodated; until we have cut him open, and find that, as a part of the stomach, there extend loose yellow pouches far into each arm, which nearly fill up much of the interior of the rays. When no great meal is to be eaten these pouches or *cæca* are not brought into use, but when occasion arises they can contain a surprising quantity. On the floor of each arm, which we have cut open, is seen the ambulacral ridge, upon either side of which are the vesicles that supply the foot tentacles, which may be filled or emptied at the pleasure of their owner. Above these, occupying the most of the interior space toward the end of the ray, and also appressed between the *cæca* and the upper surface toward the center, are the berry-like clusters or racemose masses of the generative organs.

Few persons, probably, suspect that in so low a grade of beings the sexes are divided, yet this appears to be the case in the starfishes. According to Prof. Alexander Agassiz, the males and females of our common species

of starfish can readily be distinguished by their difference in coloring; all those having a bluish tint being invariably females, while a reddish or reddish-brown color indicates a male. "When cut open, so as to expose the genital organs, the difference between the males and females is still more striking. The long grape-like clusters of reproductive organs, extending from the angle of the arms, on both sides of the ambulacral system, to the extremity of the rays, present very marked differences in the two sexes. The ovaries are bright orange, while the spermaries are of a dull cream color. At the time of spawning * * * the genital organs are distended to the utmost, filling completely the whole cavity of the ray; the abactinal system [*i. e.*, the sides and back of the rays] being greatly expanded by the extraordinary development of these organs."

The two species common on the New England coast are *Asterias arenicola* and *Asterias vulgaris*, and, though much alike otherwise, they have different times of spawning, the former (Massachusetts bay to Florida) throwing out its eggs a fortnight or more earlier in the summer than the latter, whose range is more northerly and hence in colder waters. Their period of spawning, also, is very short, comprising only three or four days. The eggs produced by the females, as well as the spermatozoa sent out by the males, find exit from the body through five very small holes in a series of large plates on the back at the angles of the arms. Such eggs as are fortunate enough to meet with spermatozoa in the water, before being overtaken by some form of destruction, are fertilized, and immediately begin a very curious series of changes in embryonic growth, which have been fully described by Alexander Agassiz. This embryolog is like that of no other group of animals, but may be roughly compared to the transformations of a butterfly in the chrysalis. The larva which hatches from the starfish's egg is entirely unlike its parent, in form or structure, being an oddly shaped, ragged, transparent little creature, permeated through and through by water-tubes. This larva, when perfected, is called a brachiolaria, and swims around for several days by means of vibrating cilia, which keep it whirling and bobbing about, not choosing its course, nevertheless, by an exertion of its will, but a prey to all the chance breezes and currents that can get it in their power.

These larvæ, says Mr. Agassiz, are to be found floating in large numbers at night, though never by day, near the surface among cast-off skins of barnacles, which furnish them with food during the time when they swim freely about, in company with multitudes of small crustacea, annelids and hydroids. At such a time they are fit food for shellfish, and no doubt many fall into those treacherous small currents that lead into an oyster's, clam's, or mussel's mouth. This helps to even up the account which the adult starfishes are making, in their daily onslaughts upon the mollusks.

The jaunty, free career of the brachiolaria, however, is soon over. Changes, begun before they were understood, now begin to alarm him. He is losing his shape and assuming a strangely symmetrical, five-armed form, covered with soft spines and tentacles. Before he knows it, and without the loss of a single portion, the brachiolaria, by absorption, has lost himself in the body of a true young starfish, and finds himself slowly acquiring the stiff armor and dignified mien which marks his approach to an adult condition. He ceases his gay wanderings and sinks to the bottom, or crawls upon the frond of some floating sea weed. This occurs when he is about three weeks old. But now that he is no longer an embryo, but a real baby starfish, his growth is very slow. Mr. Agassiz says that by arranging the starfishes, big and little, found upon our rocks into series according to size, we may roughly estimate the number of years required by them to attain their full development; this he presumes to be about fourteen years. During the earlier years the growth is more rapid, of course, than later. One young specimen, kept in an aquarium at the Cambridge museum, doubled its diameter in five months. That they begin to spawn when six or seven years old, or hardly half-grown, is ascertained; but as to how long they may live after that, provided the dangers of the sea are escaped, we have no information that I am aware of.

The size to which they attain varies in different species. The rare British *Uraster glacialis*, Ag., has been seen 33 inches in diameter, and some even larger than this have been reported from near Eastport, Maine, where echinoderms abound in greater number, perhaps, than anywhere else on our coast. South of Cape Cod, however, it is rare to see one measuring more than ten inches across, and the great majority do not exceed six.

The destructiveness of these creatures has long been recognized by naturalists and fishermen alike. In Bishop Sprat's *History of the Royal Society* of London, we are told that many years ago the Admiralty Court of England laid penalties on those engaged in the oyster-fishery "who do not tread under their feet, or throw upon the shore, a fish which they call *five-finger*, resembling a spur-rowel, because that fish gets into the oysters when they gap and sucks them out". Numerous accounts might be given of instances when great damage had been done the shellfisheries, particularly along the Welsh and Cornish coasts, by starfishes, in a very short time. Oysters, not only, but clams and scallops of every sort, fall a prey to some of the many spiny raiders, whose size or habit of living in deep or shallow water, fits them to attack one or another sort of mollusk. Couch notes, in his *Cornish Fauna*, the large *Uraster rubens*, which is called clam or cramp in Cornwall, and occurs there in multitudes in spring, infests the fishermen's crab-pots, to steal the baits; and a Belfast man reports that he had had starfish frequently seize his lug-worm bait and be brought up on his hook while fishing. Mollusks, then, are not their only food. The carrion of the sea is eaten by them with voracity, and in this respect they are beneficial to us and the rest of animal life.

I do not propose to give a history of British starfishes, but before leaving them, must tell one or two

superstitions attached to them by sea-faring men, who are so ready to invest with some supernatural quality every strange product of that mystery of mysteries, the sea, whose inscrutability and might impress him with supernal power, and excite his wonder more and more the longer he is acquainted with its majesty, its moods, and its inhabitants.

Forbes records that at Scarborough the fishermen call the big *Asterias aurantiaca*, a very destructive species, the "butt horn". "The first taken," he says, "is carefully made a prisoner, and placed on a seat at the stern of the boat. When they hook a 'but' (halibut) they immediately give the poor starfish its liberty, and commit it to its native element; but if their fishery is unsuccessful it is left to perish, and may eventually enrich the cabinet of some industrious collector."

In Ireland, it appears, the folk-lore of this subject is more grim. "The starfishes are called at Bangor (County Down) the *Devil's fingers*, and the *Devil's hands*, and the children have a superstitious dread of touching them. When drying some in the little garden behind my lodgings, I heard some of them on the other side of the hedge put the following queries: 'What's the gentleman doing with the bad man's hand? Is he ganging to eat the bad man's hand, do ye think?'"

Not a superstition, but an entire error was the belief, which I find still existing in the United States, that the starfish will poison painfully, if not fatally, the hand of any one touching it. Our oystermen know better; but I can tell them that the belief is very old. Pliny, who lived during the first century of the Christian era, asserted that starfishes "can burn all they touch". This proves he took hearsay evidence, which a naturalist is never safe to do, and did not handle them himself to see. Aldrovandus and Albertus, who wrote a few centuries later, followed his same love of the marvelous, in spite of common sense and easy proof to the contrary, and told their credulous readers concerning these creatures, that "their nature was so hot they cooked everything they meddled with". Possibly we may find here the origin of the stew, the roast, the take-home-a-fry-in-a-box, which otherwise remains very obscure. Finally, some outdoor students came along, picked up starfishes, found them harmless, and freed the foolish old tomes that called themselves "natural histories", but constantly set nature aside for the marvelous and absurd, from one more taint upon the name of observer.

The tale did not wholly lose its hold upon the minds of the ignorant, however; and even the learned sought until lately to prove that there was some sort of an acrid fluid discharged by the skin of the animal. This false idea arose, perhaps, from confounding the starfish with the various *Medusa*, or jelly-fishes, which are also sometimes called "crossfishes"; or, possibly, it is merely an outgrowth of the attempt to account for the insidious destructiveness of the five-finger, which for a long time was misunderstood.

HOW A STARFISH KILLS AN OYSTER.—In Boston, last winter, one of the oldest oyster-dealers and planters there, gravely instructed me in the manner a starfish attacks his victim.

"Crawling round the bottom," he explained, "the star accidently gets afoul a bed of oysters. He don't know what they are, mebbe, but there they all lie with their shells a-gapin', after the nature of oysters. Poking round amongst 'em he accidently, as it were, gets the end of one of his arms into an open shell, and the oyster of course shuts down on him. Now, sir, he can't get away, but the oyster can't live but a little while with its shell open, and after a few hours he is dead. Then he lets up and the star makes a meal off him right there—takes him on the half-shell in his own gravy, as it were."

This is the first and last time I ever heard an American talk this nonsense, though many have expressed an ignorance of the whole matter, which was no credit to their eyesight; but in reading Prof. Edward Forbes' *British Starfishes* lately, where he mentions the cripples so frequently taken among starfishes, I find the following paragraph:

The oystermen believe that it loses its rays in consequence of its oyster-hunting propensities, that it insinuates an arm into the incautious oyster's gape, with the intent of whipping out its prey, but that sometimes the apathetic mollusk proves more than a match for its radiate enemy, and closing on him holds him fast by the proffered finger; then the crossfish, preferring amputation and freedom to captivity and dying of an oyster, like some defeated warrior, finding

"The struggle vain, he flings his arms away
And safety seeks in flight."

This story has long been believed. Link gives a vignette representing the mode of attack, with the motto "sic struit insidias".

Everybody who knows anything about it understands now, of course, that all this is absurd. The starfish goes about his foraging in a much more effective and sensible way. Indeed, he excels almost any other animal worth calling one, in economy of exertion in eating, since to secure, swallow, and digest his food is all one operation, when once he is inside the shell.

Having met with an oyster, scallop, or other thin-shelled mollusk—and young ones are preferred because their armor is weak—the starfish folds his five arms about it in a firm and deadly grasp. Then protruding the muscular ring at the entrance of his stomach through the circular opening in the center of the under-side of the disk, which I have described, he seizes the thin, newly grown, posterior edge of the shell, which oystermen call the "nib" or "bill", and little by little breaks it off. It has been surmised that the gastric juice decomposed the edge of the shell, until an opening was effected; or, entering, paralyzed the mollusk, until he relaxed the muscle which held the protecting valves together. But I do not think either of these suppositions supported by fact. The operation is

proceeded with too rapidly to wait for the slow action of the stomach acids upon the carbonate of lime in the shell; and the vital parts of the mollusk are too far inward and sluggish to be promptly affected by any such acids. Moreover, it seems unnecessary, since the appearance of every shell attacked at once suggests a breaking down, chipping-off movement, which the starfish might easily produce, by seizing and suddenly pulling down with the suckers nearest the mouth, or by a contraction of the elastic opening of the stomach.

At any rate, the thin edge of the shell is broken away, until an entrance is made, which the occupant has no way of barricading. Then the burglar protrudes into this entrance the distensible mouth of his stomach, until it can seize upon the body of the mollusk. The consumption of this begins at once, and as fast as the poor oyster's or scallop's body is drawn within its folds, the capacious stomach is pushed farther and farther in, until at last, if the mollusk be a large one, the pouches that I have described as packed away in the cavities of the rays, are also drawn forth, and the starfish has substantially turned himself wrong side out. If he is dredged up at this stage, as many examples constantly happen to be, and dragged away from his half-eaten prey, his stomach will be found hanging out of the center of his body for a distance, perhaps, equal to half the length of one of the arms, and filled with the juices of the oyster he has devoured, and whose body, within the shell, will be found almost as squarely trimmed as could have been done by scissors. If put very gently into a bucket of salt water, and left in peace, the starfish will straighten himself out, and slowly retract his extruded abdomen, as he would have done after his meal was digested, had he been undisturbed; but if the least violence is used he will spurt out the liquid contained in the distended pouch, and quickly draw it back into his body. As a rule, however, the angry fisherman does not have patience for these experiments. This process is the one followed in the case of large sized mollusks. Very young oysters and other small prey are enveloped in the stomach, shell and all. The gastric juice then kills and dissolves out the soft parts, and the hard crust is thrown away by the eversion and withdrawal of the stomach.

DIFFICULTY OF DESTROYING THE STARFISH.—When oysters first were cultivated along the American coast, and this enemy first became known, the oystermen used to save all that they caught in their tongs and dredges, and pile them in a corner of their boats until evening. Then they would collect them into small packages and draw a cord around each lot tightly enough to cut through it. This done, the remnants were cast overboard and considered done for. But this was entirely a mistake, as was presently found out. Five out of six of these fragments not only retained life, but renewed the lost parts and became active again. Thus, instead of diminishing the pest these men were directly increasing it, since they were making two or three new starfishes out of each captive. It was a case of multiplication by division, which may be an invariable paradox in mathematics, but is by no means always one in zoölogy.

Starfishes often lose one or more of their rays, but reproduce them. Forbes figures one, where four out of the five arms had been broken off in some way, and had just begun to be replaced by the little stubs of new growth. This gave the animal, with one full-sized limb, the shape of a spike headed bludgeon. Indeed, there are certain members of the family, found in all seas, known as *Ophiurans*, or snake-armed sea-stars, which are liable to commit apparent suicide, hurl themselves all to pieces, the instant they are disturbed. This habit belongs, also, to a few larger forms, but, so far as I am aware, is never practiced by any of our familiar American starfishes, who seem to prefer to take their chances rather than voluntarily fling away their limbs. This fragility and spitefulness of certain of the starfishes is humorously described by Forbes, in his account of one large British seven-armed species, the "liugthorn", or *Luidia fragillissima*. Having been cheated out of a previous specimen by its breaking itself to pieces, Mr. Forbes took with him on his next collecting expedition, a bucket of cold fresh water, to which article starfishes have a great antipathy. "As I expected," he says, "a *Luidia* came up in the dredge—a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded in the most gentle manner to introduce *Luidia* to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision."

Now that I have spoken of the "brittle-stars," as the *Ophiurans* are well called, I may as well quote Mr. Forbes' account of the trouble they give on the French and English coasts, which entitles them to a place in this essay on an enemy of the shellfisheries. He remarks:

The common brittle-star often congregates in great numbers on the edges of scallop-banks, and I have seen a large dredge come up completely filled with them; a most curious sight, for when the dredge was emptied, these little creatures, writhing with the strangest contortions, crept about in all directions, often flinging their arms in broken pieces around them, and their snake-like and threatening attitudes were by no means relished by the boatmen, who anxiously asked permission to shovel them overboard, superstitiously remarking "the things weren't altogether right". Rondletius * * * says they prey on little shells and crabs. They constitute a favorite article of diet in the codfish's bill of fare, and great numbers of them are often found in the stomach of that fish.

Starfishes are rarely found dwelling upon a muddy bottom, nor do they like clean sand very well. Upon the mud it is difficult for them to move about, and the open, smooth sand holds little food, and is likely to be shifted by a storm too quickly for them to escape being buried. Their home, then, is chosen on rocky coasts, where submerged

reefs afford plenty of craggy points for them to cling to, and whose crannies at once serve as homes for the animals they feed upon, and safe hiding-places for themselves. Beds of jingles, *Anomia*, deckheads, *Patella*, limpets, and other rock-loving mollusks are strongholds of starfish life.

EXTENT OF DAMAGE WROUGHT BY THE STARFISH.—The amount of damage done to the oyster-fisheries of the American coast by sea-stars, was one of the objects of constant inquiry in my work north of Staten Island. To the southward of Sandy Hook, at the utmost, no harm is reported, since the starfishes are extremely few, and almost wholly confined to the mussel-beds in the inlets.

In Prince Edward island they did not reckon this enemy as of much consequence, and had no losses of any consequence to report.

Crossing the Maritime provinces to the harbor of Eastport, Maine, I learned that all attempts to bed down northern stock or to transplant and raise any northern seed-oysters, had been completely frustrated by hordes of giant starfish, which ate up the mollusks almost as fast as they could be put down. Here, then, the sea stars are responsible for an entire disuse of otherwise available privileges for oyster-culture.

The same condition of affairs exists to a great extent on the rest of the coast of Maine, and I am not sure but the mysterious extinction, at about the date of the advent of Europeans, of the once extensive living beds of oysters between the mouths of the Kennebec and the Merrimac, was largely due to the attacks of this five-fingered foe. At Portland, however, where many southern oysters are laid down every year, I heard little complaint. This immunity is probably due to the fact, that no young oysters are planted here, or grow naturally; and also to the fact, that the beds are made upon muddy flats, in shallower water than starfishes enjoy. The same is true of the whole of Massachusetts bay, except Wellfleet, where the planters count sea-stars among the enemies, but secondary to the three or four species of mollusks that prey upon the planted beds.

South of Cape Cod, however, where oysters spawn and grow naturally, and beds of cultivated oysters are raised from eggs and infancy, starfishes are plentiful. All of the shores of Buzzard's bay are infested with them, and from there to the western extremity of Long Island sound they do enormous damage annually to the oyster interests—a damage probably not overestimated at \$200,000 a year. The south shore of Long Island and the bay of New York are less afflicted. Their attacks are not uniform and continuous, it appears, but vary with years, the time of the year, and other circumstances. A steady increase, however, has been observed in their numbers, wherever oyster-cultivation has been carried on for any considerable length of time. The planters at Providence, New Haven, and Norwalk, whose memories go back for twenty-five years or more, relate that in their early days this plague was not regarded as of any consequence, and that the starfishes are steadily increasing. Such a report is no more than we should expect, in view of the enormous increase of the food afforded them by oyster-culture.

STARFISH INVASIONS.—There have occurred times in the past, nevertheless, as now happens at intervals of a few years, when an excessive crowd of starfishes invaded the beds. Such a disastrous visitation was witnessed in the Providence river, Rhode Island, about 1858. The starfishes came in "sudden droves", as my informant expresses it, "which burnt up everything". The planting-grounds were mainly on Great Bed, about three miles below the city of Providence, and of all this extensive tract only two acres escaped, owing their safety to the fact, that just before that they had been partially buried under a layer of sunken sea-weed and drifted matter. Another of the planters had his heaviest bed between Field's point and Starvegoat island (which probably were not long ago connected), where the low tide left them so nearly bare that his men could pick up the starfishes, while his rivals had no means of combating them in the deeper water. In the general scarcity that ensued, he made large profits from this rescued bed, and got a start to which he owes a large part of his present eminence in the New England trade. So complete was the destruction caused by this visit, that the state revoked the leases of all that ground, and the planters left it wholly for a new tract at Diamond reef, where the water was so fresh that starfishes could not live. This single inroad upon Providence river probably cost the planters there \$150,000. It occurred late in the summer, and the marauders staid there picking up the fragments of the feast that remained until winter. Then a heavy fall of snow and rain, in conjunction with an unusually low tide, chilled and so completely freshened the water as to kill them all off. So it is related; and it is said to have been some years before that tract was reoccupied by planters.

Similar traditions exist elsewhere along this "sound" coast; and the planters stand in constant fear that the army of the enemy, which they daily fight, may at any time be suddenly re-enforced from some invisible quarter to an extent which shall make any contest useless. In 1878, for example, after some rough and gloomy weather in the latter part of October, a planter at Pocasset, Massachusetts, went out in his boat to look at his oysters which lay in three to five feet of water. He at once noticed that the starfishes had made a raid upon him under cover of the storm. Taking an eel-spear as a weapon, he forked up 2,500 by actual count within the next two days, and later gathered 500 more. In spite of this they ate up about 300 bushels from his beds alone. Adding what his neighbors suffered, he considers the single week's loss at that point to have been about 1,000 bushels, worth \$1,200.

At Warren, Rhode Island, I saw a pile of dead starfishes, said to amount to 1,000 bushels, which had been dredged off the beds in the river there. A bushel of living sea-stars contains from 100 to 200, according to size; say, 150 on the average. In drying, however, the bulk of a bushel is reduced three-fourths. Therefore this decaying

heap, ready to be turned into manure, represented something like 1,000 by 150 by 4 = 600,000 starfishes. Suppose them to be the only starfishes caught in Warren river, and to have eaten only one oyster each before their capture, and we have 600,000 mollusks, or about 3,000 bushels, destroyed. But the oystermen say not one in twenty-five fingers gets caught, and that 50,000 bushels would come nearer to each season's loss of young and old oysters.

It is in the latter part of the summer and in the autumn that the starfish pest occurs in its greatest violence along the Rhode Island and Connecticut coasts. Then they, themselves, are done with their spawning and have renewed their vigor, and the young of all sorts of mollusks, crabs, and other prey abound upon the shores and invite the five-fingers to an easy repast. It is at this season that the sudden appearance of great bodies of starfishes make the heart of the planter sink within him: for he knows that if they once attack a bed of his, they march straight through it, and leave as dead a path as if it had been swept by a fire. It is utterly useless to struggle against them, except by putting on a large force of men and taking up all the oysters on the bed. On more than one occasion steamers have been employed, in order to hasten the work of dredging, at a large expense.

I was told all along the coast, in order to account for the sudden unforeseen appearance of these bodies of starfishes in the midst of an oyster-bed, that they came rolling in from the deep sea in a compact ball, all clinging tightly together. This ball might be a foot in diameter, or as big as a barrel, and was rolled along on the bottom by the tide. When it struck the feeding-ground it went to pieces, and the individual members at once began to devour the oyster next to them, beginning with the tenderest. I discredit the truth of this statement, since I never could find an actual witness of such a phenomenon. The nearest I came to it was this: Captain Eaton, an old oysterman, whom I saw at New Haven, told me that several years ago, when he was with his brother at Norwalk, they raked up one end of a cylindrical roll of starfishes clinging tightly together, which they hauled into their boat until it would contain no more, when they had to break the roll or "string", as he called it, which was a foot or more in diameter. He did not mention anything inside of this cylindrical body, which was solid starfishes and nothing else.

There is no reference in books, that I know of, to anything of this nature, except that Forbes quotes a French writer, Deslonclamps, of 1825, who says that on the French coast, when the tide was out, and while two or three inches of water remained on the sand, "he saw balls of *Asterias rubens*, five or six in a ball, their arms interlacing, rolling out. In the centers of the balls were *Maetra stultorum* [a kind of large clam] in various states of destruction, but always unable to close the valves, and apparently dead." How much faith is to be put in this account, repeated by many fishermen, and how much of it is pure fable, is hard to say from present data. In general it is known that the starfishes live and breed among the rocks, begin to feed in summer, but do not move about much when once they strike a feeding-ground, and either perish or retreat to deep water when the cold of winter approaches. Mussels are preferred to oysters or clams, though I have heard it asserted that they will even make their way into a quahang, if hard pressed. The smaller, thin-shelled bivalves fall an easy prey to them. One of these (*Arcavirgata?*) is called the "blood-quahang" by the rivermen, and when it is present the starfish will take nothing else. One of the tracks saved from the attack which ruined the Great Bed in Providence river, is said to have owed its safety to the abundance of "blood-quahangs" upon it, which satisfied the starfishes.

The only offsetting value in this plague, that I am aware of, is its usefulness as a manure, for which purpose those taken by the oystermen are saved. They are especially recommended for grape-vines. Large quantities are thus made use of in Great Britain and France.

"Anciently," as I have read, "the *Urasters* were used in medicine. They were given internally as a decoction with wine, in hysterical diseases and against epilepsy. The physicians of old times, members of a profession never very remarkable for logical acumen, applied them externally in hernia, from some fanciful analogy between their pouting stomach and the appearance of the rupture. Any medical man who would wish to revive the practice will find the prescriptions carefully gathered together in Link, who, however, does not appear to have put much faith either in the medical or gastronomical virtues of starfishes; yet, conceiving it necessary to find some use for them, according to the manner of his times, he tells us they are of use to man, not because they serve as food to him themselves, but because they feed the fishes, and the fishes feed him, adding, 'miror hinc et in providentia divina sapientiam.'"

In spite of his belief, however, I do not know any fishes that feed upon the sea-stars, except the cod.

PREVENTION OF STARFISH RAVAGES.—The question following a knowledge of the facts which have been given above, is: What can be done to prevent, or at any rate lessen, the ravages committed by the starfishes upon oyster-cultivation? This is a very hard question to answer. The boundless tracts of the outer sea harbor them beyond any hope of extermination by us, and all operations must apparently be confined to the small localities occupied by the oysters. Here, again, the expense involved in ridding one's property of the pests, makes it a question whether it were not more profitable to let them alone. Possibly this might be the case in individual instances; and probably it has been found so and acted upon almost universally up to the present. The result is a colonization and increase of starfishes which forsake the single localities to which they were once confined and devastate a whole neighborhood. Every man now suffers through his neighbor's neglect as well as his own.

At Norwalk, Connecticut, the starfishes are probably now more injurious than at any other place on the coast, and I paid much attention to the matter there. The result of my inquiries seemed to show, that one man, in a sloop, devoting his whole time to it, could keep ten acres of oyster-ground clean of starfishes by dredging them off.

He would continually sail back and forth, round and round over the ground, and catch the ugly visitors as fast as they came. There are in Norwalk harbor about 700 acres of cultivated bottom. This would need the persistent services of 70 men, therefore, at a total annual expense of not less than \$50,000. In lieu of this, the oystermen who own contiguous beds, should combine during the summer to dredge the starfishes all off a certain district, and divide the expense or labor equally among them all. Such combined and persistent work, when the plague first appears, will certainly clear them off; and when once they are got rid of, they will not be again troublesome until the following season, and then in less numbers. There is no more reason why the starfishes cannot be so reduced in Long Island sound, that they shall not be harmful to the oyster-beds, than there is why the Canada thistle cannot be kept down in the three shore counties of Connecticut. It is merely a question of steady labor. But this labor must be unselfish. I heard it whispered, that certain oystermen would keep very quiet so long as no sea-stars were on their own acre or two, rejoicing slyly in the losses their rivals in business were sustaining. So short-sighted and unmanly a policy as this must be abandoned.

It was also suggested to me, and I advised with many planters in Connecticut and New York on the matter, that a bounty might profitably be paid for the destruction of starfishes. The question was: Who shall pay this bounty?

It was thought by many that the general government should do it, but I consider this obviously a mistake. Another opinion was, that the state should do so; but only a portion of the state is interested, and much opposition would no doubt be manifested by the inhabitants inland. The same would, perhaps, be true of the shore counties if they attempted the scheme, though to a less extent. It seems, then, that the proper source to look to for appropriations for such an object, are the townships along the shore in whose waters the oystermen rent their ground and plant. This confines the expense to the district benefited, and, by making one officer in each town an inspector of the claims and the only authorized paymaster, restricts the possibilities of fraud.

The next question is: How much shall the bounty be? This ought to vary somewhat in different localities, according to scarcity, value of interests risked, etc. In general it was thought that the claim ought to be based upon count rather than measure, and that in western Connecticut from 5 to 10 cents a hundred would be large enough to encourage constant effort to collect them, and not too large to prove a profitable investment in the amount saved. I suppose that the town authorities could redeem a considerable percentage of their outlay, by selling the starfishes collected to farmers for manure, or to factories to be made into fertilizers.

I am not aware that any steps have been taken by any of the towns to set a bounty upon the capture of this plague; but if combined action were taken, I feel sure it would be wise, and the results conspicuously beneficial to the whole oyster-interest. If the towns will do nothing of the sort, an association of oystermen, at such crowded producing points as City Island, Stamford, Rowayton, South Norwalk, New Haven, and Providence would no doubt find it profitable.

Some years ago a trial was made in Narraganset bay of a trawl, made after the pattern introduced about 1872 by the United States Fish Commission. The Fish Commissioners of Rhode Island, in company with a firm of oyster-planters at Providence, went down the bay, and swept one of the oyster-beds with the improved trawl, hauled by a steam-tug. "On hauling it up, in a few minutes they counted nearly two hundred starfish, large and small, which were snared and caught at this first haul. A second haul brought up still more." If this report is correct, it is strange that so effective an instrument was abandoned. A still more useful appliance is the "tangles", made of rope-yarn and shaped like a mop or a deck-swab. This being drawn over the bottom, the starfish are entangled in its film. The "tangles" are constantly used in the natural history work of the United States Fish Commission. Tens of thousands of starfish are sometimes brought up at one haul.

THE DRILL.—A small but numerous and persistent enemy of the oyster, is the "drill" or "borer". Under this name is included, however, a numerous class of univalve mollusks, which are carnivorous in their tastes, and armed with a tongue-ribbon, so shaped and so well supplied with flinty teeth, that by means of it they can file a round hole through an oyster's shell. The mode in which it is done has been clearly described by the Rev. Samuel Lockwood, as follows:

The tongue is set with three rows of teeth like a file; it is, in fact, a tongue-file, or dental band, and is called by conchologists the lingual ribbon. * * * Having with the utmost care witnessed a number of times the creature in the burglarious act, I give the following as my view of the case: With its fleshy disk, called the foot, it secures by adhesion a firm hold on the upper part of the oyster's shell. The dental ribbon is next brought to a curve, and one point of this curve, on its convex side, is brought to bear directly on the desired spot. At this point the teeth are set perpendicularly, and the curve, resting at this point as on a drill, is made to rotate one circle, or nearly so, when the rotation is reversed; and so the movements are alternated, until, after long and patient labor, a perforation is accomplished. This alternating movement, I think, must act favorably on the teeth, tending to keep them sharp. To understand the precise movement, let the reader crook his forefinger, and, inserting the knuckle in the palm of the opposite hand, give to it, by the action of the wrist, the sort of rotation described. The hole thus effected by the drill is hardly so much as a line in diameter. It is very neatly countersunk. The hole finished, the little burglar inserts its siphon or sucking-tube, and thus feeds upon the occupant of the house into which it has effected a forced entrance. To a mechanic's eye there is something positively beautiful in the symmetry of the bore thus effected—it is so "true"; he could not do it better himself, even with his superior tools and intelligence.

These small "snails", "drills", "borers", and "snail-bores", as they are variously called, belong to several species of *Natica*, *Purpura*, *Anachis*, *Astyris*, *Tritia*, *Ilyanassa*, etc.; but the master and most destructive, as well

as most abundant of them all, is the *Urosalpinx cinerea* of Stimpson. It is this which is the common "drill" of the oyster-beds; and it is its eggs, laid in small vase-shaped capsules, which are often found attached in groups to the under surfaces of stones. Several of the small mollusks mentioned above lay eggs in this way, but the drill's capsules have very short stalks, or are almost sessile, and are compressed with an ovate outline, while angular ridges pass down their sides. The natural home of the drill is the tide-pools and weedy borders of rocky shallows, where barnacles, hydroids, anemones, rock-loving limpets, and other associated forms that find shelter among the algæ, afford it abundant food. Though this is precisely where the mussels grow till the rocks are almost black with them, it is said that they are never attacked by the drills.

The *Urosalpinx* sometimes stray to the oyster-beds, but is usually carried there with the seed-supplies, and finding plenty of nourishment live and increase. Though its multiplication is not very rapid, it is fast enough to make it a very serious obstacle to success, in the course of a few years. In nearly every case, I was told that formerly there were no drills, but now the oyster-beds were overrun. This was reported in particular of the Great South bay of Long Island and at Keyport, New Jersey. I heard less of its ravages in New Jersey, except in the Delaware; but in Chesapeake bay nearly every dredge-haul in any part of Maryland or Virginia waters, brings up; the Potomac seems to be the district least infested. Of course, in such natural haunts as the rocky shores of Buzzard's bay and Connecticut, would be present if there were no oysters, and are all the harder to dislodge.

Once having attacked an oyster-bed, they work with rapidity; and seem to make sudden and combined attacks at considerable intervals. Their disappearance from certain restricted localities, too, for a long time, is unexplained.

What is the best way to combat them, or whether there is any hope of ridding the beds of them, are questions often discussed by oyster-culturists. It is certain that a great deal of trouble might be avoided, if care were exercised in culling seed, to throw out—not into the water, but on the ground or deck—all the drills, instead of carrying them to one's beds, deliberately planting them, and then grumbling at destruction which previous care would have avoided. It would cost less, in point of mere labor, no doubt, to prevent this plague than to cure it when it becomes no longer endurable. Some planters clean up pieces of bottom very thoroughly before planting, in order to get all this sort of vermin out of their way, as well as to stir up the mud and fit it for the reception of spat. It is on hard bottom that drills are especially troublesome, and here some planters go over the ground with a fine-meshed dredge in order to get them up, but they fail to catch all. This is done at Norwalk, Connecticut, I know, and the men who have steamers, find in the celerity with which they are able to accomplish this sort of work, a great argument against any restriction to exclusively sailing-rig.

The drill can be exterminated to a great extent, also, by diligently destroying its eggs. Small boys might well be paid to search for them and destroy them, among the weedy rocks by the shore, at low tide. A gentleman at Sayville, Long Island, assured me that in those years when large eels were plentiful, the drills were kept down because the eels fed on their eggs. This gentleman said, that in the Great South bay the drills were nearly conquering the planters; and he advised the removal of all shells from the bottom of the bay, in order that the drills might have nothing left on which to place their eggs. This might do there, where there are no rocks along the shore and the drill is not native; but I doubt whether so sweeping a measure of protection could ever be carried out.

On the Pacific coast *Gastrochana*, and various pholadiform mollusks are a great bane to the oyster-beds, but they penetrate by digging burrows wherein their whole shell is lodged. Large numbers of these, with the help of boring-worms and sponges, may so riddle a reef as to cause its entire disintegration.

THE WINKLE.—Destructive pests on the oyster-beds are, also, found in the two large, spiral mollusks, *Sycotypus canaliculatus* and *Fulgur carica*, which along the coast are confounded under the names "periwinkle", "winkle", "wrinkle" (New England), and "conch" (southern), with occasionally a distinguishing prefix. Various other large shells also come under these generally applied names; and in the Gulf of Mexico we have, additionally, the "king conch", "queen conch", and "horse conch", all of which are edible.

The *Sycotypus* is more common north of New York—though it does not exist at all beyond Cape Cod—while along the coast of New Jersey and southward it is the *Fulgur* which is chargeable with nearly all mischief perpetrated, since the other species is rarely seen. Occasionally, as Verrill mentions, specimens of both may be found crawling on sandy flats or in the tide pools, especially during the spawning-season, but they do not ordinarily live in such situations, but in deeper water and on harder bottoms off shore. It is needless to say that they do not burrow at all, though they are able to insert the posterior part of the foot into the sand sufficiently to afford them a strong anchorage against currents. A very soft or a very rocky bottom they equally avoid.

The curious egg-cases of these mollusks, to which the names "sea-ruffe" and "sea-necklace" are often given by fishermen, always attract the attention of visitors to the seaside, who find them cast upon the beaches; and we can well echo the pious exclamation of the old historian of Martha's Vineyard, "the Author of nature makes a wonderful and copious provision for the propagation of this worm".

As shown in the figure, the eggs are discharged in a series of disk-shaped, subcircular, or reniform, yellowish capsules, parchment-like in texture, united by one edge to a stout stem of the same kind of material, often a foot and a half or two feet in length. "The largest capsules, about an inch in diameter, are in the middle, the size

decreasing toward each end. On the outer border is a small circular or oval spot, of thinner material, which the young ones break through when they are ready to leave the capsules, each of which, when perfect, contains twenty to thirty or more eggs or young shells, according to the season." Verill adds interesting particulars as follows:

Dr. Elliott Cones, who has observed *Fulgur carica* forming its cases at Fort Macon, North Carolina, states that the females bury themselves a few inches below the surface of the sand on the flats that are uncovered at low-water, and remain stationary during the process. The string of capsules is gradually thrust upward as fast as formed, and finally protrudes from the surface of the sand, and, when completed, lies exposed on its surface. The string begins as a simple shred, two or three inches long, without well-formed cases; the first cases are small and imperfect in shape, but they rapidly increase in size and soon become perfect, the largest being in the middle; the series ends more abruptly than it begun, with a few smaller and less perfect capsules. The number of capsules varies considerably, but there are usually seventy-five to one hundred or more. At Fort Macon Dr. Cones observed this species spawning in May, but at New Haven they spawn as early as March and April. It is probable that the period of spawning extends over several months. Mr. Sanderson Smith thinks that they also spawn in autumn on Long Island. It is not known how long a time each female requires for the formation of her string of capsules. There are two forms of these capsules, about equally abundant in this region. In one the sides of the capsules are nearly smooth, but the edge is thick or truncate along most of the circumference, and crossed by numerous sharp transverse ridges or partitions, dividing it into facets. Dr. Cones states that these belong to *Fulgur carica*. An examination of the young shells, ready to leave the capsules, confirms this. The other kind has larger and thinner capsules, with a thin, sharp outer edge, while the sides have radiating ridges or raised lines. Sometimes the sides are unlike, one being smooth and more or less concave, the other convex and crossed by ten or twelve radiating, elevated ridges, extending to the edge. This kind was attributed to *Fulgur carica* by Dr. G. H. Perkins, and formerly by Mr. Sanderson Smith, but a more careful examination of the young shells, within the capsules, shows that they belong to *Sycotypus canaliculata*.

Eggs so exposed are subject to numberless accidents, being drifted ashore, ground to pieces by storms, and no doubt eaten by bottom-feeding fishes, so that only a few eggs out of the hundreds in each "necklace" are ever born, or, accomplishing that, are able to survive the perils of unprotected youth and grow to adult age and strength. Having once done so, however, this mollusk probably lives to a very great age.

An examination of the plate, or, better, of a specimen, will show that in both species the muscular part is large and strong and the mouth powerful. The food of the conch being mainly the flesh of other mollusks, its method of killing them is one of brute strength, since it is unprovided with the silicious, file-like tongue, by means of which the small "drills" set at naught the shelly armor of their victims. The conch is a greater savage than this. Seizing upon the unfortunate oyster, unable to run away, he envelops his shell in the concave under-surface of his foot, and, by just such a muscular action as you would employ in grasping an object in the palm of your fist, crushes the shell into fragments and feasts at leisure on the flesh thus exposed. Where oysters or other prey are abundant, this operation is quickly repeated and vastly destructive. One planter in the upper part of Buzzard's bay, where this pest is very troublesome, told me that one winkle was capable of killing a bushel of oysters in a single hour. They do not confine themselves to oysters altogether, of course; any mollusks or other marine animal, sluggish and weak enough to be caught and broken up, suffering from their predacity. I was told in New Jersey, by an intelligent man, that the conch would even draw the razor-shell out of his burrow and devour it. If this be true, no doubt the soft clam also falls a victim to the same marauder. The quahaug is generally safe in his massive shells.

The oyster-beds most subject to attack and harm by the winkles and conchs, are those planted in water which is quite salt, as is the practice in New England and Long Island sound. The beds of the Great South bay, Staten Island, and the southern Jersey coast, are well protected by the outer beaches from the sea, and to these barriers owe their immunity from the *Fulgur*, while the *Sycotypus*, though present inside the beaches, seems to do small damage. Oystermen will tell you, also, that beds which are disturbed from time to time by the planter, will suffer more harm than neglected beds, especially in summer. Of course, the report is to be expected, that where planting has gone on for many years, there these predatory mollusks have visibly increased in numbers.

In regard to ridding our beds of this pest, I can only advise, as heretofore, that every effort be made to destroy every specimen taken and every "necklace" of eggs which can be got hold of. The trawl, tangles, etc., recommended for the suppression of starfishes, would take up these eggs at the same time, and thus increase their efficiency. Persistent fighting is the only resource against this enemy.

Some points of minor interest may be mentioned before leaving this subject. Both of these shells were used by the Indians of the coast ceremonially, and as material for the making of white wampum, their money of inferior value, which consisted of bead-shaped sections of the central column of the shell. From them, also, were fashioned sundry articles of service and ornament, such as trowels, spoons, and dippers; they are sometimes even yet called "ladle shells". The Indians ate the animals, too, when hard pressed for food, and have been followed in this practice by the whites, to some extent. De Voe says they used sometimes to be sent into Catherine market, New York, from Long Island, and found sale; "but," he adds, "they are not generally relished, being somewhat strong flavored. They are mostly used by the poor who live near the coast." Several foreign mollusks, not greatly different, are eaten—generally being boiled—and perhaps proper cooking would make these conchs more palatable than they have hitherto proved.

THE DRUM.—Perhaps as destructive an agent as the conchs and winkles, is the fish known as the drumfish, (*Pogonias cromis*, Linn.); for, although this plague is not steadily present, when it does occur the devastation is enormous. "Let us make a visit," says that brightest of American writers on animals and out-of-door matters,

“to one of these orderly communities in Oysterdom known as a ‘planting-ground’. We are seated in a boat, and, gliding through the phosphorescent sheen, soon near the oyster-bed. It is a moonlight night, about the close of summer. Hark! what singular sound is that? Boom! boom! boom! Almost sepulchral, and, strange to say, it comes up from beneath the waters. One would think they were Nereids’ groans. The oystermen, whose capital lies invested there, hear it with sad forebodings of loss, which they cannot well sustain. It is one of a school of visitors who come with marauding purpose. The fishermen call it the big drum. This drumfish is known among naturalists by the name *Pogonias chromis*. The acknowledged beat of this scamp is the Gulf Stream, from Cape Cod to Florida; and a terrible fellow is this Pogonias, for he is recorded as having attained the great weight of eighty pounds. One of twenty-five pounds would be but an ordinary affair. Their mouths are furnished with pavements of hard teeth, a little rounding on the top, and set together exactly as are the cobble-stones of the old city highways. The function of these dental pavements is to crunch the young oysters, which, after being crushed, are thus swallowed, shells and all.”

The great schools in which these fish go are illustrated by the following records:

On Monday last John Earle and sons caught, with a seine, at one draught, in Bristol ferry, 719 drumfish, weighing upward of 50 pounds each. Niles’ *Weekly Register*, July, 1833, also says: “Some days ago a haul was made in Great Egg Harbor bay, near Bearsley’s point, cape May, at which 218 drumfish were caught, their entire weight being from 8,000 to 9,000 pounds. This is said to be the largest haul of that description of fish ever made in that bay.”

Another still larger, noticed as a great haul of drumfish: “On Wednesday, June 5, 1804,” says the postmaster of Oyster Ponds, Long Island, “one seine drew on shore at this place at a single haul 12,250 fish, the average weight of which was found to be 33 pounds, making in the aggregate 202 tons, 250 pounds. This undoubtedly is the greatest haul of this kind ever known in this country. A hundred witnesses are ready to attest the truth of the above statement. They are used for manure.”

Knowing the carnivorous propensity of the fish, one can easily imagine how an inroad of such a host must affect an oyster-ground. They do not seem to make any trouble, however, north of New York city, and rarely along the south side of Long Island. At Staten Island and Keyport they come in every few years and devastate thousands of dollars’ worth of property. Such a memorable visitation happened about 1850, in July. The following summer the planters in Prince’s bay, fearing a repetition of the onslaught, anchored shingles and pieces of waste tin on their beds, scattering them at short intervals, in the hope that their dancing, glittering surfaces might act as “scare-crows” to frighten the fish away. Whether as an effect of this, or because of a general absence, no more drums appeared. In New York bay, off Caven point, where the old “Black Tom reef” is now converted into an island, one planter of Keyport lost his whole summer’s work—material and labor—in a single September week, through an attack by drums. A City Island planter reported to me a loss of \$10,000 in one season a few years ago; but the East river is about the northern limit of the drums, at least as a nuisance to oyster-culture, so far as I can learn. The vexation of it is, too, that the drum does not seem to eat half of what he destroys; but, on the contrary, a great school of them will go over a bed, wantonly crushing hundreds of oysters and dropping them untasted, but in fragments, on the bottom.

In return, the drum is himself an edible fish, but of rather poor quality, and only seen in market between July and October. There is a tradition that there were only ten species of fish known to the Dutch when they discovered America. When they caught the shad they named it *elft* (eleventh); the bass *twalf* (twelfth); and the drum, *dertienen* (thirteenth). Our name, however, owes its origin to the strange, hollow, roaring noise the fish makes in the water, like the roll of a muffled drum.

When drums are absent, various other carnivorous fishes prey upon oysters, such as the tautog, sheepshead, toad-fish, members of the cod family (if any of them ever get near a bed, which is rarely at present), and the skates or rays. Of all these the sting-ray or “stingaree” of the fishermen (including several sorts of *Dybastes*) is the chief. He is always present and steadily at work along the whole coast. Lying flat on the bottom, he works his triangular flippers until he has washed away the sand from about the oyster he wishes to seize, if it is at all concealed, and then crushes it between his powerful jaws. Even clams do not escape his sagacity in capture and strength of mastication, but are devoured in great numbers. A dredge can hardly be hauled from New Jersey to Cape Cod, without bringing one or more of these enemies of the hard-working oysterman.

MINOR ENEMIES.—Beside these foes, many minor “vermin” must be contended with. The oyster-catcher, and other birds, steal not a few at low tide. Barnacles, annelids, and masses of hydroid-growth sometimes form about the shells, and intercept the nutriment of the mollusk, until he is nearly or quite starved; this is particularly true in southern waters. At Staten Island the planters are always apprehensive of trouble from the colonization of mussels on their oyster-beds. The mussels having established themselves grow rapidly, knit the oysters together by their tough threads, making culling very difficult, and take much of the food which otherwise would help fatten the more valuable shellfish. In the Delaware bay the spawn of squids, in the shape of clusters of egg-cases, appropriately called “sea-grapes”, often grows on the oysters so thickly, during the inaction of summer, that when the fall winds come, or the beds are disturbed by a dredge, great quantities of oysters rise to the surface, buoyed up by the light parasitic “grapes”, and are floated away. This is a very curious danger. Lastly, certain crabs are to be feared—chiefly the *Callinectes hastatus*, our common “soft crab”, and the *Cancer irroratus*. Probably the latter is the more hurtful of the two. I have heard more complaint on this score at the western end of the Great South

bay, Long Island, than anywhere else. Mr. Edward Udall told me that the crab was the greatest of all enemies to oysters on the Oak Island beds. They eat the small oysters, up to the size of a quarter dollar, chewing them all to bits. These are on the artificial beds, for they do not seem to trouble the natural growth. But attracted by broken oysters, when the planter is working, they come in crowds to that point. Mr. Udall stated that once he put down 500 bushels of seed brought from Brookhaven, and that it was utterly destroyed by these crabs within a week, and while he was still planting. He could see the crabs, and they numbered one to every fifty oysters. It is well known that in Europe the crabs are very destructive to planted beds, and it is quite possible that many mysterious losses may be charged to these rapacious and insidious robbers. By the way, Aldrovandus, and other of the naturalists of the Middle Ages, entertained a singular notion relative to the crab and the oyster. They state that the crab, in order to obtain the animal of the oyster, without danger to their own claws, watch their opportunity when the shell is open to advance without noise and cast a pebble between their shells, to prevent their closing, and then extract the animal in safety. "What craft!" exclaims the credulous author, "in animals that are destitute of reason and voice."

THE OYSTER-CRABS.—In respect to the little crab, which becomes red in the cooked oyster, but is greenish-brown in life, opinion is divided as to whether its presence is of any harm to the oyster whose shells give it shelter; but the probability is that it is not. Its scientific name is *Pinnotheres ostreum*, and its history briefly as follows, so far as concerns the present inquiry:

The little red oyster-crab seems to be a parasite. He slips in and out of the oyster almost at pleasure, and enjoys a portion of all the good things the oyster feeds upon. We are told that a careful examination shows that they are almost invariably females and full of eggs. The males are so exceedingly rare that it is a matter of astonishment how the propagation of the species is effected and maintained. These crabs were regarded as luxuries by George Washington.

THE OYSTER-CRAB AS MESSMATE AND PURVEYOR.—It is many years, writes Mr. John A. Ryder, since Mr. Say named the little oyster-crab of our coasts *Pinnotheres ostreum*, and its habits in relation to the oyster seem to have excited but little interest, especially in foreign waters. Professor Verrill, in his report to the United States Fish Commission, observes that it is the female which lives in the oyster, and that the male, which is smaller and quite unlike the female, is rarely if ever seen to occur, but that it has been seen by him swimming at the surface of the water in the middle of Vineyard Sound. His statement that it occurs wherever oysters occur, I cannot agree with, since out of many hundreds of St. Jerome oysters which I saw opened, I never saw a specimen of *Pinnotheres*; they may occur, but rarely. This little crab has quite a number of allies which inhabit various living mollusks, holothurians, etc., of which admirable accounts are given by Van Beneden, in his work on animal parasites and messmates.

There can be no doubt that the oyster-crab is a true messmate, and it is highly probable that the presence of these animals in the oyster is rather to be regarded as advantageous than otherwise. The animal lives in the gill cavity of the oyster, and, as will be seen from the following observations, may be the means of indirectly supplying its host with a part of its food. During a reconnoitering trip down the Chesapeake on the yacht Lookout, in the first week of July last, in dredging, some oysters were hauled up which contained *Pinnotheres*. In the case which I am about to describe, the included crab was a female, with the curiously expanded abdomen folded forward under the thorax and partially covering a huge mass of brownish eggs. Upon examining these eggs, what was my astonishment to find that they afforded attachment to a great number of compound colonies of the singular bell animalcule, *Zoöthamnium arbusculum*. Upon further examination, it was found that the legs and back of the animal also afforded points of attachment for similar colonies, and that here and there, where some of the individuals of a colony of *Zoöthamnium* had been separated from their stalks, numerous minute rod-like vibriones had affixed themselves by one end. In this way it happens that there is a quadruple commensalism established, since we have the vibriones fixed and probably nourished from the stalks of the *Zoöthamnium*, while the latter is benefited by the stream of water drawn in by the cilia of the oyster, and the last feeds itself and its protégé, the crab, from the same food-bearing current. Possibly the crab inside the shell catches and swallows food which, in its entire state, could not be taken by the oyster, but in any event the small crumbs which would fall from the mouth and claws of the crab would be carried to the mouth of the oyster, so that nothing is wasted. We must consider the crab, with its forest of bell animalcules, in still another light. Since the animalcules are well fed in their strange position, it is but natural to suppose that they would propagate rapidly. They multiply in two ways, viz, by dividing both lengthwise and crosswise, one-half of the product being set free, and known swimmers. These cast-off germs of the animalcule colonies are no doubt hurried along in the vortex created by the cilia of the gills and palps, carried to the mouth and swallowed as part of the daily allowance of the food of the oyster. We are accordingly obliged to look upon the *Pinnotheres* in this case as a veritable nursery, upon whose body animalcules are continually propagated and set free as part of the food-supply of the oyster, acting as host to the crab. I do not suppose, however, that such a condition will always be found to obtain, and it must also be remembered that myriads of *Zoöthamnium* colonies were dredged up on algae from the bottom in the immediate vicinity. Such an abundance of germs in the water would favor their being readily transplanted or fixed to the body of the oyster-crab.*

* Report of T. B. Ferguson, a fish commissioner of Maryland, for 1881, pp. 24, 25

62. FATALITIES TO WHICH OYSTERS ARE SUBJECT.

SEDIMENT.—In addition to the active, animate enemies of the oyster, the beds suffer seriously, at certain times, from the elements, as has been pointed out frequently in the preceding pages. Great storms will sweep the oysters all off the beds, bury them under shifting sand or mud, or heap upon them the drifting wrack torn from the shores. Beds which lie at the mouths of rivers are liable to be injured by floods also, which keep the water wholly fresh, or bring down enormous quantities of silt and floating matter, which settles on the beds and smothers the oysters.

A few years ago a large tract of peat was drained at Grangemouth, Scotland. The loose mud and moss was carried down the drains upon an oyster-bed in the estuary; the consequence was that the oysters were covered over with mud, and entirely destroyed. Nothing is so fatal to oysters as a mud storm, except it be a sand storm. The mud and the sand accumulate in the oyster's delicate breathing organs, and suffocate him.

Mr. John A. Ryder, already quoted in the previous paragraphs, writes as follows about mud, as injurious to oysters:

“The origin of the black ooze at the bottom can be traced directly to the sediment held in suspension in the water, which slowly ebbs and flows in and out of the inclosure, carrying with it in its going and coming a great deal of light organic and inorganic *débris*, the former part of which is mainly derived from the comminuted fragments of plants growing in the creek. This seemed to be the true history indicated by what was noticed in studying the box-collector. The same opinion is held as to the origin of this mud by both Coste and Fraiche in their works on oyster-culture.

“There is probably no worse enemy of the oyster-culturist than this very mud or sediment. It accumulates on the bottom of the oyster-grounds, where, in course of time, it may become deep enough to cause serious trouble. Especially is this true of ponds from which the sea ebbs, and to which it flows through a narrow channel. The falling leaves from neighboring trees in autumn also contribute to this pollution, as well as heavy rains which wash deleterious materials into it.

“Adult oysters which are immersed in part in this mud struggle hard to shut it out from their shells. If one will notice the inside of the shells of oysters which have grown in a muddy bottom, it will often be seen that there are blister-like cavities around the edges of the valves filled with mud, or a black material of a similar character. There is not the slightest doubt in my mind, that in these cases the animal, in order to keep out the intruding mud has had recourse to the only available means at its command. A great many of the oysters in the pond are affected in this manner, but it is extremely uncommon to find shells of this kind in opening oysters coming from a hard bottom. It is easy to understand that such efforts at keeping out the mud from the shell will not only waste the life-forces of the animal, but also tend to greatly interfere with its growth. The importance, therefore, of artificial preparation is apparent, where it is desirable to establish ponds for the successful culture of this mollusk.

“Only in one case have I observed that the mud tended to impair the flavor and color of the oyster. In this instance the animal was thoroughly saturated with the black ooze, the very tissues seeming to be impregnated with the color, the stomach and intestine loaded to engorgement with the mud, the animal manifesting every sign of being in a decidedly sickened condition. The cause of this was probably that the shell, with its tenant, had sunken too deeply into the mud when the ingestion of the black ooze commenced, giving rise to the remarkable changes which I have recorded. No doubt had this condition of things for any length of time, the animal would have been smothered by the mud.”*

MUD AND THE YOUNG FRY.—“The accumulation of the slightest quantity of sediment around a young oyster would tend to impede its respiration, and in that way destroy it, yet in the natural beds there are so few naturally clean places which remain so, that it is really surprising that so many young oysters pass safely through the critical periods of their lives without succumbing to the smothering effects of mud and sediment. When it is borne in mind, that at the time the infant oyster settles down and fixes itself once and for all time to one place, from which it has no power to move itself, it measures at the utmost one-eightieth of an inch, it will not be hard to understand how easily the little creature can be smothered, even by a very small pinch of dirt. The animal, small as it is, must already begin to breathe just in the same way as its parents did before it. Like them its gills soon grow as little filaments covered with cilia, which cause a tiny current of water to pass in and out of the shell. The reader's imagination may be here allowed to estimate the feeble strength of that little current, which is of such vital importance to the tiny oyster, and the ease with which it may be stopped by a very slight accumulation of dirt. Möbius estimates that each oyster which is born has $\frac{1}{1,115,000}$ of a chance to survive and reach adult age. So numerous and effective are the adverse conditions which surround the millions of eggs matured by a single female, that only the most trifling fraction ever develop, as illustrated by the above circulation. The egg of the oyster being exceedingly small and heavier than water, immediately falls to the bottom upon being set free by the parent. Should the bottom be oozy or composed of sediment, its chances of development are meager indeed. Irrecoverably buried, the eggs do not, in all probability, have the chance to begin to develop at all. The chances of impregnation are also reduced, because the male and

* John A. Ryder in report of T. B. Ferguson, a fish commissioner of Maryland, for 1881, pp. 48, 49.

female oysters empty their generative products directly into the surrounding water, whereby the likelihood of the eggs meeting with the male cells becomes diminished. What with falling into the mud and what with a lessened chance of becoming impregnated, it is not unlikely that Möbius' estimate is very nearly correct; but the American oyster, whose yield of eggs is much greater, not only on account of its larger size, but also because the eggs are smaller than those of the European, has probably still fewer chances of survival.* The vigorous growth of small organisms on surfaces fitted for the attachment of young oysters also tends to cause sediment to gather in such places in the interstices of the little organic forest, where the eggs of the oyster no doubt often become entombed or smothered by the crowded growth surrounding them.†

INTERFERENCE OF OTHER ANIMAL LIFE.—“We have called attention,” continues Mr. Ryder, “to the probable interference of small organic growths to the fixation of the young fry; in practice it is found that the larger organic growths which establish themselves on the collectors also become injurious. The two most conspicuous types are the sessile ascidians or tunicates and the barnacles. I have frequently found fully one-half of the surface of a slate covered with a dense colony of ascidians; in this condition a great percentage of available surface is lost which ought to serve for the attachment of spat. The surfaces so occupied would also be comparatively clean were it not for these organisms, which actually become a serious annoyance. They, like the oyster, affix themselves to the slates while still in the free swimming larval stage, since the surfaces designed for the oyster are equally well adapted to them. The barnacles, which also affix themselves in great numbers, become a nuisance for the same reason. The larval barnacle is an extremely active little creature, and dashes about in the water with great rapidity. As soon as it has completed this stage of its growth, it betakes itself to some object, to the surface of which it attaches itself by the head end, when a singular change takes place, at the end of which it is found that it has begun the construction of the curious conical shell which it inhabits. They grow very rapidly, so that in a couple of months the shell will already measure over half an inch in diameter. In this way farther inroads are made upon the room which should be taken up by oysters.

“Of course the larger types are not alone in taking up space, since infusoria, bryozoa, polyps, etc., are also culpable, as well as algae, such as diatoms and the higher forms. The only remedy for this accumulation of animal growths on the surfaces of the slates and other collecting apparatus, will be to have the frames which hold the slate in position so arranged that each tile, shingle, or slate can be removed, in order that it may be readily overhauled and these organisms removed from the surfaces which it is desired shall remain clean. This work would have to be done at intervals of every two or three weeks, and should be conducted with great care, so as not to remove the oysters which have affixed themselves along with the other things which it is the intention to destroy. The removal of the smaller forms from the surfaces of the slate would be more difficult, and attended with danger to the fry already attached. With this object in view, I would suggest the use of wooden racks or frames lying horizontally, which would receive the slates into deep notches made with a saw, so as to hold them vertically or edgewise, rendering their removal, for the purposes of cleansing, and their replacement, an easy matter. Other devices would no doubt answer the same purpose, and be more convenient even than the last. If posts were securely fixed in the bottom eight or ten feet apart, so as to project a foot or so above the water at the highest tide, a single board six inches wide, nailed against the tops of the posts edgewise, and extending from one to the other, would provide a simple arrangement from which to hang the slates singly, by means of galvanized wire fastened or hooked to nails partly driven into the board. By the help of this plan one man with a boat could overhaul many hundreds of slates in a single day, and effectually care for them for a whole season. This last contrivance would not answer well, perhaps, where there was a swift current, but would be a most admirable arrangement in still ponds or “claires”. In such places the whole area might be provided with posts grouped or placed in rows, so that when the attendant was at work he could pass in order from one row to the other in a narrow boat, or two attendants in one boat could take care of two rows, the ones on either hand, at the same time.”‡

FOOD OF THE OYSTER.—“The food of this mollusk, as is well known, consists entirely of microscopic beings and fragments of organic matter, which are carried by currents from the palps and gills, which have been already described, to the large mouth of the animal at the hinge-end of the shell. The inside of the gullet and stomach, like some other parts of the body, are covered with cilia, so that food once fairly in the mouth will be carried by their action down to the cavity of the stomach, where it is carried into the folds and deep pouches in its walls, and even into the openings of the bile ducts, to undergo digestion or solution, so as to be fitted in its passage through the intestine, to be taken into the circulation, and finally disposed of in building up the structures of the body.

“Along with the food which is taken, a very large amount of indigestible dirt, or inorganic matter, is carried in, which in a great measure fills up the intestine, together with the refuse or waste from the body. This material, when examined, reveals the fact that the oyster subsists largely on diatoms, a low type of moving plants which swim about in the water, incased in minute sandstone cases, or boxes, of the most delicate beauty of workmanship.

* According to estimates which I have made, based on the figures of the eggs of *Ostrea edulis*, given by M. Davaine, they are $\frac{1}{150}$ of an inch in diameter. Estimates based on the figures of Lacaze Duthiers give $\frac{1}{250}$ of an inch, while Möbius estimates the size of the young fry at $\frac{1}{150}$ of an inch.

†Op. cit., pp. 49-50.

‡Op. cit., pp. 50, 51, 52.

These, when found in the intestine, have usually had their living contents dissolved out by the action of the digestive juices of the stomach. I have found in our own species of oyster, the shells of three different genera of diatoms, viz, *Campylodiscus*, *Coscinodiscus*, and *Navicula*. The first is a singularly bent form; the second is discoidal; and the last boat-shaped, and all are beautifully marked. Of these three types, I saw a number of species, especially of the latter, but as I was not an authority upon the systematic history of any of them, I had to neglect the determination of the species. No doubt many more forms are taken as food by the oyster, since I saw other forms in which the living matter inside the silicious cases was brown, the same as in most of the preceding forms, which I have indicated. Some of these brown forms were so plentiful as to color a considerable surface whereon they grew of the same tint as themselves. But in no instance have I found any indications of the animal of the oyster becoming colored by feeding on these diatoms, as it is said the European oyster does when feeding on *Navicula ostrearia*, which is green, imparting its own green color to the fluids, and thus to the tissues of such oysters as may be so situated as to readily feed upon it. A recent writer* gives an account of some experiments made by M. Puysegur, of sissable in artificially producing this green color, from which I quote: "In each plate [filled with water charged with green diatoms], according to its size, we put three to six perfectly white oysters which had never been in the 'clears', and the shells of which had been previously washed and brushed clean. In similar plates, like numbers of the same oysters were laid in ordinary sea-water. Twenty-six hours after the commencement of the experiment the oysters in the water charged with diatoms had all acquired a marked greenish hue; the other oysters remained unaltered. * * * After the oyster had turned green it was laid in ordinary sea-water for a few days, when the greenness disappeared altogether. It reappeared when the oyster was replaced in fresh water containing *Navicula ostrearia*." M. Decaisne, of the *Jardin des Plantes*, Paris, repeated the experiments with the same results.

"Beside the diatoms, the spores of algæ, the larvæ or young of many animals, such as sponges, bryozoa, hydroids, worms, mollusks, many of which are small enough to be taken in by the oyster, though their bodies in most cases being soft and without a skeleton, it is impossible to find any traces, either in the stomach or intestine, of their remains, to indicate that they have formed a part of the bill of fare of the animal. What, however, demonstrates that such small larval organisms do help to feed the oyster, is the fact that at the heads of the small inlets or creeks along the Chesapeake, where the water is but little affected by the tides and is somewhat brackish and inclined to be stagnant, there always appears to be a relatively greater development of a somewhat characteristic surface or shallow water fauna of minute forms.

"In St. Jerome creek the microscopic fauna of its headwaters is entirely different from that of the body of the creek; two minute forms inhabit in vast numbers the former, while I sought in vain for them in the more open and changeable waters of the main body of the inlet, which are brought into active movement twice a day by the action of the tides. One of these forms, an infusorian,† one-twenty-fifth of an inch in length, was found covering every available surface of attachment, so that countless multitudes of the naked young would be swimming about in the water previous to building the curious spiral tubes which they inhabit—admirably fitted in this state as food for the oyster. Beside the type referred to, there were a number of other infusorians, which in their so-called swarming stages of development, the young would become available as oyster-food. Of such types I noticed four different species, either belonging or very nearly related to the genus *Colthurnia*; all of the forms built tubes for themselves. I also noticed several forms of bell animalcules, the swarms of which would become available as food for the oysters lying in the vicinity.

"The diatoms did not seem to me to be more abundant in the headwaters than in the open creek. There was one moss animal of remarkable character, which I found in the headwaters only. This creature was very abundant, and no doubt its embryos, like those of the infusoria referred to, were available as food.

"Of free-swimming infusorians, I noticed a number of genera; one especially attracted my attention from its snake-like appearance and singularly rapid contortions; it had a tuft of vibrating hairs or cilia at the head end in close relation with the mouth. Another more abundant type was the curious genus *Euplotes*, with a thick shell inclosing the soft protoplasm of the body; the latter was of an oval form, flat beneath and rounded on the back, so that the resemblance, when the large foot like cilia were in motion, carrying the animal about, was strikingly like a very minute tortoise, the resemblance being heightened when the animal was viewed from the side.

"Rod-like algæ, of minute size, the larvæ of crustacæ, especially the vast numbers of extremely small larval copepoda, must enter as a perceptible factor into the food-supply of the oyster.

"There is no doubt but that the comparatively quiescent condition of the headwaters of these inlets and creeks, available as oyster-planting grounds, are more favorable to the propagation of minute life than the open bay or creeks, where the temperature is lower and less constant. Practically, this is found to be true, for oystermen seem to be generally agreed that oysters "fatten" more rapidly, that is, feed more liberally in the headwaters—blind extremities of the creeks—than elsewhere. This notion of the oystermen is in agreement with my own observations during the past year. Oystermen also assert that oysters "fatten" more rapidly in shallow waters than in deep ones, a point upon which I made but few observations; but such as I did make tended to confirm such an opinion.

* The Green Color of Oysters, H. M. C. *In Nature*, vol. xxi, pp. 549-50, 1880. Translated from the *Revue Maritime et Coloniale*, February, 1880.

† On the occurrence of *Freia producta* (Wright), in the Chesapeake bay.—*American Naturalist*, 1880, pp. 810, 811.

In illustration, I may contrast the condition of the oysters in the pond leased by the commission at St. Jerome and those dredged off Point Lookout, in twenty or thirty feet of water, on the 3d day of October, 1880. The oysters in the pond, by the middle or end of September, were in good condition as to flesh, and marketable, while those from deeper water off Point Lookout, and but little later in the season, were still extremely poor, thin and watery, and utterly unfit for market. These differences in condition, it seems to me, are to be attributed in a great measure to differences of temperature and the abundance of food, but mainly to the latter.*

GROUND-ICE.—North of Long Island an enemy is found, which does not exist in the milder south, in the shape of "ground-ice" or "anchor-frost". It is little understood, though often experienced, and I was able to collect only vague data in regard to it. It appears that in hard winters the bottom of the bays freezes solid in great patches, even at a depth of 15 or 20 feet. The mud freezes so hard that rakes cannot be pressed into it; and if a stronger implement, like a ship's anchor, is able to penetrate it, the crust comes up in great chunks. These frozen patches are sometimes 40 feet square and continue unthawed for long periods. When such "anchor-frost" takes place at an oyster-bed, of course the mollusks are frozen solidly into the mass, and few of them ever survive the treatment. To the Cape Cod planters this is a serious obstacle to success.

* *Op. cit.*, pp. 19-23.

III. GLOSSARY OF TERMS.

W. AN OYSTERMAN'S DICTIONARY.

63. PHRASES AND WORDS DESCRIPTIVE OF MOLLUSKS AND OTHER INVERTEBRATES OF THE ATLANTIC COAST.

- ABALONE.**—Sea ear-shells, *Haliotis*, of various species, chiefly *H. Cracherodii*. (Southern California.)
- ABALONE-MEAT.**—The dried animal of *Haliotis*. Used as food, and exported in large quantities, annually, in a dried condition. (California.)
- ABALONE-SHELLS.**—The shells of *Haliotis*, prepared for commerce. Extensively used in the manufacture of buttons and other articles, and for ornamental purposes. (California.)
- AMBULANCE.**—A box with bottom and top of wire netting, in which the “collectors”, covered with young oysters, are placed to protect them from their enemies, while the water is freely admitted. (France.)
- ARK.**—A house on a scow or other floating hulk, used as a work- and store-house in winter. (Connecticut.) See *Scow*.
- BANK.**—The oyster colony or locality where they grow. (South.) See *Bed, Rock, Bar*, etc.
- BARNACLE.**—The slipper-limpet, *Crepidula* sp.; also, true barnacles. (Cape May, New Jersey.) At Cape May limpets are called “barnacles”, and confounded by many with the true barnacles. They grow very fast, apparently, for I have seen them fully half-size on the new year's growth (or “bill”) of an oyster, showing that they attained all that size in a single season. When limpets grow on oysters the planter knows the oysters are doing well, and he expects them to prove fat and highly profitable. The explanation, I suppose, is that the attachment of limpets shows the oysters to be free from slime—clean and healthy—or the limpet spawn would not be able to attach itself.
- BASKET-FISH.**—*Astrophyton Agassizii*, a kind of many-armed starfish.
- BATEAU.**—A small, flat-bottomed boat, like a sharpie, used for moving about the oyster-beds, for clamming, and other light work. (Staten Island.)
- BEACH LA MAR.**—The Beche le Mer, or Holothurian. (Florida reefs.) See Rathbun's Report on Commercial Radiates.
- BEARD.**—I. The finely-fringed margin of the oyster's mouth, which shows near the edges of the shells.
- BEARD.**—II. The protruding byssus of mussels.
- BED.**—The *bank, reef*, or deposit of oysters in the water, either growing naturally or artificially, original or transplanted.
- BEDDING.**—Transplanting oysters of any size to beds prepared for them, from which they are to be removed before the frosts of the ensuing winter. See *Fatten*.
- BEDDING-DOWN.**—See *Bedding*.
- BENCH.**—The broad, sloping platform which runs around the walls of an opening-house, where the oysters are piled for opening. Sometimes a movable table, etc., for opening oysters.
- BENCH-OYSTERS.**—Those sold at a restaurant or lunch-counter, to be opened for “plate” or “half-shell” custom. See *Fancy, Extra*.
- BLACK MUSSEL.**—*Mytilus borealis*, a variety of *Mytilus edulis*.
- BLISTER.**—A young oyster, not larger than a quarter dollar. See *Spawn, Spat*. (Barnegat to Cape May.)

- BLOCK.**—The lignum vitæ conical block, having an iron chisel fixed in its top, upon which oysters are broken before being opened. (New York.)
- BLOOD CLAM AND BLOODY CLAM.**—The same as *Blood Quahaug*.
- BLOOD QUAHAUG.**—The young and small specimens of various species of *Arcada*, supposed to be choicest food of the starfishes. (Narraganset bay.) See *Hair Clam*.
- BLUE POINTS.**—Oysters originally found off Blue Point, eastern end of Great South bay, Long Island, but now applied to all oysters from any part of the south shore of Long Island, whether native or transplanted, eastward of Babylon.
- BOARD-BANK.**—A platform set in the bank, or otherwise arranged so as to be alternately covered by tide and flooded with fresh water, for freshening oysters before selling. (Cape May.) See *Platform*.
- BOAT.**—The little mollusk, *Crepidula fornicata*. (New Haven.) See *Deckhead*.
- BORER.**—I. The *Urosalpinx cinerea*. (New England.) See *Drill, Snail-bore*, etc.
- BORER.**—II. A sponge, *Cliona sulphurea*, which eats into oyster-shells.
- BOX.**—A measure for oysters, equal to one-fourth of a barrel; an oblong, shallow box, with cleates as handles nailed on the ends. (Mobile to Texas.)
- BOX-OYSTER.**—An oyster from seven to ten years old, of round, handsome shape, not less than 3 inches wide and 5 inches long. (Connecticut and New York.) See *Extra*. The name is due to the fact that many years ago it was customary to ship oysters of this grade to New York in boxes instead of the ordinary barrel.
- BOX-STEW.**—A stew made of box-oysters. (New York.)
- BREAKING.**—In Baltimore, the chipping of the shell preparatory to opening an oyster. See *Cracking*.
- BROGAN.**—A kind of large boat used by the oystermen of the Chesapeake.
- BRUISER.**—A short paddle used for beating sponges in process of cleaning. (Florida.)
- BUCKET.**—A wooden, firkin-shaped, covered receptacle for shifting oysters; of variable capacity.
- BUGEYE.**—A flat-bottomed, center-board schooner of three to fifteen tons, built of heavy timbers, without a frame. A bugeye is always decked over and has a cabin aft. (Chesapeake.)
- BULL-NOSE.**—An old, overgrown, heavy quahaug, unfit for food. (Cape May.)
- BUNCH OYSTERS.**—Those growing in clusters. (South.) See *Raccoon Oysters*.
- BUOY.**—To *buoy* or *buoy-off* a certain piece of water area, means, in Rhode Island, to seclude it from being fished as long as the authorities deem proper. The area so secluded is indicated by a limit-line of buoys.
- BUSHEL-BARREL.**—A barrel cut in two, holding about 1½ bushels of oysters, and used as a measure.
- BUSHEL-OYSTERS.**—See *Cullenteens*.
- BUTTER-FISH.**—The long neck clam, *Mya arenaria*. (Virginia.) See *Soft Clam, Maninose*, etc.
- CALICO CLAM.**—See *Sun Clam*. (Florida.)
- CAPIES.**—Oysters from Cape Cod and Buzzard's bay. Also, (particularly in the case of the latter) known as "*Natives*". (Boston.)
- CARRIER.**—I. A man who makes his living by unloading the boats and carrying oysters into the warehouse scows. (New York and New Orleans.)
- CARRIER.**—II. An oyster which will endure transportation well. (Trade term.)
- CHAPLET.**—A string of shells or other oyster-spat collectors suspended on wire. (France.)
- CHEEKS.**—Edible parts of the sea-clam, *Mactra solidissima*. (Cape Cod.)
- CHORNIE RAKOOSHKA.**—*Mytilus edulis*. (Russian of Alaska.) "Black shells", literally.
- CLAIRE.**—An excavation, "more or less deep, having a muddy or marly bottom, close to the edges of the sea-board, through which the sea-water passes into them. * * * In these claires they assume that green color [formerly] so much prized by the French".—*Asplet*.
- CLAM.**—A smooth-shelled, bivalved mollusk. This word is popularly of wide application, and is a corruption, apparently, of the word "clamp", preserved in the name of a huge East Indian species, and which sometimes attains the weight of several hundred pounds, and is used as a font for holy water in many churches, and for domestic purposes. The common "clam" of New England is the *Mya arenaria*; of New York and New Jersey, the *Venus mercenaria*. Many kinds are distinguished by an additional definitive word, prefixed, as beach-clam (*Mactra*), etc. On the Pacific coast there are many native "clams", chiefly a species of the *Saxidomus*.
- CLAM-CRACKER.**—A fish, a species of ray, *Rhinoptera quadriloba*, which molests the oyster-beds. (Savannah.)
- CLAM-SCRAPER.**—See *Drag-rake*.
- CLAM-TONGS.**—"Differs from oyster-tongs only in the width of the head, which averages 3½ feet."—New York, 1855. At the present day, the tongs used for gathering clams.
- CLINK SHELL.**—A name applied to various mollusks of the genus *Anomia*.
- CLUCKER.**—An oyster injured by chill, or otherwise, so as to sound hollow when its shell is struck. In England this word is spelled *Clock*; a dealer in London wrote, "The last oysters lost their sea-water, and became clocks and worthless."
- COLLECTORS.**—An arrangement of arched tiles, piles of stone, hurdles, or anything similar, to collect and give lodgment to the spat. (Europe.)

- COLANDER.—A large perforated tin basin, similar to the cooking utensil of the same name, only three or four times as large, in which the oysters are washed.
- CONCH.—Various large, univalved, and spiral mollusks, particularly *Fulgur carica*.
- COON-HEEL.—A long, slim oyster. (Connecticut.) See *Razor-blade*, *Shanghai*, *Rabbit's-ears*.
- COON OYSTER.—Small, shapeless, worthless stock, growing in heavy clusters along the salt marshes, or forming great bars. (Southern coast.) At Cape May the word is restricted to young oysters caught on the sedges.
- COT.—See *Finger stall*. (Baltimore.)
- COUNT.—I. Method of selling oysters in Philadelphia and New York, by enumeration instead of measurement.
- COUNT.—II. In respect to terrapins, one of full size, *i. e.*, six inches long; two or three small ones will make a "count". (Savannah.)
- COUNT-CLAMS.—Quahaugs large enough to count 800 to the barrel. (Keyport, New Jersey.)
- COVE-OYSTER.—"The term *cove-oyster* has a trade-signification differing from that in which it is understood by the oysterman. The packer, by *cove-oysters*, simply means steamed oysters packed in hermetically sealed cans. They may be, in fact they are, of any and every size and quality. By 'cove-oysters' the oysterman means the single oysters scattered through the bays and creeks and old planting-grounds, occurring too sparsely to be taken by the ordinary methods of tonging. When the water is clear and smooth the oysterman moves slowly over these grounds, and when he 'sights' an oyster, which he can readily do in from 4 to 7 feet water, or even more, he picks them up singly with a pair of nippers. These oysters, as might be expected, are large, fat, and of good shape. They class as 'selects' and bring 'top' prices in the market, from 60 cents to \$1 per bushel."—*Colonel M. McDonald*. (Chesapeake bay.)
- COVING.—The business of picking up "cove-oysters" (q. v.) with nippers. (Chesapeake.)
- CRACKER.—One who opens oysters by first breaking the shell with a hammer.
- CRACKING.—The breaking of the oyster-shell before extracting the oyster. See *Breaking*.
- CRACKING-IRON.—A piece of hard iron, $\frac{1}{8}$ inch thick, 2 inches long, and 1 inch wide, set upright in the bench upon which the opener rests the oyster, while he breaks the edge of the shell off with his hammer. (Fairhaven.)
- CRAWL.—I. A pen or *corral* made of upright stakes wattled together, intended to hold sponges while being cleaned; or turtles awaiting a market. (Florida.)
- CRAWL.—II. The track of a sea-turtle to its nest. (Florida.)
- CULL-BOY.—A boy who goes in the small boat with tongers to pick over the oysters. (Virginia.)
- CULL-BOARD.—A heavy board laid athwart the gunwales, or elsewhere, upon which the oysters are broken apart and sorted.
- CULLENS.—See *Cullins*.
- CULLER.—One who picks over oysters, or *culls* out the worthless and smaller ones; usually a boy.
- CULLINS.—See *Cullings*.
- CULLINGS.—The poorer oysters remaining after the *culls* have been picked out.
- CULLING-TOOL.—A straight, stout, blunt, but thin-edged instrument of steel, about 10 inches long, having the heavy butt wound with cord to form a handle, used for knocking and prying apart a cluster of oysters. It is like an exaggerated and very heavy oyster-knife. But various rougher tools, of no particular form, are used for the same purpose.
- CULLINTEENS.—The smaller grade left after "extra", "box", and "cull" oysters have been picked out. (Norwalk.) Formerly called "bushel oysters".
- CULLS.—Culled-out oysters; the next to the poorest grade; 4 to 5 years old. (New York and East river.)
- CULTCH.—The shells, gravel, fragments of brick, or any other material placed in the water to catch the spawn of the oyster. See *Cutch*.
- CULTIVATE.—To raise oysters artificially from spawn, or from transplanted young. See *Plant*.
- CUNNER.—A canoe. (Chesapeake.)
- CUTCH.—An American spelling of *cutch*.
- CUT-OUT.—I. To open oysters. (Providence river.)
- CUT-OUT.—II. In respect to scallops, to open them, or remove the edible part from the shells. (Rhode Island.)
- CUTTER.—One who opens scallops on the boat, as they are dredged, and extracts the edible portion. (New England.)
- DRAG.—I. See *Dredge*. (Norwalk.)
- DRAG.—II. To dredge.
- DRAG-RAKE.—A large, heavy rake, having teeth crowded and much curved, which is often dragged (principally in search of clams) like a dredge. (New England.)
- DECK-HEAD.—The *Crepidula*. (East river.) See *Slipper-limpet*, *boat*.
- DESIGNATION.—The right to plant oysters on a certain piece of ground *designated* by oyster-commissioners or other authority (Connecticut); also, the plat of ground itself.
- DEVIL-FISH.—Cuttle-fishes, chiefly octopods.

DREDGE.—"A scoop-net, with a heavy, rectangular iron frame for scraping the sea-bottom. The frame is about three times as long as high, the two longer sides having sharp edges and serving as scrapers. The net is of heavy twine, or of iron chain-work. The rope by which the dredge is manipulated is fastened to the ends of two handles, reaching forward from the ends of the frame."—*Rathbun*.

DREG.—Corruption of *dredge*.

DINGY.—A small, sharp-prowed, flat-bottomed boat, with a miniature center-board, and half-decked; used for running about the grounds in, and back and forth from vessels at anchor. (Southern.)

DRIFT.—The distance gone over while making a single haul of the dredge or dredges.

DRILL.—A small mollusk, the *Urosalpinx cinerea*. See *Borer*.

DRINK.—To give oysters a "drink" is to place them in fresh water, over one or more tides, in order that they may expel the salt-water from their systems and imbibe the fresh water. This results in an increase of size and plumpness. This, however, only lasts for a few days. At the end of this time the oysters become lean again, for the increase in size is due to no material growth of flesh, but due entirely to the absorption of moisture. The tissues of oysters, when first taken, are saturated with the ocean brine, and when removed to fresh water, or that which is less salt, the external liquid passes inward more rapidly than the more saline and denser elements within can escape; the effect being simply to cause the oyster to swell, with no increase of its virtues. When the water in which the oyster is immersed is too fresh, it loses its flavor. It has been suggested, that by immersing the oysters for some days in concentrated brine, and then removing them to ocean water, the plumpness would be gained without the sacrifice of the saltness which is so agreeable to the epicure. A simple method of ascertaining whether the oysters increase in flesh or not, would be to take 100 or more from a given locality on the sea-coast, and drying them at 220° Fahrenheit and ascertaining their average weight, and then repeating the process for the same number of like oysters after transplanting.

DRUDGE.—See *Dredge*.

DRUGGED.—Past tense of *drag* (q. v.). A Connecticut man told me: "I heaved my drudge over and drugged the whole lot."

EAST RIVERS.—Oysters grown between New Haven, Connecticut, and New York.

ETALAGE.—A place on shore where oysters are stored for sale. (France.)

EYE.—I. Of a scallop, the edible adductor muscle. (Long Island.) See *Heart*.

EYE.—II. The colored circular mark or cicatrix in the interior of an oyster-shell, near the hinge, where the adductor muscle was attached.

FALL.—A deposit or *set* of spawn, or infant oysters. Used also as a verb. (South of England.)

FANCY OYSTERS.—Superior grades kept at retail, to be opened on the counter and eaten raw. In New York these are "Saddle-Rocks", "Blue Points", etc. See *Bench*.

FATTEN.—To place oysters on floats or in fresh water, just before marketing. See *Drink*.

FATTEN.—To bed down for growth; also to plant. Not good usage, because confusing.

FEATHER-EDGE.—The new thin growth added to an oyster-shell each season. See *Bill*.

FIRSTS.—Box-oysters. (New Jersey and New York city.)

FISH.—To fatten. (South of England.)

FINGER SPONGE.—Applied to various slender, branching forms; unmarketable. (Florida Keys.)

FINGER-STALL.—In Fairhaven, the protection (of rubber or of twilled cotton) worn on the left hand in opening. See *Cot*.

FIVE-FINGER.—A starfish.

FLAT.—A flat-bottomed, square-sterned boat used by the oystermen in Prince Edward island.

FLOAT.—A platform of planks, upon which oysters are piled and subjected to fresh water, before being taken to market. See *Fatten*.

GARVEY.—A small scow, used to plant oysters, and take them up in for market. (Barnegat, New Jersey.)

GAUCH.—Offal resulting from culling and opening scallops. (Greenwich bay, Rhode Island.)

GINGLES.—Various species of *Anomia*. (Long Island sound.) See *Gold-shells*; *Silver-shells*.

GLOVE SPONGE.—One of the poorest grades of Florida commercial sponges, *Spongia tubulifera*.

GOLD-SHELL.—A species of *Anomia*.

GOUGE.—The *Pinna* shell (Gulf of Mexico); also the *Vermetus*. The reason is, in each case that, lying buried in the sand, when they are stepped on by the bare-feet they make an ugly, gouging wound in the foot.

GRAIN (or GRANE?).—A fish-spear. (South.) This is a ship term; in Florida the turtle-grains have only one prong and one barb (half a barb) when anything but a "peg" is used. The fish-grains most approved have two prongs, each half barbed inwardly, and detachable from the pole when the fish is struck.

GRANT.—Stipulated area "granted" by the state for oyster-culture. (Massachusetts.)

GRASS-SPONGE.—An inferior grade of Florida commercial sponge, *Spongia cerebriformis*. (Florida Keys.)

GRAVETTE.—The oyster of the bay of Arcachon, France; so called "from the impressions they make on the sandy bottom".

- GRAY-BEARD.**—The common hydroid of northern oyster-beds, *Sertularia argentea*.
- GREEN-GILL.**—In Richmond and Petersburg, and on the York river in Virginia, are to be found in the markets what are called "green-gill oysters". Some say they are diseased, and refuse to eat them; but the oystermen claim that they are perfectly wholesome, but admit that they do not sell very well, because of a prejudice against them. The negroes claim that they are the best in Richmond, and that they are made green by their being found with the green sea-weed.
- GULLY OYSTERS.**—Those caught on shoals, etc. (Mobile.)
- HAIR.**—Hydroids. The "hair" that oystermen assert grows on their oysters under certain circumstances, is an animal growth, which attaches itself to the shell, and is nothing put out by the oyster itself.
- HAIR-CLAM.**—Adult specimens of the various species of *Arcadea*. See *Blood Clam*.
- HALF-DECK.**—The slipper limpet, *Crepidula fornicata*.
- HALF-MEASURE.**—A tin receptacle for the meats of opened oysters, holding $2\frac{1}{2}$ quarts. (New Haven.) See *Measure*.
- HAMPER.**—An oyster-basket holding two bushels. (New York.)
- HANG.**—To hang an oyster boat is to thrust a pole down beside it into the mud and cling to it, without tying. (Canada.) I, A, 3.
- HARD-OYSTER.**—The northern "native" oyster. (Staten Island sound.)
- HEEL.**—The umbo of a clam-shell. (Long Island, south shore.) Behind it is to be found "the print of a clam". This distinguishes the quahaug from other bivalves, according to the fishermen.
- HOKER.**—I. In sponging, the man who hooks up the sponges from the bottom. (Florida reefs.)
- HOKER.**—II. A tool of any size, consisting of a rod of tough iron, bent into more or less of a hook at the end, used to pull out the racoon oysters, and knock the bunches to pieces. (Georgia.)
- HORSE-CONCH.**—The largest species of Triton. (Florida reefs.)
- HORSE-MUSSEL.**—A large species of mussels, *Modiola modiolus*.
- HUSK.**—To remove the shells from an oyster, or "open" it. (Georgia.)
- HUSKS.**—Oyster-shells.
- JAG.**—A lot, parcel, or quantity of oysters of indefinite size; *e. g.*, "I sold a jag of 75 bushels to A, B & Co."
- JINGLE.**—Any species of *Anomia*. (Long Island sound.)
- KETTLE-BAIL.**—A dredge used in catching scallops, which has the blade adjusted to swing in the eyes of the arms, in order to prevent its sinking into the mud of the soft bottom on which it is used. (Rhode Island.)
- KITCHEN-OYSTER.**—Small oyster for cooking. (New Orleans.)
- KNIFE-HANDLE.**—See *Razor-fish*. (Massachusetts bay.)
- LADLE-SHELL.**—Mollusks of the genera *Fulgur* and *Sycotypus*.
- LAYER.**—An artificial oyster-bed. (England.)
- LINE-CONCH.**—A species of mollusks, *Fasciolaria distans*. (Florida reefs.)
- LITTLE RED CLAM.**—Common name for quahaug, *Venus mercenaria*.
- LOADED.**—An oyster is said to be *loaded* when it is coated with annelid tubes. See *Sand Up*. (Rhode Island.)
- LONDON STOCK.**—Oysters culled out for the foreign market; about three years old, small, round, and cup-shaped. See *Cullins*, etc.
- LONG CLAM.**—See *Razor-fish*. (Massachusetts bay.)
- MEADOW MUSSEL.**—In Great South bay, Long Island, the *Mytilus plicatula* which grows on the tide-flats.
- MEASURE.**—A round tin receptacle for meats, holding five quarts, used in the opening-houses. (New Haven.)
- MEAT.**—The fleshy, edible part of an oyster, or other mollusk.
- MILK.**—The spat before it is discharged from an oyster, and is said just before and during spawning to be "in the milk".
- MILKY, OR MILCHY.**—To be "in the milk", *i. e.*, ready to spawn.
- MUSSEL.**—Mollusks of the family *Mytilidae* and genera *Mytilus* and *Modiola*. See below.
- NATURALS.**—Oysters of natural growth; wild, not planted. (New Jersey.)
- NET-FISIL.**—A species of orphiuran or serpent skin, *Astrophyton, Agassizii*. See *Basket-fish*.
- NIB.**—The tender, growing, posterior end. (Prince's bay.)
- NIPPERS.**—Tongs having at the end not a rake-head with many teeth, but only one tooth, or a very few teeth, so as to act as pincers; used in picking up solitary oysters, which can be seen and aimed at. (Chesapeake.)
- OLD MAID.**—The soft-clam, *Mya arenaria*. (South of England.)
- OPEN.**—To remove the meat from the shell of a mollusk. See *Out out*.
- OPENER.**—One who opens oysters for trade. See *Sticker*; *Side-opener*.
- OPENING-HOUSE.**—A place where oysters are opened.
- OYSTER.**—A mollusk of the family *Ostreidae* and genus *Ostrea*; also, some allied forms distinguished as "pearl" oysters, etc. They are scattered over the whole world, and through the geological record since Jurassic time. In the United States only one species, *Ostrea virginiana*, is now recognized as edible; but this appears in market under a long and diverse set of names, derived from the district or bed where the particular variety grew. See particularly the chapter on the natural history of the oyster, *infra*.

- OYSTER-CAN.**—The tin receptacle, holding from one pint to four quarts, in which oysters are packed for shipment. These may be square or round, and of various shapes. The industry of can-making is perhaps the greatest auxiliary of the oyster-trade. In the chapter on the oyster-trade of Maryland and Baltimore, statistics are given to show how enormous is the industry there. In New England all the retail trade is carried on by means of cans, in which the opened oysters are delivered raw to the consumers, either in the city or outside, by railway express. In 1878 a company was formed in Boston to manufacture tin cans, with a capital stock of \$25,000. In 1879 they made about 150,000 oyster-cans, distributed as follows: Of four-quart size, 15,000; of two quart, 30,000; of one-quart, 90,000; of one-pint, 15,000. Including the waste, the amount of tin used was nearly 65,000 pounds. This is nine-tenths of all the cans made in Boston, the total manufacture amounting to about \$5,000 worth a year. Providence and Fairhaven use, perhaps, an equal number of cans.
- OYSTER CRAB.**—The female of the *Pinnotheres ostreum*, found parasitic in the gills of oysters from Massachusetts southward.
- OYSTER-GRASS.**—The kelp and other sea-weeds which attach themselves to oysters and mussels, or grow on the beds. (Cape May.)
- OYSTER-GLOVE.**—A leather palm or mit worn as a protection for the hand in opening oysters. See *Cot.* (Georgia.)
- OYSTERING.**—Fishing for oysters.
- OYSTER-HAMMER.**—A square, blunt-headed hammer of medium hard iron, used to break the shell of the oyster before opening. (Fairhaven.)
- OYSTER-KEG.**—A small wooden keg for transporting raw oysters; now gone out of use. (Connecticut.)
- OYSTER-KNOCKERS.**—Double-headed hammers used for culling oysters and prying apart the bunches. See *Culling-tools.* (Cape May.)
- OYSTER-PAIL.**—A wooden receptacle with a locked cover, used in transporting raw oysters. They hold from four to six gallons each, and cost from 75 cents to \$1 each. They are made chiefly at Fairhaven, Connecticut; Jamestown, New York, and Brooklyn, New York, and are of various patterns, with several patented devices for securing the cover. These pails are returned to the wholesale dealer by his customers.
- OYSTER-PALM.**—See *Oyster-glove.*
- OYSTER-RAKE.**—See *Rake.*
- OYSTER-SACKS.**—Sacks or bags of coarse gunny-cloth, holding about 1½ bushels. Used chiefly near Philadelphia, in place of barrels.
- OYSTER-SIGN.**—A large letter "O" plainly painted on a board affixed to a stake, to mark the boundaries of marsh-land claimed for oyster-culture. (Georgia.)
- OYSTER-TONGS.**—See *Tongs.*
- OYSTER-TUB.**—A large wooden receptacle for transporting raw oysters. It has a cover which may be locked down, and is simply an oyster-pail of large size.
- PACKER.**—One who buys oysters from the planters and packs them in barrels for shipment to Europe. (Long Island.)
- PANAMA-SHELLS.**—Mollusks of the genus *Voluta.* (Florida reefs.)
- PARC.**—A sunken bed, wherein oysters are placed for reproduction and growth, which is filled with water by each high tide. (Europe.) There are French and Italian pares. In England the word is spelled *park.*
- PARK.**—See *Pare.*
- PEG.**—A square, sharp-pointed iron spear, used in striking turtles. (Florida.)
- PEGGING.**—Spearing green turtles. (Florida.)
- PENNYWINKLE; PENNYWINKLER.**—The mollusks of the genera *Fulgur* and *Sycotypus*, interchangeably.
- PERIWINKLE.**—I. *Littorina littorea.* (England and in America, from New Haven, Connecticut, northward to the Gulf of St. Lawrence.)
- PERIWINKLE.**—II. The *Sycotypus canaliculatus*, a large pear-shaped mollusk, destructive to the oyster. Also known as *Winkle* and *Wrinkle.*
- PICK.**—To gather wild oysters for seed from the muddy shores at low tide. (Georgia.)
- PINCHED.**—Long, slender growth.
- PINPATCHES.**—*Littorina littorea.* (Suffolk, England.)
- PLANT.**—I. To place oysters on artificial beds, intending them to survive the winter, attain full size, and spawn. See *Cultivate.* In Connecticut the term is applied only to southern oysters laid down for the summer. See *Bed.*
- PLANT.**—II. An oyster which has been "bedded", in distinction from one of natural growth. The name of the original locality is usually prefixed, as "Virginia plant". In Boston the term is generally applied to oysters that have been transplanted to Providence river. In some localities, also, by "plant" is meant a young oyster suitable for transplanting. See *Seed.*
- PLANTATION.**—Cultivated areas of oyster-bottom; a common and legal term in the state of Delaware.
- PLATFORM.**—The planked floor on the bank, where oysters are laid out to freshen before selling. (Atlantic county, New Jersey.)

POMPANO-SHELLS.—Mollusks of the genus *Donax*. (Florida gulf.) Eaten by the pompano.

PROG.—To search for clams, etc., along the shore in a desultory way. (Connecticut.)

PROGGER.—One who digs clams and searches for other sea-life alongshore, in a desultory and unbusiness-like way. A man who persistently gets his living this way is generally a good-for-nothing fellow, and is said to “follow the creek”. (Connecticut.)

QUAHHAUG.—The “hard” or “round” clam, *Venus mercenaria*. An Algonquin word, spelled in various ways, and usually wrongly pronounced *ko-hog*.

RABBIT-EAR.—A long, slender oyster. See *Coon-heel*.

RACCOON OYSTERS.—Wild oysters, growing naturally on muddy banks, exposed at low tide; and owing to their luxuriance and crowded condition, long, slender, and shapeless; or very diminutive. (Southern coast.)

RAKE.—An instrument for lifting the oyster from the bed; shaped much like the agricultural implement of the same name, but all iron except the handle, and having tines straight, and from 6 to 12 inches long, or curved into a half circle. The rake is an ancient device. In 1748 Baron Kalm crossed New York bay, and notes the following sentence: “We saw many boats, in which the fishermen were busy catching oysters; to this purpose they make use of a kind of rake with long iron teeth bent inward. These they used either single or two tied together in such a manner that the teeth were turned toward each other”. The rake is used in deeper water than the tongs (which see), and is more serviceable in catching quahaugs than oysters; indeed, it is now rarely used for the latter, except in Buzzard’s bay, Massachusetts. With it the oysterman can alternately push his boat along and then pull the rake toward him, and thus take all the mollusks that lie in his path.

RAZOR-BLADE.—A long, slim oyster. (Connecticut.) See *Coon-heel*.

RED-BEARD.—The red sponge, *Microciona prolifera*, Verrill, commonly growing on northern oysters. Consult Verrill’s *Invertebrates of Vineyard Sound*, [741] 447.

REEFER.—A natural reef-growing or untransplanted oyster. (Mobile to Texas.)

RIDDLE.—To sift the young oysters and cultch on a bed by means of coarse-netted dredges. (Norwalk.)

RIM.—The worthless part of the scallop flesh, remaining after the edible portion has been cut out. (Rhode Island.)

ROCK.—A growth of native oysters massed into a rock-like bottom or ridge. (Chesapeake and southward.)

ROCK-OYSTER.—An oyster found growing upon a rock, as distinguished from those found in beds; wild growth.

ROLLING JOHN.—A detached sponge drifting about the bottom. (Florida.)

ROUGH CULLING.—Hasty separation, throwing out only dead shells and largest trash. (Virginia.)

ROUGH WHELK.—A small mollusk, the *Urosalpinx cinerea*. (Chesapeake.)

RUCHE.—A pile of arched tiles, loosely placed, to catch and lodge oyster-spawn; one form of *collector*, q. v. (France.)

RUFFLE.—The connected egg-capsules of the periwinkles.

RUNNER.—Vessels engaged in transporting oysters from the grounds to the market; they also buy the stock they carry. (Chesapeake.)

SADDLE-ROCK OYSTERS.—A trade name in New York for the largest and finest oysters.

SAND.—To bury oysters beneath drifting sand or mud.

SANDING.—I. The burying of oysters under storm-drifted sand or mud.

SANDING.—II. In some parts of Rhode Island they say an oyster is *sanded* or *sanded up*, when it is thickly coated with annelids’ tubes, and the mud which has gathered among them.

SAND-OYSTERS.—Single scattered oysters found on leeward sandy shores. (Chesapeake.)

SAND-SUCKER.—Poliothurians, Nereids, and other soft animals buried in the low-tide sand, and showing tentacles. (Florida, Gulf coast.)

SCHLEFFER.—Cart-boys or Arabs, who peddle a mean quality of oysters (Maryland stock) about the streets of Baltimore.

SCHOONER-BASKET.—A basket holding three-fourths to seven-eighths of a bushel, used in measuring oysters to be sold out of vessels. (New York.)

SCALLOP.—An edible mollusk of the family *Pectenidae*, genus *Pecten*. Several species in the United States.

SCALLOPER.—A scallop-fisher.

SCALLOPING.—Fishing for scallops.

SCALLOP-NET.—The small dredge used in catching scallops. (New Bedford.)

SCOOP.—A light kind of dredge. (Chesapeake.) See *Scraper*.

SCOW.—See *Ark*. Also called *Scow-house*.

SCRAPER.—A small dredge. Chiefly spoken of with reference to scallops. (New England.) See *Dredge*, *Scallop-net*, and *Kettle-bail*. A writer in a New York journal, in 1855, describes this dredge, which was chiefly used there in cleaning old planting-ground, thus: “A singular-looking instrument, somewhat resembling a scythe, with this exception, that at one side of the blade a large bag, constructed of iron ring-work, is attached. Into this all the sowings of the bed, cleaned off with the front of the blade, fall, and the whole is hauled up at regular intervals.” See *Drag-rake*.

- SCULLER.—In sponging, the man who manages the small boat, while the hooker (q. v.) works. (Florida reefs.)
- SEA-CAP.—A basket-shaped sponge, often of great size. (Florida reefs.)
- SECONDS.—Oysters of second market grade; cullens. (Northern cities.)
- SEED.—Infant or young oysters suitable or intended for transplanted growth in artificial beds. See *Set* and *Plant*.
- SEEKONKS.—Oysters (mainly seed) growing in Seekonk river, Rhode Island.
- SELECTS.—Oysters of the first quality, *i. e.*, selected; applied wholly to opened stock.
- SET.—I. A young oyster. Occasionally "Set" is used improperly for *spawn*. See *Spat*.
- SET.—II. The appearance of young oysters in a district, as a whole, thus: "The *Set* is good in Somerset this year"; *i. e.*, there is an abundance of infant oysters. See *Seed*.
- SHANGHAI.—A long, slender oyster. See *Coon-heel*.
- SHARE (verb).—To divide the proceeds of a sponging-cruise. "We will *share* \$40 this trip," they say.
- SHARE (noun).—The amount of money resulting to each of the crew of a sponging-vessel from the proceeds of a trip.
- SHARPERS.—Elongated, protruding, sharp-ended oysters, dangerous to the feet in moving about the reefs. (Gulf coast.)
- SHEEPWOOL.—The highest grade of Florida commercial sponges, *Spongia gossypina*.
- SHELLERS.—Persons who open clams for market. (New Jersey.)
- SHELLING.—The spreading of shells upon the bottom to catch spawn.
- SHIFT TO.—To move half-grown oysters to a new bed for their improvement.
- SHOCK.—To open or "shuck" clams or oysters. (New England.)
- SHOOTS.—The spaces between the concentric ridges on an oyster-shell, marking each season's growth. (New Jersey.)
- SHUCK.—I. To open oysters. (Baltimore and southward.)
- SHUCK.—II. An oyster-shell. (South.)
- SHUCKER.—One who opens oysters. (South.)
- SHUCKING-STAND.—A rude table, with boxed sides, etc., at which oysters are opened. (South.)
- SIDE-OPENER.—An oyster-opener, who rests the oyster in the palm of his left hand alone, while he parts the shell. (Quicker and more laborious than the *sticker's* method; it is followed at Providence, Rhode Island.)
- SILVER-SHELL.—*Anomia*. See *Gold-shells*.
- SIGHT (verb).—To be able to see oysters on the bottom and direct the tongs to them. (Virginia.)
- SKIFF.—The peculiar, special oyster-boat used at Keyport, New Jersey. It is shaped like a small, shallow yawl.
- SKIFT.—Vernacular for *skiff*.
- SKIMMER.—Flat, shallow pans of tin or zinc, with perforated bottom, in which the openers empty their measures of oysters, and where the liquor is allowed to drain away.
- SKIMMER.—The *Cyprina islandica*, or big beach clam. (South shore of Long Island.)
- SINGLE OYSTERS.—In the south "single oyster" means an edible oyster in contradistinction from the racoon oyster.
- SLIPPER-LIMPET.—Mollusks of the genus *Crepidula* (three species). Also known as *Deckhead*, *Boat*, and q. v.
- SNAIL-BORE.—Mollusks of the genus *Urosalpinx*, etc. (New Jersey.) See *Drill*, *Borer*, etc.
- SNAPS.—The most inferior oysters sent to market. (Maryland.)
- SOFT OYSTER.—The "Virginia plant", or southern oyster (Staten Island sound), as distinguished from the "hard" native oyster.
- SOMERSETS.—Oysters from Taunton river, Massachusetts, after the name of the chief village, 7 miles north of Fall River.
- SOMERSET TONGS.—Oyster-tongs, working on a patented swivel-joint of brass, used at Somerset, Massachusetts.
- SOUNDS.—Oysters grown in Staten Island sound, New York; especially an European brand.
- SPAT.—Spawn. This word, however, is generally used to signify the "set" or minute infant oysters, after they have become attached to some support. See *Spawn*.
- SPAT.—To emit eggs or spawn.
- SPAWN.—The eggs of the oyster (or any other sea-animal) in their floating condition; but sometimes the "set" or infant oysters are erroneously called *spawn*. See *Spat*, *Milk*, *Set*.
- SPAWNED.—Improper pronunciation of *spawn*, frequent in some districts.
- SPONGE, or To GO SPONGING.—To go on a cruise for gathering sponges. (Florida reefs.)
- SPONGER.—A man who gathers sponges. (Florida reefs.)
- SPONGE-BAR.—A rocky spot where sponges grow. (Florida.)
- SPONGE-HOOK.—The bent, two-pronged iron tool at the end of a pole, with which sponges are gathered from the bottom. (Florida reefs.)
- SPONGE-POLE.—The pole by which the hook is operated in gathering sponges. (Florida reefs.)
- SQUID.—Naked mollusks of the order *Cephalopoda*; they are used as food and as bait.

- STABBER.**—One who opens oysters by sticking the knife in at the side, without previously breaking the shell. (Massachusetts and Rhode Island.) See *Sticker*.
- STALES.**—The handles of the oyster-tongs or oyster-rake.
- STEM.**—The proboscis of a clam. (New Jersey.)
- STEW.**—An artificial bed of oysters. Applied to the old Roman, and also to the modern methods of fattening. (English.) See *Layer*.
- STICKER.**—An oyster-opener who rests the oyster against the bench while he thrusts the knife between the valves. This is the method in Boston, and obviates the strain across the loins, but takes longer than *side-opening*, q. v. (See *Stabber*.)
- STICKUP.**—A long, thin oyster, growing in mud, etc. (Dennis creek, New Jersey.) See *Strap oyster*, etc.
- STING-TAIL.**—The sting-ray, *Dasybatis centrura*. (New York.)
- STONE-CADDYS.**—Schooner carrying stone. (Chesapeake and Delaware.)
- STOOLS.**—Material spread on the bottom for oyster spawn to cling to. See *Cultch*, etc.
- STRAP-OYSTER.**—The long, slender form which grows in mud. See *Coon-heel*, etc. (New Jersey.)
- STRIKE.**—To become tenanted by living oysters; or when infant oysters attach themselves to any object they are said to “strike”. (Staten Island.) See *Set*, etc.
- SWEET-CLAM.**—Same as *Squaw clam*, etc.
- SWEET-MEAT.**—A small mollusk, the *Crepidula fornicata*. (Martha’s Vineyard.) See *Half-deck*.
- TEA-CLAM.**—The quahaug, *Venus mercenaria* of small size; about 1¼ inches diameter. They will go from 1,200 to 1,400 to the barrel. (Keyport, New Jersey.)
- TEN-FINGER.**—A thief.
- TILE-COATING.**—At Yannes, France, the coating of spat-collectors is composed as follows: The tiles are first dipped into a solution of hydraulic lime and water; when dry they are again dipped into a very thin mixture of common lime and water; when dry they are ready for use.
- TOLERATION.**—License to gather oysters or operate beds; paid by every individual annually. (Brookhaven, Long Island.) The money paid is called a *Toleration fee*.
- TONGER.**—One who procures oysters by the use of tongs.
- TONG-MAN.**—See *Tonger*.
- TONGS.**—An instrument used in gathering oysters from the bottom. Something of an idea of it may be got by supposing two garden-rakes with very long handles, with the tooth side of each rake facing each other; let the handles be secured by a loose rivet about two or three feet from the teeth, so that by operating the extreme ends of the handles the whole contrivance shall act as a pair of tongs. The instrument is so constructed, that when the tong handles or “stales”, as they are called, are held perpendicular to the bottom, the teeth are at an angle of 45°, and by working the upper end of the stales together above water, at the same time pressing the teeth against the bottom, the oysters are thus raked together, and may be hoisted to the surface and emptied into the boat. Various patented forms have been made, but in general those in actual use are made by the local blacksmith and are one of two patterns—iron headed or wooden-headed—according to intended service. The latter form is the most common. Ordinarily the heads must be of the best oak, and the whole tongs are worth \$3 50 to \$5. The teeth are about 1½ inches apart and not over 1 to 1½ inches long. The stales are sawed out of a white-pine board ¾-inch thick. Though seeming so thin, they last as long as the heads. A pair of tongs lasts only about a year. The wooden heads are better, because they do not dig into the sand as do the iron heads, and because they are lighter to work. Tongs are used of from 7 to 24 feet in length, and the latter, worked as they are, in 21 and 22 feet of water, require not only considerable skill, but a good allowance of strength, to handle with success. This tong is a very ancient contrivance in America, for Charlevoix, in the middle of the seventeenth century, found them “on the coasts of Acadia”.
- TRASH.**—All cullings, small oysters, refuse, etc., thrown over from the oyster-gathering on to idle ground, and which will be overhauled one or two years later. (Delaware.)
- TUB.**—I. Long Island measure for selling oysters, holding somewhat less than a bushel. It consists of part of a barrel, and should be 10 inches deep, 17 inches wide at the bottom, and 19 inches at the top, inside.
- TUB.**—II. Chesapeake measure; is similar to the above, but twice as capacious.
- TUSK-SHELL.**—A species of the *Dentalium*. (Pacific coast.)
- UNDER-RAKE.**—An instrument used in the Point Judith ponds, Rhode Island; “the handles of said rake being 15 to 20 feet in length, the head from 1 to 2 feet in length, filled with iron teeth from 6 to 10 inches in length, and mostly used through holes cut in the ice.”—*Gen. Stat. R. I.*
- VIVIER.**—See *Parc*. (Ile d’Oleron.)
- WAGON-LOAD.**—Of oysters; a “wagon-load” is 20 bushels; of mussels, 30 bushels. (New Jersey.)
- WASH-BASKET.**—A rude splint basket, circular, shallow, holding about a peck, and with a high bale-handle. (Rhode Island.)
- WATCH-HOUSE.**—A shanty built on the shore, or near the planted oyster-beds, from which they may be guarded. (Massachusetts.)

- WATER-GLASS.—A bucket with a partial glass bottom, through which the position of sponges is sought. (Florida reefs.)
- WHELK or WHILK.—A mollusk, *Buccinum undatum*. (England.)
- WILD OYSTER.—One of natural growth; uncultivated or transplanted. (Massachusetts.)
- WINKLE.—A mollusk, the *Sycotypus canaliculatus*. (Massachusetts.) See *Periwinkle*.
- WINTER-KILLED.—Oysters that have become so weak by long-continued cold weather or contact with ice, that, though they are living when caught, they will not survive handling or transportation, and are of no value for food.
- WHIPS.—Slender branches used to mark the bounds of oyster-beds. (Connecticut.) “Stakes” are larger and break rather than bend before gales and ice.
- WHITE-SNAILS.—Small species of mollusks noxious to the oyster-beds, particularly *Urosalpinx* and *Natica*.
- WOOD-DROGGER.—A wood schooner. (Chesapeake and Delaware.)
- WRINKLE.—A mollusk, the *Sycotypus canaliculatus*. (Buzzard’s bay.) See *Periwinkle*.
- YELLOW SPONGE.—A grade of Florida commercial sponge, next under the Sheepswool. Designated scientifically as *Spongia corlosia*.

IV. GENERAL SUMMARY.

W. STATISTICAL TABLES.

64. TABLE SHOWING, BY STATES, THE PERSONS EMPLOYED, CAPITAL INVESTED, AND VALUE OF PRODUCTS IN THE OYSTER-INDUSTRY.

STATES.	GRAND TOTAL.			PERSONS EMPLOYED.		APPARATUS AND CAPITAL.		
	Number of persons employed.	Bushels of oysters produced.	Value of oysters as sold.	Fishermen.	Shoresmen.	Total capital invested in oyster-industry.	Number of vessels.	Value of vessels.
Total	52, 805	22, 195, 370	\$13, 438, 852	38, 249	14, 556	\$10, 583, 295	4, 155	\$3, 528, 700
Maine	15	1, 000	a37, 500	5	10	4, 210	1	3, 000
New Hampshire	9	36, 000	6, 050	6	3	2, 400	-----	-----
Massachusetts	896	163, 200	405, 550	409	487	303, 175	56	227, 000
Rhode Island	650	336, 450	356, 925	300	350	110, 000	-----	-----
Connecticut	1, 006	1, 043, 300	672, 875	672	334	361, 200	100	69, 000
New York	2, 724	2, 080, 625	1, 577, 050	1, 958	766	1, 013, 060	426	397, 000
New Jersey	2, 917	60, 000	2, 080, 625	2, 605	312	1, 057, 000	575	530, 000
Pennsylvania	-----	-----	a187, 500	-----	-----	-----	-----	-----
Delaware	1, 065	300, 000	687, 725	820	b245	145, 500	65	50, 000
Maryland	23, 402	10, 600, 000	4, 730, 476	13, 748	c9, 654	6, 034, 350	1, 450	1, 750, 000
Virginia	16, 315	6, 837, 320	2, 218, 376	14, 236	d2, 079	1, 351, 100	1, 317	460, 950
North Carolina	1, 020	170, 000	60, 000	1, 000	20	68, 500	90	22, 500
South Carolina	185	50, 000	20, 000	175	10	12, 250	10	2, 500
Georgia	350	70, 000	35, 000	300	50	18, 500	-----	-----
Florida	166	78, 600	15, 950	140	26	22, 000	-----	-----
Alabama	300	104, 500	44, 950	250	50	16, 000	20	6, 000
Mississippi	60	25, 000	10, 000	50	10	3, 000	-----	-----
Louisiana	1, 400	295, 000	200, 000	1, 300	100	36, 750	45	10, 750
Texas	240	95, 000	47, 300	200	40	17, 750	-----	-----
Washington Territory	85	15, 000	45, 000	75	10	6, 550	-----	-----

STATES.	APPARATUS AND CAPITAL—continued.				PRODUCTS.			
	Number of boats.	Value of boats.	Value of gear and outfit.	Value of shore property.	Bushels of oysters produced.	Value of same to producer.	Enhancement of value of oysters in process of preparation for market. e	
							Number of bushels.	Amount of enhancement.
Total	11, 930	\$708, 330	\$712, 515	\$5, 633, 750	22, 195, 370	\$9, 034, 801	13, 047, 922	\$4, 368, 991
Maine	3	60	150	1, 000	-----	-----	75, 000	37, 500
New Hampshire	5	300	100	2, 000	1, 000	800	7, 000	5, 250
Massachusetts	117	9, 485	10, 690	56, 000	36, 000	41, 800	514, 000	363, 750
Rhode Island	100	14, 500	5, 500	90, 000	163, 200	225, 500	274, 300	131, 425
Connecticut	563	33, 165	19, 385	239, 650	336, 450	386, 625	515, 000	286, 250
New York	1, 714	121, 700	42, 460	451, 900	1, 043, 300	1, 043, 300	1, 065, 500	533, 750
New Jersey	1, 400	110, 500	91, 500	325, 000	1, 975, 000	1, 970, 000	237, 500	110, 625
Pennsylvania	-----	-----	-----	-----	-----	-----	h250, 000	187, 500
Delaware	300	12, 000	10, 000	f73, 500	300, 000	325, 000	i834, 500	362, 725
Maryland	1, 825	130, 520	161, 480	g3, 992, 350	10, 600, 000	2, 650, 000	7, 653, 492	2, 080, 476
Virginia	4, 481	224, 050	329, 250	k336, 850	6, 837, 320	1, 948, 636	1, 622, 130	269, 740
North Carolina	800	16, 000	15, 000	15, 000	170, 000	60, 000	-----	-----
South Carolina	100	2, 500	2, 250	5, 000	50, 000	20, 000	-----	-----
Georgia	100	10, 000	3, 500	5, 000	70, 000	35, 000	-----	-----
Florida	110	8, 000	2, 000	12, 000	78, 600	15, 950	-----	-----
Alabama	42	4, 000	3, 000	3, 000	104, 500	44, 950	-----	-----
Mississippi	40	1, 000	500	1, 500	25, 000	10, 000	-----	-----
Louisiana	120	3, 000	13, 000	10, 000	205, 000	200, 000	-----	-----
Texas	70	6, 750	2, 000	9, 000	95, 000	47, 300	-----	-----
Washington Territory	40	800	750	5, 000	15, 000	10, 000	-----	-----

a This quantity represents simply the enhancement, the first cost being included in the Maryland and Virginia statistics.
 b Of these, 215 are employed in the canneries at Seaford.
 c Of these, 8,864 are employed at the various canneries.
 d Of these, 1,578 are employed in the canneries.
 e This includes planting, bedding, fattening, and transportation to distant markets in oyster-vessels.
 f Of this \$28,500 is invested in the cannery interests at Seaford.
 g Of this amount, \$2,492,350 represents the cash capital invested in the cannery industry.
 h Brought in winter by vessels registered in other states; the men engaged and the value of the vessels being accounted for elsewhere.
 i Of these, 184,500 bushels were packed at Seaford, and 650,000 bushels were planted in Delaware bay.
 j Of this, \$22,225 represents the enhancement on those canned.
 k Of this \$119,350 represents the cash capital in the cannery interests, and \$107,500 the value of buildings and fixtures for canning.

7



LIBRARY OF CONGRESS



0 002 896 661 1

