XVI.—ON THE OYSTER-INDUSTRIES OF THE UNITED STATES.

By Lieut. P. de Broca.

[The great interest taken by the French in the subject of oyster-culture, in view of the threatened failure of this branch of industry on the shores of France, induced the government to send Lieutenant de Broca to the United States, in 1862, for the purpose of ascertaining its condition in this country. The report of that gentleman was first published in the *Revue Maritime et Coloniale*, and afterward reprinted in separate form, with some additions, under the title given below.*

As nothing so elaborate in reference to the oyster-culture and -industry in the United States has been published elsewhere, I have caused M. de Broca's report in the *Revue* to be translated, and present it herewith, supplemented by some additions from the Étude. I hope to present before long the present condition of the oyster-fisheries of the country from an American point of view.—S. F. Baird.]

REPORT.

To His Excellency the Minister of Marine and Colonial Affairs:

Honored Sir: At the end of the month of March, 1862, your excellency, at the request of M. Coste, Member of the Institute, instructed me to proceed to the United States, in order to study the Oyster-Fisheries of that country, and to bring back specimens of two kinds of edible mollusks, susceptible of acclimation on the shores of France.

Since my return to Havre, on the 2d of October, I have hastened to forward to your excellency a summary report of my mission, to be followed by a more detailed account, containing all my investigations in regard to the American coasts.

Leaving Boston on the 17th of September, in the steamer Asia, of the Cunard line, I reached Liverpool on the 29th, after a passage of twelve days of most delightful weather. I brought with me a number of mollusks, principally of the *Mya arenaria*, of which, notwithstanding the greatest care, I was able to save only a few specimens. I was more for-

*Questions maritimes et coloniales.—Pêches maritimes.—Étude sur l'industrie huitrière des États-Unis, faite par ordre de S. E. M. le comte de Chasseloup Laubat, ministre de la marine et des colonies. Suivie de divers aperçus sur l'industrie de la glace en Amérique, les bateaux de pêche pourvus de glacières, les réserves flottantes à poisson, la pêche du maquereau, etc. Par M. P. de Broca, lieutenant de vaisseau, directeur des mouvements du port du Havre.—Nouvelle édition, augmentée de divers documents et de notes.—Paris. Challamel aîné, éditeur, 1865, 12 mo., 2 p. l., 266 pp.

tunate with the *Venus mercenaria*, and the oysters of Virginia, and succeeded in landing two thousand living representatives at Havre, from which place they were sent immediately to the Hougue of Saint-Waast.

Your excellency will permit me, before entering into details concerning my commission, to mention the circumstances which preceded it, as the experience resulting from them is worthy of record.

About the end of the year 1860 one of my cousins, M. de Férussac, spoke to me of the alimentary supplies afforded the people of the United States from two species of marine mollusks, known in the country under the names of the *soft clam* and the *round clam*. The information thus given me having been confirmed by several American captains frequenting the port of Havre, I hastened to communicate with M. Coste, proposing, if he considered it advisable, to import some specimens of the mollusks in question, by means of the transatlantic steamers, from New York. This proposition was immediately accepted; funds were placed at my disposal by the College of France; and in the month of May, 1861, the reliable officer in charge of the Arago, who cheerfully took the matter in charge, brought to Havre a number of round clams (*Venus mercenaria*,) as well as oysters from Virginia, of a species entirely different from those found on our shores.

Some time after this, the Emperor, whose attention is constantly directed to everything that tends to increase our alimentary resources, took himself the initiative in the general acclimation of American edible mollusks. To facilitate this design of the Emperor, M. de Montholon, consul-general of France at New York, was invited to confer with the celebrated Professor Agassiz, of the University of Cambridge, near Boston, in the United States.

M. Coste, Member of the Institute, was instructed by His Majesty to take all necessary measures for the success of the enterprise in France

Mr. Burkardt, draughtsman of the Museum of Natural History at Cambridge, left Boston in the month of September, of the same year, with some of each of the following species, collected through the kindness of Professor Agassiz: (1.) *Mya arenaria*; (2.) *Venus mercenaria*; (3.) *Pecten concentricus*; (4.) *Homarus americanus*; (5.) *Mactra solidissima*; (6.) *Mytilus edulis*.* The voyage to Europe was accomplished under such unfavorable circumstances that a large portion of these perished during the passage; and as the vessel did not arrive at Liverpool until after the departure of the steamer for Havre, Mr. Burkardt was obliged to convey the shell-fish, which were still alive, entirely across England, in order to embark at Southampton. Of all the mollusks brought from Boston only two hundred of the *Venus* survived to reach France; and these were immediately placed in the parks of Saint-Waast, in accordance with the instructions of M. Coste.

Such, your excellency, were the first attempts at acclimation; and if

* (1.) Soft clam; (2.) Round or quahaug clam; (3.) Scallop; (4.) Lobster; (5.) Hen clam; (6.) Mussel.

I mention them here, it is not to detract in the least from what was then accomplished. My sole purpose is to show that the probabilities in favor of the successful acclimation of oysters and clams are very great, since they have lived for seventeen months in the waters of the Manche quite as thriftily as if they were on their native beds.

By the close of the year 1861 these two important facts were satisfactorily established: first, that the mollusks in question can easily bear transportation across the Atlantic; and, secondly, that our salt waters do not appear to affect them unfavorably. The number of specimens was not sufficient to warrant the planting of them in bays; beside, all the species with which it was desirable to experiment had not survived to reach Europe. These two reasons induced M. Coste to request your excellency to send me to the United States, not only to bring back a large number of mollusks, but also to examine into the conditions essential to their healthy growth; to investigate the nature of the soil and the character of the waters in which they live; and, in short, to obtain information upon every point which might insure the success of the enterprise. I was also ordered to examine everything connected with the oyster-industry; and, in compliance with these instructions, I sailed from Liverpool, on the 29th of March, for New York, by the steamer Asia.

Owing to circumstances beyond my control, my departure, which ought to have taken place in February, had been delayed; so that on my arrival in America I was obliged (as my commission embraced but two months) to arrange matters so as to return to Europe by the middle of June, a season of the year when transportation is difficult on account of the excessive heat. As I was in possession of very uncertain information with regard to the best manner of treating the mollusks, I thought it the wisest plan, in order to take them safely across the Atlantic, to ask the advice of competent persons in the country; and it may be well to say that every one to whom I mentioned the subject predicted a failure if I made the attempt during warm weather.

In view of an opinion so decidedly expressed, and after consultation with the consul-general of France, I concluded to dispatch immediately a number of the mollusks, by the steamer Asia, whose captain, a very intelligent gentleman, had offered me his co-operation.

On the 23d of April, I put on board the steamer 3,000 of the *Venus mercenaria*, and 600 of Virginia oysters, gathered from beds in New York Bay. Some time after this I sent 2,000 of the *Venus* by the Persia, the fleetest vessel of the Cunard line. Your excellency will permit me to observe in this connection, that the discontinuance of the transatlantic Havre line of steamers, the vessels of which were required by the Federal Government for the exigencies of the war then in progress, disarranged my plans, and forced me to send my collections by way of England; so that the probabilities of failure in the transportation of the shell-fish were greatly increased.

After remaining two weeks in New York, during which time I commenced my investigations in regard to the shell-fisheries, I went to Boston, in order to avail myself of the counsel and experience of Professor Agassiz, to whom M. Coste had given me a letter of introduction.

With the utmost readiness and kindness, (for which I tender him my thanks,) the professor made me acquainted with the best means of promoting the success of my undertaking. He pointed out to me those portions of the coast of the Northern States which I ought especially to study, and generously placed himself at my service to direct me in the most fruitful path of investigation. Nevertheless, when he learned that my stay in America could not exceed a month, he did not hesitate to express his opinion of the great difficulty attendant upon so limited a period. In his judgment the investigations I had undertaken in regard to the oyster fisheries alone would require much more time than had been accorded to me; for, in the United States, where there is no fiscal import duty upon fish, as in France, it is difficult to ascertain the statistics of amounts consumed; and since each State is regulated by its own laws, it is only by personal observation that exact knowledge could be obtained.

The transportation of a large number of the mollusks in the month of June, seemed to Professor Agassiz extremely hazardous, and he also informed me that in consequence of the interest he felt in the success of an enterprise which had been initiated by His Majesty himself, he dreaded nothing so much as a failure, which without really proving anything against the undertaking, might yet lead to its relinquishment.

It is evident that I could not but be impressed by such important considerations, and deeming it to be my duty not to act without positive orders from your excellency, I requested Professor Agassiz to write to M. Coste, and explain the reasons why my departure from the United States should be deferred.

On the 27th of April I received from Cambridge the following communication:

"I have just forwarded to M. Coste a long letter, written in accordance with the opinion I expressed to you in regard to the necessity of prolonging your stay in the United States, in order to accomplish the object of your commission. I consider it indispensable that you should pass the warm season here, if you would become acquainted with all that concerns the fishery and the preservation of our oysters, and that you wait until autumn to transport with any chance of success the mollusks which are to be acclimated on the shores of France, &c.

"AGASSIZ."

While awaiting a reply from your excellency, I began at Boston some experiments with reference to the best mode of treating the mollusks during their passage across the Atlantic. I bought for this purpose a number of Virginia clams and oysters, which were placed in tubs or

vats upon a bed of gravel, and supplied every morning and evening with pure water from the sea, taken at some distance from the harbor; these vats being emptied after the water had remained about an hour upon the shell-fish. These experiments gave the following results: Shortly after the Myas had been placed in the vats, they evidently began to decline, and on the twelfth day there was not one alive. So far the failure was almost complete. The *Venus* and the oysters, on the contrary, thrived so well, under this mode of treatment, that at the end of a month they were in as good condition as on the first day, the mortality among them having been insignificant and attributable to several extraneous causes. During my absence Mr. Higgens, a planter and dealer in oysters, cheerfully consented to continue these experiments, and to keep me constantly informed of their results.

Success with the oysters and the *Venus* inspired me with such confidence that, on the 28th of May, I sent ten baskets of them by the steamer Europa, which sailed from Boston.

Having been informed early in June, through a dispatch from the admiral of the Roncière, that your excellency had extended the time of my commission, I made arrangements for continuing the transportation.

On the 10th of June the captain of the vessel from Selva, in command of the frigate la Bellone, consented to take to France some oysters and some of the *Venus*, as well as about forty fresh-water turtles, which I sent to M. Coste as specimens of the American species. Having been convinced by some new experiments, undertaken on the shore of Long Island, that it was possible to keep Myas alive out of their native element for twenty days, even in the warm season, I sent, on the 18th of July, 800 of these mollusks by the Europa, with six baskets of oysters, gathered in Delaware Bay. The Myas, buried in cases, filled with sand, as in their natural beds, were supplied several times a day during the passage with salt-water, and I have since learned that 400 of them reached Saint Waast alive.

On the 29th of July the Persia carried over 2,000 of the *Venus;* and on the 10th of August I put on board the Australia thirty fresh-water turtles; while, on the 3d and 10th of September, I dispatched by the English steamers several thousand mollusks. I have learned, since my return to Havre, that these various transportations were not equally successful. Of thirty thousand shell-fish sent from America, including those I brought with me, and others constantly arriving, we can only count upon about a third. It is greatly to be regretted that so large a number failed to survive the perils of the passage; but it is not surprising when we remember that I was obliged to confide them to the care of persons having at the most only a moderate interest in their preservation. I sent on board the vessels with each lot written instructions as to their management; but I have every reason to believe that these were not carefully observed by the subordinate agents intrusted with their execution. As I have mentioned before to your excellency, nothing

could have been more unfortunate for the success of my commission than the suppression of the American line of steamers from Havre, since the sending of the mollusks by the English vessels necessitated their reshipment at Liverpool, thus causing them to pass through a number of hands, increasing the length of the passage and greatly multiplying the causes of mortality.

The directors of the Cunard line at New York and Boston gave me, however, their ready co-operation; and as soon as they learned that the mollusks were sent for purposes of public utility they declined receiving any remuneration for their transportation.

Yet, notwithstanding these unfavorable circumstances, we have now, at Saint Waast, a sufficient number for the proposed attempt at acclimation; and, as a result of the arrangement which I have been enabled to make, both in New York and Liverpool, with the directors of the Cunard company, nothing is easier than to bring over new specimens during the winter should it be deemed necessary.

During my sojourn in the United States I visited all those portions of the northern coast where the oyster fisheries are in the most flourishing condition. It is true that in consequence of the war I was unable to investigate the oyster-beds and plantations of Chesapeake Bay; but as the mode of culture in all important points is the same throughout the country, I should probably not have obtained any additional information.

In the course of my investigations I found myself in constant contact with men engaged in various coast fisheries, and I availed myself of the opportunity offered to collect facts which might be of value to similar establishments in France. At New London, where I went to examine the clam beds, I obtained the plans of several fishing vessels, constructed by Mr. Beckwith, who is one of the best builders of this kind of boats. I also brought away with me plans of a cutter furnished with a well, of a schooner provided with an ice-house, and of another schooner having both these appendages.

During my official sojourn in America I forwarded, from time to time, to M. Coste, in accordance with the directions of your excellency, reports upon various subjects, such as the ice-trade in the United States, and its employment as a means of preserving fish; the establishment of wells and ice-houses on board fishing vessels; the floating preserves for fish introduced into the harbors; the lobster fishery at Boston; the mackerel fisheries; and the halibut fisheries; which it would be greatly to the interest of our Newfoundland fishermen to combine with that of the codfish.

These reports, rendered more complete by subsequent observation, I shall have the honor to submit to your excellency.

In the course of my investigations I endeavored to take only a practical view of things, and to free my judgment as much as possible from national prejudices. If a process appeared to me new, I examined it with attention, and was careful not to condemn it merely because it

was not in use in France. On the other hand, I guarded myself against a too ready acceptance of statements which at first sight were plausible, and never accepted them without confirmation. In the United States, more perhaps than anywhere else, statements should be accepted with allowance; for, notwithstanding the coldness, seriousness, and reserve of the people, they are singularly prone to exaggeration in everything that relates to the commerce, manufactures, or greatness of their country. This extreme self-esteem, which is to some extent meritorious, is one of their most prominent characteristics. During my investigations concerning the oyster-fisheries, I frequently received the most conflicting and sometimes erroneous statements.

Notwithstanding the most presistent efforts, I failed to find in the book-stores or libraries either in Boston, New York, or Philadelphia a single treatise upon shell-fisheries. I could only obtain a few incomplete statistical documents and newspaper articles, and these discussed the subject only in its commercial aspects.

As to the raising of the mollusks and their planting, my only mode of obtaining information was to visit the establishments, and talk with the fishermen; and I ought not to omit to commend these sea-faring people, for, their reserve once thrown aside, I found them uniformly obliging, and ready to furnish me with the information I required.

In closing, your excellency, I would express my acknowledgments for the kind aid extended to me by the French consuls at New York and Boston, and also my sense of the great favor conferred upon me, being intrusted with a commission which brought me into such close relations with those eminent scientists, M. Coste and Professor Agassiz; a great privilege to any one desirous of instruction.

I have the honor to be, with the greatest respect, your obedient servant,

DE BROCA,

Lieutenant of the Imperial Marine and Director of the Port of Havre.

HAVRE, *October* 12, 1862.

CHAPTER FIRST.

INTRODUCTION.

The aphorism of Brillat Savarin, "The discovery of a new dish does more for the happiness of the human race than the discovery of a new star," has never proved itself more true than in our time, when the continual increase of population adds each day to the importance of the question of public alimentation. France, upon a comparatively limited territory, nows numbers over forty millions of inhabitants; and, notwithstanding the fertility of her soil, the perfection of her agriculture, and the number of her flocks and herds, it cannot be denied that the rate of her production is beginning to be less than that of her consumption.

In seasons when the cereal harvests have fallen below the average, we have been obliged to resort to foreign nations to supply the deficit; and if the people have not recently suffered serious privation, it is because the provident solicitude of the government has taken in time the necessary measures to prevent such a calamity. It would be fatal to rest quietly in a state of false security, and far better to recognize the existence of a permanent danger to which a remedy may be applied than to be unprepared for some casualty (a war for instance) which might be of such a nature as at any time to prevent the importation of the necessaries which we require.

To insure food to the people by applying the discoveries of science to the pursuits of agriculture, to encourage labor, repeople the impoverished streams, and make the most of the sea-coast; in a word, to create more abundant and cheaper resources of nourishment are motives which ought to enlist the most intense co-operation of all who have at heart the prosperity of the country.

Among the means which we have in our power for this desirable end, one of the most effective is to acclimate in France the vegetables and animals of other countries. How many instances of the acclimation of vegetables might be mentioned; and, if we would speak of any one in particular, there is that modest plant, the potato.* Imported from America in the sixteenth century, it produced such a revolution in public economy that entire populations now depend upon it for subsistence. Maize is another example of the same kind.

The acclimation of animals also has added greatly to the national wealth. The Arabian horse, and the merino sheep from Spain, have renewed our degenerate races. The turkey from America, the guinea-fowl from Africa, the cock from China and India, the duck from Barbary, as well as various kinds of pigeons, &c., are found on our farms in great numbers, and by crossing them with indigenous species most savory and important edible products have been furnished.

For several years the Imperial Society of Acclimation has made the most laudable efforts to secure for France new resources of food and trade, while similar societies in the departments have concurred in this eminently patriotic undertaking. Through their efforts the *hemionus*, or wild ass, has been completely domesticated, and is about to become an important element in the horse trade, of which it will form a most graceful ornament. The Angora sheep is now reared in several parts of France without perceptible degeneration; while the young ostriches, born and raised in the zoölogical gardens of Algiers and Marseilles, give us ground to hope that the time is not far distant when the flesh of these birds will rank among the choicest viands of the market.

* The potato was imported into Ireland in 1545, by Captain John Hawkins. It was cultivated in Lancashire in 1684; in Saxe in 1717; in Scotland in 1728; and ten years later it spread over Prussia. In France it was cultivated in several provinces during the reign of Louis XV; but it was Parmentier, who, at the close of the last century, was the most active in its propagation in our country. *Louillet, (Encyclopédie Moderne.)*

Many similar experiments are in course of trial with every probability of success.

How happens it that, among all these efforts, so few have had for their objects the fish, the crustaceans and the mollusks? With the exception of the carp and the gold-fish from China, which may be considered merely objects of luxury, and of *no* great utility, there have been very few cases of acclimation, since the introduction of living fish into our water-courses from localities at no great distance cannot be properly considered such.* The attempt with the gourami of China, the most delicious of fresh-water fish, has hitherto been without result, but it is gratifying to record that it has become an article of commerce with Europe, and that a great many specimens are now found in the island of Mauritius. As to the edible mollusks, the very first effort at acclimation is probably that now undertaken with the oysters of Virginia and the *Venus mercenaria.*

Before the use of steamboats and railroads, those two great levers of modern activity, the transportation of foreign marine or fresh-water productions was attended with great difficulties. The slow progress of navigation by sail constituted a very unfavorable condition, to which should be added a want of knowledge of the proper management of the animals. With perseverance, however, such transportation was not impossible, as is proved by the importation of the gourami into the island of Mauritius, and by similar instances recorded in history.†

M. Milbert, a traveler employed by the Museum of Natural History, succeeded, in 1824, in bringing to Havre some fish from the United States. Unfortunately they all perished on their arrival, through the carelessness of the captain of the vessel, who left them upon the deck during a heavy winter frost. Milbert was inconsolable in consequence of the failure. We have another instance, in the case of an American merchant, who, about twenty-five years ago, emptied into the roadstead of Boston a cargo of sea-bass, taken in the bay of New York, and conveyed to their destination in a boat-well; from that time these fish, before unknown in the latitude of Boston, have multiplied to such an extent that the fishermen capture them daily. If, at the time when sailing-vessels were the only means of transportation, there were very few

* The carp was introduced in England in 1514, by Marshall; and into Denmark in 1550, by Pierre Oxe. In our time, M. Coste has naturalized the grayling in our waters. At the commencement of the century, Péron and Lesueur attempted in vain to import the gourami into France, and a few years later Captain Philbert followed their example with no better success. He, however, kept one fish alive until within sight of the shores of France.

† In ancient times, the Romans, not content with having naturalized, in several of the lakes of Italy, different kinds of fish, such as the *salsinum* and the *ciminus* ordinarily found at the mouths of rivers, introduced into the Tuscan Sea the *Scarus onias* of the seas of Syria. This remarkable undertaking was accomplished under the reign of Claudius, by one of his freedmen, Elipertius Optatus, who commanded the Roman fleet. The scaria were imported in boat-wells, and for several years were carefully thrown back into the sea when caught in the nets of the fishermen.

attempts made for the acclimation of fish and mollusks, there was in fact no urgent necessity for it. Before the water-courses of France were monoplized by commerce, they were filled with fish, and it is not a great while since, in certain localities of Great Britain, servants, as well as the Scotch peasants, were not content if they were obliged to eat salmon more than three times a week..

The increase of crops, through a better knowledge of agriculture, the raising and improvement of various breeds of cattle, &c., naturally occupied the public mind, as a means of increasing alimentary resources, much more than enterprises which at best were considered very precarious. In our day it is very different. The rivers and streams, through a deplorable mismanagement, yield only insignificant products. The beds of oysters and edible mollusks are becoming day by day less productive, and it is absolutely necessary to have recourse to the fruitful sciences of pisciculture and ostriculture to retrieve our losses.

On the other hand, at no period have circumstances been more favorable for the ultimate success of the projects for acclimation. The transatlantic and other steamers have opened communication with the most distant countries, while the completeness of their construction and their rapidity of passage are about as perfect as we may ever expect to secure.*

Our means of transportation are now of the first order, without taking into account the vessels of the imperial navy, which would assist in this work of public utility, and might, in certain cases, be intrusted with particular installments, incompatible with the service of commercial steamers.

It ought not to be forgotten that fish and mollusks possess great advantages over other animals, in the rapidity with which they multiply when they are acclimated, and in the less expense of their introduction. Of all the animals subservient to the use of man, they alone live in an element in which they can provide nourishment for themselves. They therefore make no demands upon our resources, which is not the case with other kinds of game. With foreign quadrupeds years must elapse before they can increase greatly in number, without taking into account the diseases which may attack them. How many disappointments has the Society for Acclimation experienced in their attempts with the llama and alpaca! Birds are somewhat more satisfactory, but their reproduction is also very slow; while fish and mollusks, as soon as they become accustomed to the character of our waters, will increase in a few years to millions. The astonishing reproductive power of the oyster and the mussel is well known. Naturalists have numbered the eggs of the pike by the hundred thousand; of the carp and the mackerel by the half million; of the plaice by six millions, which satisfactorily accounts for

* To speak only of France: Marseilles, besides a line from the Mediterranean, has recently established one from the extreme east. Bordeaux has one from Brazil and La Plata; Saint Nazaire one from the Antilles and the Gulf of Mexico; and certainly before the middle of next year Havre will inaugurate a line from the United States.

the prodigious increase of this fish in the ponds of eastern Friesland, where it was introduced by the Dutch at the beginning of this century. In the thick-lipped mullet, Professor Valenciennes has counted not less than thirteen millions of eggs. These examples show how rapidly they multiply, and how important it is to acclimate species with such remarkable powers of reproduction.

The experiment with the gourami will, undoubtedly, soon be tried again, by means of the steamers from Indo-China and those of the line from Alexandria.

During my sojourn in the United States, although my commission related particularly to the acclimation of mollusks, I extended my researches to other species useful for food. Among others, I would mention the terrapin-turtle, found at the mouths of rivers and in salt marshes, and which is a very delicious article of food; the lobster, larger, but less agreeable to the taste, than ours; and several exclusively fresh-water tortoises, of which the *red-belly* is the most esteemed. The learned director of the museum of Cambridge, Mass., has engaged to send to France, next spring, a sufficient number of specimens of the latter species to make an attempt at acclimation in the ponds in the suburbs of Paris.

Among fresh-water fish, the large salmon-trout (*Salmo amethystus*) and the white fish (*Coregonus albus*) would be great additions to French ichthyology, if they could be transported to Europe. Professor Agassiz,* whose opinion is authority in such matters, considers artificial fecundation a certain means of success, as he himself informed the Emperor, and which I had the honor to explain to His Majesty in an interview accorded me at St. Cloud.

Whatever may be the future of these projects, mentioned only to show how many valuable resources we may render available, I must now leave them and turn my attention to the acclimation of the mollusks, the object of my visit to America.

The shores of our two seas are singularly deficient in specimens of edible mollusks, there being only a few scallops on the coast of Great Britain; some species of Venus, not at all abundant, in the bays of the ocean and the Mediterranean; a few cardiums, &c. Such is the extent of our resources. America, on the contrary, whose Atlantic coast is rich in shell-fish, is probably the most favored country in the world for this kind of production.† The oysters, of which there are three species,

*The distinguished professor is of the opinion that the French government ought to undertake the acclimation of the *nandou*, which is much more susceptible of naturalization in France than the ostrich of Sahara, for the single reason that it is a native of a temperate climate.

In 1860 I pointed out the pearl mussel as capable of introduction upon the coast of Algeria, and I even opened a correspondence upon the subject with a Greek merchant of Alexandria, who was engaged in the pearl fisheries of the Red Sea.

Recently Mr. Lamiral has published in the *Bulletin de la Société Impériale d'Acclimatation* a very interesting article upon this subject.

†As regards the fish commerce, the American coast presents a conformation entirely

form immense banks along the shores, and the fisheries furnish every year, for the public consumption, a mass of alimentary matter of which it is impossible to form any idea in Europe. There are, besides, in the bays, inlets, straits, &c., numerous beds of mollusks, known under the general name of clams, of which the most important are the soft clam and the round clam, the *Mya arenaria* and *Venus mercenaria* of naturalists.

The oysters, the *Venus mercenaria*, and the Myas, to speak only of these species, enter so largely into the public means of sustenance that a failure of these products would be a material calamity.

In the city of New York, the most populous center of the United States, the commerce in oysters is estimated at 35,000,000 francs, or $5,000,000; and the trade of the whole country is valued at 100,000,000 francs, ($50,000,000,) although these high figures do not represent the total amount of products, since along the coast and the rivers there is a daily consumption which cannot be estimated.

The Merchants' Magazine and Commercial Review, for 1859, estimated the trade in oysters of the principal cities as follows:

	Bushels.
Virginia, (State)	1,050,000
Baltimore	3,500,000
Philadelphia	2,500,000
New York	6,950,000
Fair Haven	2,000,000
Other cities, such as Boston and Providence	4,000,000
Total	20,000,000

Calculating two hundred oysters only as a bushel we have the enormous amount of 4,000,000,000 mollusks consumed.

Mr. Meigs asserted, in the American Institute for the same year, that in the city of New York more money is expended for oysters than for meat. This delicious article of food has become so necessary with every class of the population that scarcely a town in the whole country can be found without its regular supply. By means of railroads and water-channels, oysters in the shell, or out of the shell, preserved in ice, in pickle, or canned, are carried even to the remotest parts of the United States. The cities of Fair Haven, Boston, and Baltimore are at the head of the interior trade, which, for six months in the year, gives employment to a large number of persons.

unique. From Cape Fear to the extremity of Long Island sandy beaches are almost universally interposed between the ocean and the main land, which run parallel with the shore at a distance of from one to several miles. These sometimes form islands, varying in width from several yards to a half mile, and of great length. These sandy formations make bays, sounds, lagunes, &c., in the most favorble condition for the multiplication of fish and mollusks. Besides, as the openings communicating with the sea are not very numerous, in places where rivers and streams empty, the water is less salt than in the open sea, which still further increases the chances for the production of certain kinds of fish and mollusks, particularly oysters.

The soft clam, similar in every respect to the Mya of the sands which inhabits the seas of the north of Europe, and especially of Scotland, multiplies so rapidly on the coast of New England, that, although they are in constant demand, they do not seem to decrease in number. Although found in abundance in the State of New York, their real home is farther north, where they are found even as far as the shores of Newfoundland; but they are nowhere so numerous as on the coasts of the counties of Essex and Barnstable, in Massachusetts. Doctor Gould, in his Natural History of Invertebrata, published in 1841, estimated the quantity of soft clams consumed in Massachusetts at more than ten thousand bushels; but this amount, based probably upon the sales by professed fishermen alone, gives no idea of the real rate of consumption, since the laws accord to each citizen of the State the right to catch as many of the mollusks as he may need for his family. Not even an proximate calculation is possible. It is very certain that Boston consumes enormous quantities of soft clams in the excellent soups which the Americans so well appreciate. The Myas also form one of the best baits for the codfish, and every year Massachusetts salts down thousands of barrels for the use of the fisheries on the banks of Newfoundland. Freshly caught, they are sold on the wharves of Boston for 75 cents a bushel.

The round clam of large size is similar in taste to the *Venus verrucosa*, and, like it, is found in sheltered and shallow bays, where it buries itself in the miry sand. As prolific as the Mya, it abounds upon that portion of the coast of the United States lying south of Cape Cod, which appears to be its most northern limit. It is met with, however, in the vicinity of Cape Ann, but in that locality is not an article of commerce.

The most important fisheries that I visited are those of the suburbs of New York, of the great bay south of Long Island, of the bay of New Haven, and of Cape Cod. A large quantity of round clams is consumed in New York and Philadelphia during the summer months, taking, at that season, the place of oysters, which are then considered by some as not fit for food. They are excellent, either cooked or raw.

Oysters from Virginia, *Venus mercenaria*, and *Mya arenaria*, are the three species of bivalves which we are now endeavoring to acclimate upon our shores, with the probability of complete success, at least with the first two. It will probably be necessary to replace the third (of which I imported only a few specimens) by a species inhabiting Scotland. It will be quite easy to bring thence a sufficient number.

When I hadp ersonally investigated the resources afforded the people of the United States by the mollusks in question, I came to the conclusion that the oyster ought to claim the especial attention of the imperial marine; not that I do not attach an equal importance to the acclimation of the *Mya*, and the *Venus mercenaria*, but since these two species develop slowly, as I have learned from an examination of specimens at different ages, that several years must elapse before they would be sufficiently numerous to be used for food. The oyster, on the contrary, as prolific as

our own, develops so rapidly that according to reliable information which I have received, one of these mollusks planted in April, and about three inches in length, will increase by more than half that size before the end of the following autumn.

I have myself seen oysters planted in the bay of New Haven increase over a half inch in two months. In the course of my investigations, I have eaten oysters from the most celebrated localities, and must say that I have always found them somewhat insipid in taste, a marked characteristic of the species. In Massachusetts, I found them much saltier, which is due both to the peculiar nature of the water, and the soil in which they are cultivated.*

When eaten raw, they will never probably be as highly esteemed by the epicure as the indigenous species; but, on the other hand, they will be preferred when the mariner wishes to put them in store, or when they are to be used for culinary purposes, which deprives them of none of their nutritive properties. It would be impossible to find anything more acceptable to the palate than certain preparations of oysters furnished by the good restaurants of New York, such as Delmonico's.

In my opinion the acclimation of this species, susceptible of rapid growth and richer in nutritive substance than ours, will, in one respect, complete the oyster trade of France, bringing into it elements of true alimentary support, while up to this time its contributions have been considered merely as articles of luxury. But it will be necessary to bring the price of the oyster within the limits of every purse, as is the case in the United States, where it is considered one of the most common and cheap means of subsistence. In the public establishments of New York a most excellent soup, made of these mollusca, can be obtained for six cents.

It is only necessary to have assisted, as I have done in the course of my investigations in the daily sale of several thousand oysters by the same merchant, to have witnessed the opening of eight hundred bushels a day in the establishments of Boston and Fair Haven, for the purpose of sending the flesh, packed in ice, into the interior of the country; it is only necessary, I say, to have taken part in such scenes to become profoundly convinced that the raising of shell-fish so prolific must become in France, as in the United States, a most important element for the support of life.†

I should, therefore, consider it a national blessing if we can obtain their reproduction in France, a consummation which we have every reason to hope will take place next spring, since the oysters deposited by M. Coste in the basin of Arcachon have developed as rapidly as in the best American plantations. As soon as reproduction allows them to be

* The oyster merchants divide these mollusks into "fresh" and "salt" oysters. The latter come from submarine soil, where the sea is not mixed with fresh water.

† The American oysters have the advantage of being able to endure the regimen of the parks; and although some localities suit them better than others, on account of the richness of the soil, they prosper on almost all parts of the coast. Long experi-

brought into the market, I have not a doubt that their excellent qualities will readily secure consumers.*

From whatever point of view we regard the shell-fisheries of the United States, they present remarkable results. The food provided for the people; the resources furnished agriculture by use of the shells; the influence upon coast navigation, which is so greatly developed by them; the work provided for the poorer classes, &c., all claim the earnest attention of political economists. Oysters and clams have now become necessities of the first importance in North America, and show how much the productions of the sea may add to the riches of a country, whatever may be the means employed to obtain them in abundance.

Apart from the interesting question of acclimation, the exposition of this industry is of service, in showing us the necessity of pursuing the fruitful field opened by the perseverance of M. Coste. The marvelous results obtained in a few years, on those parts of the coast where he has experimented, no longer admit of a doubt as to the value of his ingenious method of ostriculture. It will certainly be necessary to make a more complete study of our shores in order to prevent mistakes, or rather badly conceived enterprises; but this work once accomplished, there are few industries of France which offer as many probabilities of success.

I have often heard it stated as a reproach to ostriculture, that it had not produced in the bay of St. Brieuc all the results expected; that although the fascines immersed were covered with embryos during the breeding-season, they had not prospered and formed new banks. Having never been in circumstances to verify the truth of this assertion, I cannot say how well it may be founded; but, admitting it to be true, I cannot see how it militates against ostriculture. It proves, at most, the utility of transplanting the young generations attached to the collecting apparatus, thus putting in practice means employed with many products of the soil. To expect of a science, which dates but a very few years back, the unfailing success which belongs only to long experience, seems to me to be very unreasonable.

Pisciculture, hirudiculture, ostriculture—in a word, all the industries which relate to the domain and constitute the agriculture of the sea—must necessarily pass through all the stages from infancy to maturity; but in order that they may rapidly bring forth fruit, thoughtless prejudgment should not interfere with their progress.

The most prejudiced persons with whom I have conversed upon the subject of ostriculture, admit that the embryos can be obtained in un-

ence has shown that those from the Chesapeake may be transplanted to all the Northern States without deteriorating in quality; and it is remarkable how much they will improve under certain hydrographic conditions. The salt-oysters of Massachusetts, so highly esteemed in New York, originally come from Virginia and remain several months in Boston Bay or that of Wellfleet, (Cape Cod.)

* By a remarkable coincidence, the oyster from Virginia, which we are endeavoring to naturalize in the basin of Arcachon, is found in the fossil state in the neighborhood of Bordeaux.

limited numbers; but there, they think, all useful results end. Yet experience in the United States, where the secret of the culture consists in raising upon nutritive soil the mollusks removed from the places of production, evidently shows the fallacy of this opinion.

As the example of the American planters proves, nothing is easier than to remove the young oysters attached to the collecting apparatus, and to plant them in hurdles or narrow stalls very well sheltered, the bottom of which is firm enough to prevent their being smothered by the mud. This can be done at no great expense, and with no complicated manipulation; and, in a few months, the mollusks will be strong enough to defend themselves from ordinary causes of mortality.

It is an unfortunate error, prevalent among mariners, which supposes that what appertains to the productions of the sea should not be modified by the hand of man, and they consider it, to say the least, useless to attempt to obtain these productions by artificial means. Such an idea, which is equivalent to the negation of science, is as absurd as the fatalism of the Orientals, who leave to Providence the care of all things, and so excuse their own idleness and carelessness. We do not hesitate to say, that it shows great want of a just appreciation of the mission of humanity thus to limit its intelligence and powers of investigation.

The exploration of the domain of the sea gains in public opinion every day. The people of the coast instinctively feel that the sea is destined to be to them a most fruitful source of prosperity, and to deliver them from the miserable condition which has for a long time been their portion. In a few years, thanks to the light of science, profitable fisheries will be established upon the coast, among which ostriculture will certainly be the most fruitful. While, on the one hand, by means of intelligent regulation, based upon careful study of locality, myriads of young fish will be protected from wanton destruction by ignorant fishermen, on the other measures will be taken to raise in reservoirs such as can bear the regimen. Shell-fisheries will also be developed wherever they can be established with success. The populace, attracted to the coast by the hope of a better livelihood, will become acquainted with the sea; will learn to consider it the source of many blessings; and will finally greatly augment the elements of our maritime power.

P. DE BROCA,
Lieutenant, and Director of the Port of Havre.

CHAPTER SECOND.

OYSTERS OF THE UNITED STATES.

Naturalists divide the oysters of the eastern shores of North America into three species, namely: the oyster of Virginia, (*Ostrea virginiana*); the northern oyster, (*Ostrea borealis*); the Canadian oyster, (*Ostrea canadensis*). Notwithstanding this classification, based upon details of form, which in fact vary considerably, the mollusks in question,

always found in the same latitudes, are so similar in taste that they may be considered merely as varieties of the same species. Dr. Gould, an American naturalist, admits this to be the case so far as the northern and Canadian oysters are concerned. However the facts may be, the difference between the American oyster and the European is so marked that a superficial examination is sufficient to prove that they are of distinct species. The prominent points which distinguish those bivalves from ours are the violet color of the muscular impression, and the greater insipidity of taste, even when they are taken from banks situated on the open coast, and in water entirely salt.

While the form of the common oyster of Europe, growing freely, is almost entirely round, that of the American is always more or less elongated. In addition to this, its lower valve is more concave, and contains a mollusc thicker, more tender, richer in nutritive elements, and having also a less salty taste, which in some cases resembles that of the mussel. When it attains its full development, which, according to fishermen, requires twenty years, its dimensions are considerably greater than those of ours. Its shell is thicker and heavier, and the interior enamel rarely presents those soft parts from which fetid water escapes when they are accidentally pierced.

The oyster of Virginia.—This, most common of the three species, has a narrow shell, increasing gradually in size from the top and moderately curved in the plane of the intersection of the valves when it is allowed free development. The specimens taken from the natural banks are generally distorted, on account of certain conditions affecting their growth; but they nevertheless preserve all the most marked characteristics of the species.

As in Europe, the oyster which is most regularly an article of commerce is that which has been improved by culture. The beak of the Virginia oyster, very pointed when old, is somewhat bent, and the opposite part of the shell is rounded. The upper valve, almost entirely flat, is the smoother of the two, and the surface, when not worn by friction, presents numerous laminæ more regularly disposed than in the other species. The muscular impression, very often central, is of a deep violet color. The weakness of the muscle is a marked characteristic of American oysters generally, a fact which I have not seen noticed in any book upon natural history.

Specimens are sometimes found measuring 15 English inches in length, 3½ in width. This species, known in the market under the name of the Chesapeake oyster, is common all along the coast, especially in the Southern States. In the North it is found in as high latitudes as Prince Edward Island and the mouth of the Saint Lawrence River. Its most essential characteristics are its great length, compared with its width, and the pyramidal form of the beak.

The Northern oyster has a shell rounded, curved, ordinarily crooked, and always less elongated than that of the preceding species. The upper

valve is flat, and the beak short and bent over. The surface of the shell is very irregular, and formed of laminæ of a greenish color, disposed without order. Its edges, more or less jagged and scalloped, are calcareous in the lower valve, while in the upper they are flexible, and seem to be membranous in nature. The muscular impression is of a deep violet color, and the interior of the valves of a chalky white, or light green. The lower valve is deeper than that of the Virginia species. Some specimens are a foot in length, by six inches in width. This oyster is commonly known as the New York oyster, as it is found in considerable numbers in that bay. It is found all along the coast, and even in the Chesapeake, were it is mixed with the principal species. It is frequently taken in Buzzard's Bay, (Massachusetts.)

The Canadian oyster.—The Canadian oyster, also less elongated than that of Virginia, is generally crooked, with the beak rounded. The shell is wide, expanded, very white, and laminiferous. The upper valve is slightly convex. It is common on the Canadian shore, at the mouth of the Gulf of Saint Lawrence, as well as upon certain parts of the coast of the United States, particularly in the latitude of New York.

The American oyster, without distinction of species, exists in such profusion that it seems to be gathered as plenteously as manna was in the exodus of Israel. From the British provinces to the Gulf of Mexico it constitutes inexhaustible banks, which in certain localities, were it not for the constant fisheries, would form reefs, modify currents, obstruct channels—in a word, interfere greatly with navigation. Abundant on every part of the coast, nevertheless some latitudes seem specially to suit it. Such are the shores of New Jersey, of Long Island, of Connecticut, of Rhode Island, of the mouth of the Delaware, and, above all, the magnificent bay of Chesapeake, a regular magazine of abundance, where every year vessels are loaded with the precious mollusks, and transported to all parts of the coast.

North Carolina, Albemarle, and Pamlico Sounds also produce excellent oysters.*

The Americans, pre-eminently practical in all that concerns the material interests of life, have not neglected this great source of wealth. They realized, at a very early period, the great advantage which might be derived from so much alimentary substance, obtained almost without expense; and the oyster-fisheries, with their culture, have been, with them, for a long time, lucrative industries, becoming each day more extensive, in order to supply the demands of the ever-increasing number of consumers.

Disregarding the methods of culture adopted in Europe, they have

* The enormous multiplication of this species has, for a long time, attracted the attention of philosophers and naturalists, many of whom, in view of this incessant production of the mineral matter composing the shells, are of the opinion that most of the calcareous deposits have no other origin. Like the polyps of the Indian Ocean, this mollusk, if left to itself, would change the hydrography of coasts.

chosen one which is very economical, and which yields excellent results, as may be seen in the well-known "plantation system." Their mollusks, like ours, require beds of miry sand, rich in animal production, and sufficiently exposed to the open sea. The brackish water at the mouths of certain rivers, into which the tide rises, constitutes one of the best conditions for the success of this industry.*

Chesapeake Bay, from which is gathered a large proportion of the oysters cultivated in America, is a magnificent basin in which Providence seems to have accumulated every necessary condition for forming an admirable locality for the fishery. Its entrance, between Capes Charles and Henry, opens from the east to the west; but the bay soon changes in direction, and extends toward the north for a distance of one hundred and fifty miles, with a width of from twenty to thirty miles in the southern part, and from ten to fifteen in the northern. It is accessible to the largest vessels. A number of rivers empty into it, of which the most important are the Potomac, the Rappahannock, the York, and the James. The amount of fresh water which flows into this bay daily from these streams, the smallest of which admits the rising of the tide, renders the water of the Chesapeake less salt than that of the ocean, a circumstance which we have already mentioned is favorable to the natural production of the oyster. The shores of the bay are indented by a multitude of gulfs, creeks, small bays, &c., in which are numerous islands. The extent of shore is thus greatly increased, and innumerable places of shelter afforded for the multiplication of fish and mollusks.

The quantity of fish furnished by the fisheries is very great; and before the war the annual estimate at Baltimore was four hundred thousand barrels of salt fish, principally herring and shad.†

The oyster-industry is still more important; and the production from the banks in the bay, in 1858, was twenty millions of bushels. At that time about ten thousand persons were employed in the fisheries and with work on the plantations.

The oyster of the Chesapeake, in consequence of the favorable conditions in which it lives, is in its natural condition so large, that, for the most part, it does not need culture, but can enter the market immediately. At Fair Haven and at Boston, where, on account of the thickness of the ice, it is impossible to secure a supply in winter, they are, during that season, brought from Virginia in sufficient quantity to supply the needs of commerce. The schooners which transport them manage

* Pearls are found in many American oysters, but of very inferior quality. They are of a chalky white, sometimes having a faint violet tint. It seems that upon the coast of New Jersey a bank of oysters was found a few years ago furnishing beautiful pearls. The country was in a great state of excitement; the fishermen supposed they had made a valuable discovery, but after a short time it was found that the hopes excited were quite fallacious.

† Chesapeake Bay abounds in fish of all kinds—mackerel, herring, perch, eels, red mullet, cat-fish, shad of every variety, &c. In the Potomac, James, and other rivers enormous sturgeon are taken, weighing from 150 to 200 pounds.

their voyages in such a manner that the merchants are regularly supplied; and the mollusks ordinarily remain in the hold of the vessels until the cargo is sold. However cold it may be, they will live for several days, provided the hatchway is not opened until the hour for removal. They have been known to live in this way for a month.

With a few exceptions, we may say that a large part of the cultivated oysters in the Northern States come from the Chesapeake and the mouth of the Delaware, where the planters can procure them at so low a price as to make it unnecessary to take part in the local fisheries.

The fishermen of Maryland and Virginia sell them at from 15 to 20 cents a bushel, containing from 200 to 250, according to the size of the oyster. It must be acknowledged, however, that these oysters, although they may be improved by culture, and in certain cases acquire a saltier taste, are never quite equal to those of the coast of Connecticut, of Rhode Island, of certain parts of Massachusetts, &c. The native oysters are generally consumed in the neighborhood; are sold at a much higher price; and are never sent without their shells into the interior. The most highly esteemed oysters come from the bays of New York, New Haven, and Providence; from different parts of Long Island Sound, and from the shores of New Jersey, (principally from Milk Pond and Absecom Creek.) In my opinion those taken at Blue Point, in the great bay south of Long Island, are the most delicate of all.

When not consumed raw, the oysters are prepared in a variety of ways. They are pickled and preserved by the Appert process; they are eaten in the form of soup, or stewed, broiled, made into pâtés, &c., and they serve, besides, as accessories to numerous culinary preparations. The consumption is so extensive that in the towns along the coast during the winter season it forms a part of the daily food of almost every family in moderate circumstances.

In all the great centers of population there are large establishments known under the name of oyster-houses, where the mollusks are sold, prepared in every possible way. These are, in fact, restaurants, and differ from the ordinary establishments of the kind, only in being especially intended for the sale of every variety of shell-fish. In New York there are more than three hundred of these oyster-houses, some of which are handsomely furnished, and situated in the finest portions of the city. They are mainly frequented by the commercial class, who take a meal here in the middle of the day. Oysters are also sold in small shops, and even at stalls in the open street, where the working classes supply themselves.*

Oyster-soup (stew) is the most favorite preparation of the mollusk with Americans; and during the winter season it is an almost universal custom with them to call for it at the oyster-houses after leaving the theater. It is so popular that it is even introduced as a refreshment at large

* During the summer the oysters are preserved in the oyster-houses by placing them upon a block of ice; which lowers the temperature, so that they live for several days.

parties and balls, invariably making its appearance toward morning, to repair the exhausted forces of the dancers.

The American oyster, when cooked, is certainly superior to ours, and as it preserves its nutritive properties better during the process, it is highly regarded by physicians as an article of food for convalescent patients. Many persons eat them throughout the year without experiencing any injurious effects. On this point I would hazard an observation, which, it seems to me, has sufficient foundation. Fishing, during the breeding season, is prohibited by law, so that all the oysters then sold come from the plantations. Now, as these oysters were transported in the month of April, a time when the process of generation commences with them, it is very probable that this process was affected, and in most cases arrested completely, by the fatigue of the voyage and the change of medium. As under the circumstances they rarely become spawn-bearers, they can hardly be injurious in the warm season, although in their natural condition they would be positively unwholesome.

The price of oysters for consumption varies greatly. It depends upon their size, quality, the reputation of the plantations in which they are cultivated, and the importance of the establishments in which they are sold. At wholesale, they are about $1 a bushel; while in the markets, oyster-houses, &c., the price is higher, and varies from 50 cents to $2.50 for the largest size used in choice preparations. The merchants, intelligent in all that concerns their profession, make many distinctions in the value of the oysters, in order to derive as much profit as possible from them; and they well know how to take advantage of the taste of their customers. Fresh oysters can be procured either in or out of the shell in all the markets. In the latter condition they are generally sold to restaurants, hotel-keepers, and families who buy them for immediate consumption.

For exportation and transportation into the interior they are sold—

1. In the natural condition
2. Out of the shell;
3. Pickled;
4. Canned.

The oysters in shells are sent in great quantities into the interior during the winter season. They are put in barrels about a quarter the size of an ordinary flour-barrel, and tightly packed to prevent the opening of their valves. These barrels have, at regular intervals, openings for ventilation.

Naked oysters, intended for the most part to be eaten cooked, are sent into the interior during the entire year, but chiefly in winter. As I have said, the cities of Baltimore, Boston, and Fair Haven are the principal centers of the trade, and form the most important branch of the oyster-industry.*

Pickled oysters.—Pickled oysters are prepared, as in Europe, with an

* Some persons eat these oysters raw, seasoning them with salt, pepper, and vinegar.

addition of vinegar and spice to the water in which they have been cooked. As the vinegar used is inferior to that employed in France they are not equal in value to ours.

Canned oysters.—These are mostly prepared in Baltimore. The mollusks are taken from the shell, slightly cooked, and then put into cylindrical tin boxes, or cases, with a circular hole at the upper end about an inch and a quarter in diameter. When filled, the cans are closed by soldering a small round piece of tin over the opening.

Use of the shells.—The shells of the oyster give rise to various industries, which are also very important. In agriculture they are used for improving the soil when it has not a sufficient quantity of calcareous matter. They are also used for macadamizing roads, and forming paths in pleasure-grounds, which, by the use of this substance, become of a dazzling white. Lastly, they are burned, and an excellent lime is obtained, which is better as a fertilizer than ordinary lime, inasmuch as it contains no magnesia. Generally the oyster-dealers give away the shells gratuitously, upon condition that their establishments shall be daily relieved of them.

It was estimated, in 1857, that the pecuniary profits derived from the shells, from the various oyster-establishments in Baltimore alone, amounted to more than $120,000. Before the war the lime-pits of Mr. Barns, at Fair Haven, burned annually more than 250,000 bushels. At the present time there are upon the coast of the United States a great many mills employed in this branch of industry. A bushel of oyster-shell lime sells at from 12 to 13 cents.

MODE OF OBTAINING THE OYSTERS.

Oysters are obtained in different ways, according as the beds are more or less deeply situated in the water. The instruments employed are the drag, the rake, and the tongs, which is a peculiar implement, unlike anything we have in Europe.

The drag is very much like that in use in France, but as the weight is not determined by law it is generally heavier. The part intended to hold the oysters is sometimes made of rope and sometimes of iron network.

The rake, similar in form to that employed by our fishermen, is about 14 inches wide, with iron teeth from 6 to 10 inches in length, and is provided with a net for the reception of the mollusk. Sometimes it is made entirely of iron, with curved teeth, which will hold a certain number. It is worked by hand, by means of a pole 15 or 20 feet in length, to which it is fastened. It is frequently used during the winter season in Rhode Island for gathering the mollusks from the ponds of Point Judith, the surface of which is frozen sometimes for several weeks. Fishing is then accomplished by thrusting the rakes through holes made in the ice.

The tongs, which I have never seen except in America, is an instrument which ought to be introduced into France, as it would be of great

service to our shell-fisheries in general. It is, as its name indicates, an immense pair of pincers, with rakes attached to its lower extremities, the teeth of which interlock when the instrument is closed. These rakes are about 14 inches in width, and the teeth, placed about 1½ inches apart, are only 4 inches long. The handles are from 15 to 20 feet in length, and the point of intersection is about a yard from the lower extremity. To take the oysters with this instrument, the fisherman first anchors his boat over the bed to be worked; then seating himself at the side, he takes the upper extremities of the two poles, one in each hand, and opening and closing the instrument successively, endeavors, as it were, to nibble the bank with the rakes and pick up the mollusks. As soon as he feels that he has a sufficient number, he draws up the instrument and deposits the captured oysters upon the deck. A large part of the oysters furnished by Chesapeake Bay are taken in this manner. The tongs is also used on the plantations and in fishing for clams.

The boats used are generally of small tonnage. Most of those which I saw in the bay of New York, and in the great bay south of Long Island, were constructed with flat bottoms, in order to pass easily over the banks, and provided with a sail, and three or four men constitute their crew.

The working of the banks, by means of the tongs, is eminently preservative, as there is no loss by the destruction of many of the mollusks, as is the case with the drag. Undoubtedly, the use of this instrument is impossible on many of the banks of the French coast, but in the basin of Arcachon, in the salt ponds of the south, and those of Corsica, it might be employed to advantage.

Local regulations.—Notwithstanding the extraordinary richness of the oyster-production on their coast, the Americans have felt the necessity of protective legislation to prevent the exhaustion of the banks, and for this purpose the various seaboard States have established special laws determining the time of the fisheries, and the mode in which they must be worked.

A few years ago, on the shores of Maryland and Virginia, the oysters were taken in such great quantities for consumption, for the manufacture of lime, and for manure, that the danger of diminishing the value of the fisheries was recognized, and very severe restrictive laws were passed in these States. In general, however, the legislation which controls the oyster-industry is very complicated, since, with great want of uniformity, each State enacts its own laws without reference to those of the neighboring States. Its objects may be enumerated thus:

1. To prevent the destruction of the natural banks, by determining the time and mode of the fisheries.

2. To protect the plantations from lawless depredations.

3. To reserve, with a few exceptions, for the residents of each State, the right of local fishing.

4. To reserve, in certain cases, the fisheries to the inhabitants of the circumscribed maritime districts in which they are situated.

I give in this article, and in the one which treats of the culture of oysters, a summary of such laws as appear to me to be interesting.

Massachusetts.—In this State no one, in a maritime district defined by law, can fish for oysters without a written permit from the mayor or the selectmen* of the locality. This permit must give the length of time of the fishing, the number of mollusks to be taken, and the purpose for which they are to be used. Any resident of the place can take oysters from the banks, for the use of his family, from the 1st of September until the 1st of June. Trespassers are fined $2 a bushel for oysters illegally obtained.

Rhode Island.—In this State, where legislation is most stringent, the oyster-fisheries, reserved exclusively for the residents, are prohibited for use from the 15th of May till the 15th of September, under a penalty of $20 for every bushel taken. And, during the permitted season, there are regulations controlling the quantity of mollusks to be taken daily, which quantity varies with the locality, but must in no case exceed five bushels. To protect the fisheries as much as possible from depredation, the law inflicts a fine of $500 on any person convicted of damaging the oyster-banks by any means whatever. Half of the fine goes to the State and the other half to the person commencing the prosecution or lodging information.

The fisheries are allowed only between the rising and the setting of the sun, and it is required that all oysters not of marketable size shall be thrown back into the water. The use of the drag is positively forbidden, and the boats using them are confiscated, with all that they contain, while each of the crew is condemned to pay a fine of $300.

Connecticut.—According to the legislation now in force, every locality in this State, containing oyster and clam fisheries, has a right to enact laws for their control, and may impose a fine, not exceeding $14, for every offense.

The fisheries are everywhere prohibited from the 1st of March till the 1st of November, under a penalty ranging from $7 to $50, or by imprisonment not exceeding thirty days. In certain cases the delinquents may be punished by both fine and imprisonment.

New York.—The ordinary fisheries in this State are prohibited during the months of June, July, and August, under a penalty ranging from $20 to $30, according to the locality. One-half of the fine goes to the superintendent of the poor of the district in which the offense occurred, and the other half to the prosecutor.

To take oysters from the Hudson River, in order to transport them out of the State, is prohibited under a penalty of $250. The use of the

* The selectmen are public officers, elected by the people, to administer justice in localities where there is no mayor.

drag is forbidden in the county of Richmond, and several of the local fisheries are reserved for the maritime district to which they belong.

New Jersey.—No fishing is allowed in this State from the 1st of May till the 1st of September, under a penalty of $10. Any person convicted of using a drag, or having one on board a vessel on which this instrument is usually employed, is liable to a fine of $50. The same penalty is imposed upon the owner of the boat.*

No one who has resided less than five months in a district can fish for oysters and clams, under a penalty of $20, and the seizure of boat and cargo. A boat-load thus condemned is sold, and half the proceeds of the sale, after expenses have been deducted, are given to the informer and half to the collector of the county in which the offense was committed.

By a law enacted in 1857 any fisherman convicted of dragging for oysters in Dennis Creek (county of Cape May) was compelled to pay a fine varying from $10 to $100, to have the boats on which the prohibited instruments were found confiscated, and to be imprisoned from ten to thirty days.

Delaware.—Fishing is prohibited in this State from the 1st of May till the 1st of October, under a penalty of $10, and the same fine is inflicted if the drag is used in any of the creeks, bays, or ponds of the State, while the boats employed for the purpose are also confiscated.

During the regular fishing seasons the oysters must be sorted on the spot, and those not marketable thrown back immediately into the water under a penalty of $10.

No one not a citizen of the United States can fish in those portions of Delaware Bay belonging to the State without a permit from the clerk of the district. This permit, which is good for a year, can be used only by the boat named in it. Its cost is $50, which is that much profit to the State. Whoever violates this law is punished by a fine of $50, with confiscation of the boat, and all it contains. Any vessel may fish for oysters in the proper season if they are for its own consumption.

Maryland.—Fishing is interdicted from the 1st of May till the 1st of October, and no one is permitted to engage in the business who has not resided in the State at least twelve months, under a penalty of $100. The fishing-instruments allowed are the rake and the tongs; the drag, with a very few exceptions, being rigorously prohibited, under a penalty of $100 and the confiscation of the boat.

The laws also require the prosecution of fishermen who use the seine upon the oyster-banks, as the nets dragged over the beds either carry off a number of mollusks or bury them in the mud.

A law of 1835 forbids fishing for oysters for the mere purpose of procuring a fertilizer, under a fine ranging from $10 to $50. Finally, no one who is not a resident of the State can fish at less than two miles from the shore, and the punishment for this offense is a fine of from $5

*Those who reside on the shores of Delaware Bay are exempt from this regulation.

to $50 and the confiscation of the boat. No prosecution, however, can be undertaken without a special order from a justice of the peace, given upon the affirmation, under oath, of a resident of the State. The county sheriff, the constable, and civil and military officers are expected to assist in the execution of these laws.

Virginia.—Fishing for oysters in waters belonging to this State during the months of June, July, and August is prohibited under a fine of $50.

On the shores of rivers and in bays the only instrument allowed by law is the tongs, excepting always localities where the water is deep. In the sounds of Tangier and Pocomoke, for instance, the use of the drag is permitted, but never in the mouths of rivers, in the interior of the bays, or where the water is less than twenty feet in depth.

The legislature of Virginia, in order still better to protect an industry which is a great source of wealth to the State, passed a law in 1856 by which each county, when it is considered necessary, can appoint inspectors, whose duty it is to arrest persons and boats suspected of having violated the laws. These inspectors are sworn into office, and receive the half of the fines imposed upon the delinquents whom they bring to justice. With a very few exceptions, which are mentioned in the laws, the taking of oysters from the banks for enriching the soil, or for the manufacture of lime, is punished with a fine of $500.

CULTURE OF OYSTERS.

The methods adopted by the Americans for the culture, or rather for the improvement, of oysters obtained from the coast fisheries are in no respect similar to the complicated and expensive processes in operation at Marennes, Ostend, Courcelles, or other such localities where these mollusks are reared. The "pen," in the exact sense of the word as we use it in France, is unknown in the United States; for the ponds or reservoirs for oysters, formed in certain places by closing the mouths of small creeks, with sluice-dams, can hardly be so called. Establishments of this kind are, moreover, very rare, and I had not an opportunity of visiting one.

American ostriculture, more simple than ours in all its details, consists in planting the mollusks on those parts of the coast where the submarine soil is best fitted by its nature to fatten them and promote their growth. The process is very much the same as that adopted at Saint Waast and Cancale; and in the United States the results are so satisfactory that it would be worse than useless to have recourse to more complicated methods, which, without increasing the profit, would add greatly to the expense.

The success of this branch of the oyster industry depends upon the hydrographical configuration of the locality chosen for planting the oysters, upon the nature of the submarine soil, and upon the saltness of the water.

The American oysters, like our own, do not prosper on every kind of soil indiscriminately. In pure sand they do not fatten, and grow very little; in mud they contract an unpleasant taste, and also run the risk of being smothered; but in mixed soils of sand and mud they develop to an astonishing degree, especially when the water is slightly salt.*

These artificial deposits, called oyster-beds, are necessarily formed in accordance with circumstances which vary with the locality. Sometimes ground is used which is constantly under water. Sometimes, on the contrary, as at Boston, Wellfleet, and New Haven, the beds are exposed for several hours each day, and only covered at high-tide.

The most favorable places are those situated in bays, creeks, and the mouths of rivers in which the tide rises, but the bottoms of which are not shifting; in estuaries or arms of the sea; in salt ponds; in short, in all places so sheltered that there is no fear that the waves of the ocean will wash away the deposits. The action of currents, if not too strong, is not considered injurious. The maximum depth at which the oysters are planted is from twelve to fifteen feet at low tide; but more commonly the beds are only four or five feet below the surface of the water, which is preferable, as the oysters can be taken up more readily.

The most important plantations are in the vicinity of the large centers of population; but with the facilities for transportation which exist in the United States they are found on all parts of the coast.†

Whatever may be the locality chosen by the planters, they can in no case pursue their industry on the natural banks of oysters,‡ the common property of the people, or in any way interfere with the free exercise of navigation. These conditions complied with, every facility is generally afforded them by law; but in some States, before commencing operations, a license must be obtained from the civil authorities of the maritime district in which they are to be located.

The limits of plantations are marked by slender poles inserted in the

* Oysters planted in tidal rivers, or in ponds of brackish water, fatten and grow very rapidly, but are characterized by a more insipid taste than those cultivated in purely salt water.

† In the vicinity of New York the principal plantations are upon the shores of Staten Island, particularly at Prince Bay, in the East River; in the Harlem River and Shrewsbury inlet, &c. At New Haven they are numerous in the bay, and at the mouth of the Quinipiac. At Boston the most celebrated are established upon the projecting shores of Bird Island and Hog Island, as well as in certain parts of the Saint Charles and Mystic Rivers.

‡ By a natural bank, we mean a conglomeration of mollusca presenting a character of continuity, constituting what is usually called an oyster-bed. The natural bank may be single or formed of several small banks, separated by greater or less spaces, but always sufficiently connected to be considered parts of one whole. As to places where, through accidental circumstances, isolated oysters have developed, they are not classed among the natural beds, since, if this were the case, the largest part of the submarine soil of the coast would be under interdiction and oyster culture would be impossible. However protective the American laws may be in what concerns public property, they are careful not to interfere with private enterprise by a too rigorous interpretation of the term *public property*.

soil so long that the extremities, garnished with small branches, are two feet at least above the level of the highest tide. Similar poles divide the entire ground into squares of from twelve to fifteen yards at the side. These divisions, obligatory in most of the States, serve to indicate the exact position of the plantations, facilitate their surveillance by the police or coast-guard, and accelerate the labor of gathering. The poles are so flexible that they do not endanger vessels which may accidentally run against them.

The oysters are planted annually, from the 1st of March until the 1st of May, when the work generally ends. The vessels which bring them from the Chesapeake, the Delaware, or any other place of production, are, for the most part, schooners of 100 or 150 tons burden, which carry from 3,000 to 6,000 bushels of mollusks. When they reach their destination the oysters are delivered to the planters, who carry them to the beds, and distribute them as regularly as possible. The latter operation is of great importance, since if planted too closely together the mollusks will interfere with each other. The planting is done in the following manner: The men intrusted with the work load the oysters into long flat-boats, and carry them at high tide to the plantations. They station the boat over the center of each of the squares mentioned above in turn, and by means of a large shovel, or pitch-fork having twelve teeth, throw the oysters around them by a circular movement, very much like that of the farmer in sowing wheat. This is probably the origin of the term "planting" or "sowing" oysters. When the cargo of oysters is exhausted, the mollusks are regularly distributed at the bottom of the sea, in order that they may not injure each other. This part of the work, which is accomplished by rakes, is much more easily effected on ground which is sometimes exposed by the receding tide than in places always covered by the water.*

As I have already said, the oysters fatten and greatly increase in size in good plantations, and even change considerably in taste. No longer impeded in their development, the shells become more regular, spread, and have a more rounded form. In places where they are always covered by water, and there is no fear of their being frozen, they are frequently allowed to grow for several years, in order to obtain very large specimens. In localities, on the contrary, where the severity of winter would be sure to destroy them, on the exposed ground where they are cultivated, they are allowed to remain only during the warm season, and are taken up before cold weather commences. In any case they remain at least three months on the ground before they are used, otherwise the benefit of culture would be lost. About fifty bushels of mol-

* The position of the oyster upon the ground is of no importance, provided the deeper valve is uppermost. I have observed several times in the bay of New Haven a curious phenomenon. When the oyster happened to rest upon this valve, the growth was affected in such a manner that the edges of the shell turned upward toward the surface of the water, as if the animal thus endeavored to obviate the danger arising from its abnormal position.

lusks are generally sown upon each of the square divisions of the plantation. When the harvest season approaches the oysters are collected daily at low tide when the bed is exposed, or otherwise by rakes.

There is a very prevalent opinion in the United States and in England that oysters may be fattened by pouring Indian meal into the water which covers them. It is said that certain planters in New Jersey adopt this method in small ponds; but it is very probable the meal has no effect whatever upon the oysters, their stomachs being too delicate to digest such nourishment. Many persons reject this opinion as a mere prejudice without foundation.

The culture of oysters in the United States is a source of certain revenue, since it is an industry in which failure is unknown; and the survey of those parts of the coast where they can best be established is now so complete, that every probability of success is secured to the planter. A few years ago the profit upon capital engaged amounted to 50 per cent.; but as consumption became more extended, and the number of people employed in the commerce increased, profits, although still large, were reduced to a more ordinary rate. The war which desolated the country also interfered with the fisheries, since they were forbidden on a part of the coast of Virginia by the Federal authorities, lest the fishermen might establish communication with the enemy.

The effect produced upon navigation by the culture of oysters is very important. According to the information furnished me, the plantations of the bay of New York and of that vicinity employ one hundred vessels, and those of Boston and Cape Cod from thirty-five to forty. Before the war, from one hundred and fifty to two hundred schooners were employed during six months in the year, either in transporting oysters for plantations or in supplying the merchants of Fair Haven during the winter.

LAWS CONCERNING OYSTER-PLANTATIONS.

The oyster-planters are subject to laws peculiar to the different States, but which in every case are sufficiently stringent to protect the industry from the depredations of evil-disposed persons. This is very necessary, for as the plantations are for the most part in isolated places, sometimes at a distance from the shore, only very rigorous legislation can insure their safety. Misdemeanors are tried by the public officers, such as constables, sheriffs, harbor-masters, police, and coast-guards, and any person cognizant of an offense is requested to report the same to the authorities.

The following are some of the principal laws in force in the Northern States:

Maine.—Persons wishing to cultivate oysters on the banks of rivers, bays, or creeks belonging to the State must first obtain a permit from the local authorities. The only exception is in favor of plantations situated in the interior of bays and gulfs. In no case must navigation be impeded.

Massachusetts.—In Massachusetts the mayor and selectmen of each maritime locality may grant a written permit, to any inhabitant of the place, to plant oysters and to cultivate them, at any time during the year, in the waters of their district, provided the natural banks are respected. This permit, which is good for twenty years, indicates exactly the limits and character of the ground, and must be registered by the county clerk before it can be used. The magistrate who has granted it receives $2 as his fee, and the clerk 50 cents. This proceeding insures to the planter, and to his heirs in case of his death, the right to the ground conceded, and he can prosecute any one who trespasses upon it; while the offender is also punished by the law with a fine of $20 for each trespass.

Rhode Island.—In the Providence River the commissioners of the shell-fisheries can, upon their own responsibility, rent, for the good of the State, to any citizen of the State, any ground covered by water where there are no natural banks, for the establishment of plantations. These grants, given for five years, have a tax imposed upon them which is to be paid into the general treasury of the State.

When a citizen applies for a permit, the commissioners, before granting it, must give public notice of the day, the hour, and the place where the matter will be arranged. This notice, containing an exact description of the ground solicited, is published, at the expense of the solicitor, in one of the daily papers of Providence, at least two weeks before the day of settlement, in order that the transaction may be generally known, and the citizens have an opportunity of bringing before the commissioners any objections they may have to the issuing of the permit.

In no case can more than one acre be assigned to any one person, and only one acre a head to members of a company. The ground granted for the formation of oyster-beds cannot be rerented during the continuation of the grant.

A double copy is made of the lease, one for the solicitor, the other for the general treasurer, and if the commissioners consider it worth while, before signing it, a sketch may be made of the reservation granted.

The boundaries of plantations thus assigned must be determined exactly by landmarks on the adjacent shore, and by poles or boughs placed about eleven yards from each other, in the water; being so arranged as not to interfere with navigation. The landmarks, and poles or boughs, are renewed whenever the commissioners consider it necessary, and these officers of the government are also authorized to appoint a special guard, provided with a boat, for the protection of the plantations of Providence River known under the name of the Great Bed.

When the conditions specified in the leases are not complied with, or when the rent is not paid regularly, the grant may be revoked.

The regulations forbid the taking of oysters upon the plantations before the rising and after the setting of the sun, under a penalty of $20 and the confiscation of the boat.

Whoever robs a plantation of oysters is liable to a fine of from $20 to $100, and, in default of payment, may be imprisoned for a term not exceeding a year.

When a planter is found guilty of having taken oysters from a neighboring plantation his grant is withdrawn, and all the products confiscated to the State, while he is also subject to the ordinary punishment for theft. The right of fishing for oysters in waters belonging to the State is withdrawn for three years from persons twice convicted of transgressing the laws concerning plantations.

Connecticut.—In Connecticut each district has the right, in a special meeting of the inhabitants, to nominate a committee of five members at the most, who shall designate the places in the navigable waters where oysters may be cultivated without infringing upon the rights of citizens, and without detriment to navigation. Persons wishing to establish a plantation must address a written petition to the committee, clearly indicating the parts of the sea or river which they wish to occupy. If nothing asked for in this petition is contrary to the public interest, the committee may issue a grant, defining the situation and the limits of the plantation, and the time it may be held.

The extent of ground occupied by any one person must not exceed two acres, and before taking effect the grant must be registered by the clerk of the district. Plantations must be surrounded by poles, two feet at least above the highest water mark.

The owner of land on which there is a small creek or estuary may, with the permission of the selectmen, close it with a sluice-dike, in order to form a depot for oysters, where they may be fattened. He must present his request to the selectmen of the district, and if, in their *opinion*, the dam will not interfere with the privileges of the public, or be an obstacle to navigation, these officers will represent the case at the next annual meeting, and, if approved, the party interested may construct the dam in question.

Any person convicted of taking oysters from a plantation without permission, or of removing or injuring in any way the boundary-marks, is punished, for the first offense, by a fine not exceeding $7, and an imprisonment of not more than thirty days; for the second offense, by a fine of from $7 to $10, and an imprisonment of from one to three months; and for every subsequent repetition of the offense, by a fine of $50, and imprisonment for six months. The guilty party is also liable to punishment by the State authorities.

Any one who establishes a plantation upon a bank of natural oysters, without permission, is liable to a fine of from $5 to $50, one-half of which goes to the treasurer of the district in which the offense was committed, and the other half to the informant.

New York.—In the State of New York, all land-holders on the banks of the Harlem River, have the right to plant oysters in the bed of the river, in front of their property, provided that a sign-board, with the

name of the owner plainly inscribed upon it, marks the spot as private property. If this condition is fulfilled, no one but the proprietor or his agents can take the oysters from the plantation, under a penalty of $50, in addition to the value of the oysters stolen.

In Jamaica Bay, Queens County, land-owners on the shores of the bay and its tributaries, may plant oysters in front of their property, starting from the line of low tide and extending the beds about 66 feet. No person, or association of persons, is allowed to occupy more than a quarter of a mile along the shore. In this locality robbery of the plantations is punished by a fine of $25.

New Jersey.—In certain parts of this State the proprietors of tidal ground, in which are ponds, creeks, coves, &c., of salt water, which are not required for any public purpose, may use these for the culture or preservation of oysters by inclosing them with a dam.

Persons who, without permission, take oysters from the plantations, are punished with a fine of $20, without taking into account the action the owner may take for his damaged property.

Delaware.—According to the legislation of this State any citizen can establish in public waters a plantation, not exceeding one acre in extent, provided it is not on a natural bank of oysters, and that it does not interfere with navigation. It is necessary to inclose the plantation with poles or stakes, and to mark the ownership distinctly; and then any person who commits a depredation upon it is punished by a fine of $20. A person not a citizen of the State cannot, under any pretext whatever, deposit oysters in the bays, creeks, or rivers, under a penalty of $20 and confiscation of the mollusks.

Maryland.—Every citizen of Maryland may appropriate in the rivers, creeks, bays, &c., of the State, an extent of maritime ground, not exceeding one acre, for depositing and cultivating oysters, either for his own personal use, or for commercial purposes; provided he opposes no obstacle to navigation, and does not interfere with the rights of land-owners on the shore. A written description of the plantation and its limits, given under oath, must be registered by the clerk of the district.

In all cases the land-owners on the shore have a right of priority over one acre of ground, extending from the ordinary low-water mark. The plantations should be, as nearly as possible, rectangular.

Landholders having upon their property creeks or inlets, with mouths not over 100 yards wide, may use them for oyster plantations.

CHAPTER THIRD.

THE OYSTER-BUSINESS IN SEVERAL CITIES OF THE UNITED STATES.

A complete work upon the American oyster-fisheries ought, properly, to include all the localities in which they are carried on to any extent; but the length of time such an extended exposition of the subject would

require, owing to the difficulty of obtaining precise information, as well as the constant repetition of similar statements, would make the subject very tedious to the reader. I have therefore preferred to confine my remarks to those cities of the Northern States in which this industry has reached its greatest importance, as a sufficiently approximate estimate can thus be obtained of its valuable addition to the resources of public alimentation. These cities, which I have had occasion to mention several times in the course of this treatise, are New York, Fair Haven, Boston, and Baltimore. They alone monopolize, in consumption and transportation into the interior, more than half the entire commerce in oysters of the entire United States.

New York.—New York, the rich and populous commercial metropolis of the United States, contains to-day more than a million of inhabitants, including the city of Brooklyn, which may be considered only one of its suburbs. Nowhere in America is the consumption of oysters so great as in this city. As I have already stated, the Merchants' Magazine estimated it at 6,950,000 bushels annually; that is to say, 19,000 bushels a day, on an average.

The culture of the oyster is carried on to a great extent in the vicinity of New York, partly on account of the excellent grounds afforded by the bay and neighboring waters, and partly from the necessity the dealers experience of having large depots for these mollusks near at hand, to supply the daily needs of the inhabitants.

The most celebrated plantations are situated, on the one hand, on the shores of Staten Island and New Jersey, and, on the other, on the coast of Long Island and in the arm of the sea known as East River, in which there are innumerable small bays and creeks in a most favorable condition for such purposes.

The two most important markets for the wholesale trade in these mollusks are Catharine 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.

The establishments at Catharine Market and at the foot of Spring street are floating houses, constructed on rafts, generally one story, but sometimes two, in height, and ornamented more or less elaborately. These houses are generally moored together, and kept in communication with the wharf by means of a swing bridge, which rises and falls with the tide. They are usually about 15 yards long by 10 wide, and are divided into three distinct compartments.

1. The part entered from the bridge, which constitutes the only room in the house.

2. That which I will call the cellar, which is under water, and extends from the platform of the room to the bottom of the raft.

3d. The attic, which is formed at the top of the house by a ceiling about two yards and a half above the floor of the room.

These establishments, called oyster-boats in New York, are eleven in number at Catharine Market, and twenty-three in number at the foot of Spring street. They are generally furnished with two doors, one communicating with the wharf, the other opposite the first, and opening upon a small platform at the back of the house. This arrangement is for the convenience of the fishermen, who are thus enabled to discharge their cargoes immediately into the oyster-boat, labor as well as time being thus saved.

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.

Oyster-boats are obliged to pay rent for the place they occupy along the wharves.

The principal places for the retail sale of the mollusk are Fulton Market and Washington Market.

Fulton Market, on the East River, from which it is separated only by the width of the wharf, is a large, ungainly establishment, where all the various branches of the trade in comestibles are united. There is some regularity in the disposition of stalls, but nothing else that can compare with the well-ordered arrangements of the large markets of Paris, or other cities of France. The Americans are a free and easy people, but their love of liberty sometimes degenerates into lawlessness.

There are several persons in Fulton Market engaged in selling shellfish, who, notwithstanding their contracted quarters, keep a kind of restaurant, which it is very interesting to visit about noon, when merchants and workmen come from all quarters for their dinner. They are popular establishments in every sense of the word, and oysters, cooked in various ways, constitute almost the entire repast.

In front of the counters of these traders are large sheet-iron furnaces, usually rectangular, about six feet long, six feet high, and three feet wide. The upper part serving as a receptable for smoke is terminated by a pipe, which communicates with the outer air. The lower part, lined with bricks, holds a large quantity of coal, by means of which a hot fire is sustained.

Upon the fire, and touching it, a gridiron is placed, and on this the mollusks are cooked, particularly the roasted oysters, for which Americans have a special predilection.

I do not intend to enter into details in regard to the preparations sold at these restaurants, but I must say a word about the roasted oyster, as it is peculiar to the United States.

The mollusks used for this purpose are of large size, and generally come from New Jersey or the East River. They are placed upon the gridiron, the deeper valve below, and when sufficiently cooked in their own juice they are withdrawn from the fire and served to the customers. Large oysters prepared in this way are excellent, especially when seasoned with a little pepper and a few drops of lemon-juice.

There is no better way to obtain an idea of the habits of the American people than to visit their restaurants, where at the same table are found promiscuously representatives from all classes of society. There is a number of them at Fulton Market, and their business is very profitable, some of them selling as many as 10,000 shell-fish a day in the winter season. At Washington Market the stalls are not as comfortable as those in Fulton Market, and although the trade in oysters is considerable there are no restaurants, for the name can hardly be applied to the small establishments where soup is sold.

The mollusks are sold in the market both with and without the shells, and a certain number of men are employed by all the dealers to open the shells and take out the oysters. Each man has before him a kind of small anvil several inches long, and upon this he breaks the edge of the shell with the assistance of a flat piece of iron called a knife, one end of which serves as a hammer; he then turns the instrument round in his hand and inserts the other end, formed into a blade, between the valves, takes out the oyster with it, and throws it into a dish half full of water The work proceeds in this way very rapidly, and the men earn from $8 to $10 a week, according to their dexterity. Some earn as high as $15, but these are generally men in whom the proprietors place great confidence, and who are also intrusted with the sale of the mollusks.

New Haven and Fair Haven.—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 one to six 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.

The oysters cultivated in the bay remain, for the most part, upon the ground until autumn, when the work of transporting them proceeds on a grand scale. They are also consumed at that time in great numbers by the planters, so that when frost commences there is not a single one left upon the banks. This course is necessitated by the severity of the winter weather, and also by the little depth at which the oysters are cultivated.†

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.

As the fishermen must visit the banks at all states of the tide, they have boats of very peculiar construction, called "sharps," which draw only a few inches of water, and yet are very swift. Entirely flat on the bottom, the prow is sharply pointed and the stern greatly inclined. They have a rudder and can carry a sail. These sails are extremely simple, consisting of one or two triangular pieces fastened to a mast, the top of which is somewhat flexible and terminates in a point. Light poles, arranged as with the shoulder-of-mutton sail, serve to extend the sails of the "sharp," so that they are entirely flat. The result is that when the boat, sailing too near the wind, is thrown upon its side, the wind glides over the sail, and the boat rights itself. This system of

*As in most places where oysters are cultivated, the plantations here, also, are indicated by poles or branches, dividing the ground into regular portions. Although very slight, these poles are fastened so firmly in the ground that they cannot be readily displaced; and they are so flexible that they are not easily broken. When I visited the plantations, the boat which carried me was in full sail, and pressed upon them, first on one side, then on the other, and yet not one was injured. The boat, I ought to say, however, was managed with great skill in passing these obstacles.

†Although many of these oysters come from a warm climate, they could probably be preserved during the winter in the bay of New Haven, if they were planted at a greater depth.

arranging the sails seems the best suited to the purpose, and has been generally adopted.

The "sharps" generally hold from seventy to eighty bushels of oysters.*

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.† Divided into two parts by the Quinipiac River, they have been connected by means of a viaduct or railroad bridge.‡

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 operation of taking the oysters from the shell is performed exclusively by women, chiefly Irish, and the process is very nearly the same as in New York. Seated before a stand, loaded with a quantity of oysters, each one is supplied with a small hammer, with which she breaks the edge of the shells upon a blade of iron inserted in the stand. She then opens the oysters with a thin knife and throws the fish into a wooden pail placed at her right side. These women receive 8 cents a gallon, including the juice. They can earn at this price, if skillful, $2 a day in the winter season, when the work lasts throughout the day; but ordinarily they do not make more than a dollar and a half. About seven or eight hundred women earn their living in this way and some of the dealers employ sixty of them at a time.

As soon as a woman has finished a measure, the inspector of the establishment sets it down to her account, and empties it immediately into a tin trough, pierced with holes and placed under the spigot of a water-tank. The oysters are then well washed, in a full stream of water, and moved about with the hands, in order that any small pieces of the shell may be carried off by the current. They are then thrown into a cask.

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

*These boats, which are quite graceful in form, might be used with advantage in France, in bays, rivers, ponds, &c., where the water is not rough.

†Some of these establishments are at Oyster Point, on the western part of the bay.

‡At Fair Haven the Quinipiac 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 Quinipiac, the saltish water giving the flesh a better appearance.

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.

In 1858 the number of oysters used by the establishments of Fair Haven amounted to 2,000,000 bushels.

It has long been known that few occupations in America are more profitable than the packing and transportation of oysters. In 1856, the Journal of Commerce reported that a single house at Fair Haven had made $100,000 in the last four years. In that very year the Levi Rowe house, which has agencies at Buffalo, Detroit, Cleveland, &c., alone transported 150,000 gallons. Twenty vessels were in its employ, and from seventy-five to one hundred young women were engaged in its workshops during the winter. Twenty-five or thirty houses engross the largest share of the business, some of them transporting as many as 1,500 bushels mollusks a day.

The oysters planted in the bay of New Haven and in the Quinipiac are all disposed of before winter, and during that season the establishments of Fair Haven are regularly provided with mollusks from the

*In the State of New York, dealers found guilty of selling oysters in barrels or boxes containing more than a quarter of their capacity of liquor, are liable to a fine of $20.

†When sent only a short distance the dealers adopt a more economical method. The oysters, mingled with pieces of ice, are put into a kind of scuttle-cask, provided with a cover, and thus are sent to Hartford, Syracuse, Utica, and to places even more distant.

‡The kegs are made to contain two gallons, one, three-fourths, one-half, or one-fourth of a gallon, according to size.

Chesapeake and the Delaware. On the arrival of the schooners which bring them, they are either landed in the store-houses immediately, or remain in the hold of the vessels, until negotiations concerning them are complete.

A few years ago the commerce of New Haven was much more important than at present, especially with the West. It has in part been supplanted in the market of Saint Louis by that of Baltimore, which has greater facilities of communications with that city.

In 1857 from two hundred to two hundred and fifty schooners were employed, for six months in the year, in supplying the establishments of Connecticut; now the number does not exceed one hundred.

Boston.—Massachusetts, although one of the smallest States, is, nevertheless, one of the most influential. Through its commerce, the practical intelligence and enterprising spirit of its inhabitants, &c., it takes the lead in all the industrial movements of the country, and it is unrivaled in the importance of its literary and scientific institutions. Situated upon the Atlantic Coast, in a most favorable position for maritime interests in general, both its great and its small fisheries have enjoyed remarkable prosperity. The shores of Nantucket, of Cape Cod, of Plymouth, and of Cape Ann nourish enormous quantities of lobsters, and abound with edible bivalves, while immense shoals of migratory fish, varying with the season, such as cod, flounders, mackerel, shad, and herring, every year bring wealth to its hardy fishermen.

Of the whole tonnage of American fisheries in general, Massachusetts counts more than half. Boston, the capital of the State, naturally enters largely into this industrial and maritime movement; and to speak of the oyster-fisheries alone, this city plays the same part in supplying the Northern States as Baltimore and Fair Haven do for the Central and the Western. Built upon ground which is almost an island, at the head of a bay, and protected from the open sea by a chain of small islands, it is almost entirely surrounded with vast sheets of salt water, in which are found united the best conditions for the culture of the oyster according to the American method. Four rivers, of which the most important are the Charles and the Mystic, empty into the bay, and increase facilities for the fisheries.*

Ten principal merchants conduct the different branches of the oyster commerce. One of them, Mr. Higgins, senior, furnished me with much of the information which I received, and supplied me with most of the mollusks which I sent to France. At once dealer, planter, and proprietor of an oyster-house, no one could be better fitted to furnish me accurate information as to all the details of the business. His establishment, like those of his fellow-merchants, is situated upon the wharf

*The oyster-plantations are numerous in the bay, upon the shores of Bird Island and Hog Island. They are also to be found in the Saint Charles and the Mystic Rivers; but as they only partially supply the demands of commerce, the deficiency is made up by the plantations of Cape Cod, from which the markets of Boston are mostly provisioned. The quantity of oysters planted in the different localities in the spring amounts to about one hundred thousand bushels.

of the City Wharf, a part of the harbor specially reserved as a depot for fishing-boats. It is a building consisting of but one room, about twelve yards wide and ten deep, and the interior arranged with reference to the utmost economy of space. All round the apartment is a horizontal stand, breast-high, and almost two yards wide, on which the oysters are placed. At regular intervals a small square of wood, about an inch thick, is nailed to the stand, which separates the places of the workmen, and also serves as a convenient support for opening the oysters. The men stand side by side, but not so close as to interfere with each other's movements. They use a peculiar knife, consisting of a thin blade of steel, with a very sharp point and a round wooden handle. When a workman opens an oyster he takes it in his left hand, places it upon the small square of wood, the part opposite to the hinge facing him, pierces the edge of the shell with the sharp point of the knife, so that he can introduce the blade between the valves, then cuts the muscle, takes out the flesh, and throws it into a tin measure at his side.

A skillful workman can open eighteen oysters in a minute. I have nowhere seen work executed so rapidly; and as the edge of the shell is not broken, there is very little *débris* mingled with the oysters. As the supplies of oysters diminish upon the stand they are renewed by persons detailed for the purpose. As to the shells, each man throws them into a cask placed at his right hand, which, when filled, he carries to the door of the apartment, and empties on the public road.

Wages are 10 cents a gallon for the oysters without the shells. In winter, skillful workmen can earn as much as $3 a day when the oysters are of medium size; the small ones require much more time.* Six or seven hundred men are employed annually, and most of them are also engaged upon the plantations of the bay.

The work of packing, of closing the barrels and tin cases, and of repacking in boxes, with a receptacle for ice, &c., is carried on in every respect as at Fair Haven.†

Mr. Higgins keeps the oysters until the time for packing in double cases of zinc, containing from 50 to 60 gallons, and pieces of ice are mixed with them. In winter the establishments for transportation are supplied as at Fair Haven.

Baltimore.—Baltimore is the most important of all the cities engaged in the oyster-trade, as far as regards interior and foreign transportation. In fact, no other city of the Union is as advantageously situated for the business. In consequence of its position, on a navigable river

*The principal markets are in the cities of Massachusetts, New Hampshire, Vermont, and Canada, especially Quebec and Montreal.

†For short distances, during the warm season, it is customary to use tin vessels somewhat like our milk-cans. The oysters are placed in these, mixed with pieces of ice, which keep them fresh until they reach their destination. The merchants of Boston are in constant communication with the merchants of the neighboring cities, from whom they receive daily cans marked with the names and address of their owners, and they are immediately returned, filled with oysters. When they arrive the oysters are again put upon ice, and must be consumed within three days.

emptying into Chesapeake Bay, the expense of receiving the oysters is not great, and they can be easily dispatched to their various destinations, by means of the railroads which diverge in various directions from the city.

For about thirty years, Annapolis, the capital of Maryland, has been the principal market from which the cities of the West have been supplied with this article of food which every year has become more popular. Yet, strange to say, it is only within the last few years that public attention has been turned to the commerce, or any mention made of it in the statistics of the State. The only satisfactory document I could procure upon the subject dates only back to 1856, when a summary article appeared in the Baltimore American.

During the civil war all business matters were more or less deranged, so that the information contained in this treatise relates only to the condition of the oyster fisheries or trade as it was two years ago. The facts given are, for the most part, taken from an excellent publication printed in New York, called the "Merchants' and Commercial Review."

Besides the oysters consumed in the city, the transportation-houses send into the interior oysters in the natural state, without shells, or in cans, employing exactly the same processes as have been already described.*

Oysters in the shell, as well as out of the shell, are sent to the West and Northwest. Canned and pickled oysters go for the most part in the same direction; while the others are sent to California, Australia, the Antilles, and to a few markets in Europe, where the first of these preparations are highly esteemed.

The city of Saint Louis, Mo., is the center of the western commerce for transportation into the interior.

According to the official documents of the State of Maryland, for 1840, the oysters consumed by the trade at that time amounted to 710,000 bushels.

During the years 1856 and 1857, September to May, inclusive, the statistics of the oyster-trade were as follows:

Oysters in the shell:

	Bushels.
To Cincinnati and Chicago	400,000
To other cities	400,000
Consumption in Baltimore	150,000
Total	950,000

*The oysters required by the trade are obtained directly from the banks, or from plantations on the shores of Maryland and Virginia. Within the last few years they have been brought in great numbers from the vicinity of Norfolk, and these are very highly esteemed both for their size and their quality. The most important plantations in Maryland are in the counties of Saint Mary's, Dorchester, Talbot, and Somerset: in Virginia, in the counties of Northampton, Accomack, York, Gloucester, Norfolk, Lancaster, and Middlesex.

Oysters out of the shell, raw or canned:

	Bushels.
To California	200,000
To Saint Louis	150,000
To other cities	310,000
To foreign ports	50,000
Total	1,660,000

The season from 1859 to 1860 was an excellent one for the business, which began and continued with great activity. In the month of September the demand for raw oysters, put up in ice, was very great, as the oysters were superior to those of preceding years, particularly those of large size, taken from banks far out in the bay.* The price of the oysters continued good, and the principal merchants were busy night and day. As to the canned article, prepared for foreign exportation, it was also in great demand, and sold at a reasonable price, although oysters in the shell had advanced in price. During this season, the oysters consumed by the trade amounted to 25,000 bushels a day.

One-half of the principal transportation dealers were specially occupied with the sale of raw oysters and the other with that of the canned. The number of vessels employed in supplying the market of Baltimore was estimated at from 800 to 1,200.†

In the season of 1860 and 1861, notwithstanding the general prostrate condition of commerce, the oyster dealers did a good business, especially during the first months. From the 1st of September to the 15th of June, 3,000,000 of bushels were consumed; that is to say, 10,000 bushels a day on the average. About two-thirds were sent to the West, in a raw condition, packed in ice.

The commercial statistics of that season were as follows:

Number of the principal houses of transportation	30
Quantity of oysters sold in the market of Baltimore, (bushels)	3,000,000
Amount of the reselling of the oysters at $1.35 a bushel	$1,050,000
Number of vessels employed in the transportation	500
Number of persons employed in the various labors connected with the transportation trade	3,000
Capital engaged	$1,800,000
Commercial value of the canned oysters	$3,000,000

To avoid repetition, I will not speak of the manner in which the various operations of the transportation trade are conducted, since it is much the same as at Fair Haven. The oysters are generally opened by colored persons, of both sexes; while the white workmen are employed

*These were taken from the great banks of the Chesapeake Bay, which, as they are worked less than the others, yield oysters of larger size.

†Some of the boats used in the bay for transporting oysters to Baltimore are called "*pungies.*" They are a kind of schooner peculiar to the Chesapeake, moving with great rapidity, and holding from 300 to 600 bushels of oysters.

in putting them in boxes, in canning them, repacking them, &c. It is a custom in Baltimore to pack cases of raw oysters in boxes three feet and a half long by seventeen inches in width and only eight in depth. The cases are handled with great ease, and a space is left vacant in the middle for ice.

Mr. Maltby, a dealer who has made a fortune in the oyster-trade, informed me that, during the warm season, the boxes were placed in ice-wagons, so arranged that a current of cold air might pass continually over them.

The packing of raw oysters, taken from the shell and canned, forms one of the most lucrative industries of Baltimore. No other branch of commerce has a more substantial basis, since the demand for the article is constant, and the sales are ordinarily for cash. The importance of the business, upon which I cannot dwell too strongly, is one of the most convincing proofs of the influence that ostriculture, conducted on a grand scale, may have upon the wealth of a nation. Two or three thousand sailors man the boats, which provide the establishments with oysters; two thousand persons of both sexes are employed in opening the oysters; two hundred men in packing and closing the cans and in making the outside boxes; while three hundred tinners are required for the manufacture of the cans. It is probable that the value of the tin and solder used annually amounts to $150,000, while the number of feet of pine wood used for boxes must be nearly a million.

CHAPTER FOURTH.

GENERAL VIEWS UPON THE NATURAL HISTORY OF THE MARKET-CLAMS.

Soft clam (*Mya arenaria.*)—The soft clam is, next to the oyster, the most important bivalve of the American coast, whether we view it as a means of public sustenance, or as an addition to the fishing industry of the country. Its great abundance on the coasts where it is found, the good market it commands, the ease with which it can be obtained from the banks at low tide, all render it a most valuable source of sustenance for the poorer classes.*

Its principal characteristics are the following: the shell is oval, equivalve, almost equilateral, thin, open at both ends, and especially at the posterior part, which can never be closed on account of the conformation of the valves. The exterior surface is rugose, and marked in places by the raised lines of growth. Its general color is a chalky white, sometimes a blue black, more or less deep. The left valve has a cardinal tooth, as broad as it is long. There are two muscular impressions, and the ligament which unites the two valves is internal. In specimens of large size the siphons are nearly two inches long.

* In some places this mollusk has retained its ancient Indian name of *Manínose.*

As I have said in the introduction, soft clams form upon the coast of New England immense banks, upon which constant demands are made by the people, without any apparent diminution in the products. The places where the mollusks are found in the greatest abundance are the emergent sloping beaches of the counties of Barnstable and Essex, in Massachusetts. Farther south they are more rare, and if the information given me is correct, they are not found below the latitude of the mouth of the Delaware. They are so numerous in Boston Harbor, that I have myself seen more than a hundred of different sizes taken from a single square foot of ground, on the shores of Governor's Island.

The soil which suits them best is sandy, with a large proportion of mud, in which they can bury themselves to a greater or less depth, according to the season. In pure sand, or in too compact gravel, they do not develop as well, and attain a size of only about two inches and a half in length; while in mud they generally grow full three inches and a half long. Dr. Gould had a specimen which measured five inches and a half in length.

The color and thickness of the shells vary greatly, according to the surroundings of the animal. In sand, they are almost white. If gravel predominates, they are more yellowish; while in mud, on the contrary, they take a bluish tint, more or less deep.

Soft clams are, in the full acceptation of the word, inhabitants of the beach, living as *Solens*, *Tellinas*, and *Donaces*, in banks which are uncovered at low tide. In certain localities they are found only a few feet from the point reached by the waves at the highest tide. The consequence is, that during the great heat of summer they are exposed for a part of the day to a very high temperature. During the winter, when the shores of New England are often covered with ice for several weeks, the fishermen say that the clams leave the higher banks, and move nearer the sea. I was not in possession of the data by which I could refute this statement, but I am inclined to think that the clams, instead of changing their locality, only bury themselves more deeply in the sand during the continuance of the cold weather. A fact strongly confirmatory of this is, that they can be obtained during the winter season, if the ice is broken. Whatever may be the truth in regard to their moving away in cold weather, it is certain that they can bear a very low temperature, since Professor Agassiz has frequently found in the shells of these mollusks icicles, which did not seem to incommode them in the least.

The spawning season occurs, according to the fishermen, during the months of June and July. How much time they require to attain full size is not known, the American naturalists not having studied the subject. Judging from the almost imperceptible difference there is between specimens differing considerably in age, their development must be very slow.

Clam-beds are generally found in sheltered parts of the coast, or at

least in places where the action of the waves is not sufficiently strong to change the character of the banks. This fact I observed several times at Nahant, the summer residence of a portion of the wealthy inhabitants of Boston. On all the eastern shore of this quasi-island, washed by the open sea, not a single soft-clam is to be found; while on the western, where the water is comparatively calm, they exist in great numbers. They are taken by means of a spade, at low-tide, when the banks are left uncovered. Their hiding-place is betrayed by a number of small holes, through which they eject a stream of water when the sand is pressed down upon them, or shaken by the spade. This habit has won for them a very descriptive, although not very poetical name. On some parts of Long Island Sound hogs go down upon the banks at low water to hunt for clams, of which they are very fond. They manifest great sagacity in finding them, and know exactly when to leave, so as not to be caught by the returning tide.

The consumption of these mollusks is considerable during every season, but especially in summer, along the entire coast of the Northern States, from New York to Maine; but nowhere is it so great as at Boston.

In most places regular fishermen sell the clams in their natural condition; but in some localities, like New York, they are generally taken from the shell and sent to market in packages of twenty-five, which are sold, on an average, at 75 cents a hundred.

The merchants mix pieces of ice with the clams in summer to keep them fresh; in winter, of course, this precaution is unnecessary.

The extent of the fisheries throughout the year depends upon the rate of consumption.

The people of the United States use clams in a variety of culinary preparations, the most popular of which is, undoubtedly, a kind of soup especially esteemed in Boston.*

*In Rhode Island and Massachusetts clams serve as a pretext for fêtes of a very peculiar kind, called *clam-bakes*. The following description is taken from a work on natural history published in the United States:

"The clam-bakes which take place every year near Bristol, as well as in several other localities of Rhode Island and Massachusetts, have their origin in an old Indian custom.

"The aborigines of these States were accustomed to assemble in great numbers every year for a feast consisting of clams and green corn cooked together with sea-weed. The modern clam-bake is an improvement on the old one. A circular hearth or bed is first made in the sand, with large flat stones, upon which a fire is kept up until they are red hot. A layer of sea-weed is then placed upon them, and upon the sea-weed a layer of clams about three inches thick covered by more sea-weed; then follows a layer of green corn in the husk, intermixed with potatoes and other vegetables; then a layer of poultry cooked and seasoned; then more sea-weed; then fish and lobsters, again covered by sea-weed. This arrangement is continued according to the number of persons to take part in the feast, and when the pile is complete it is covered with a linen cloth to prevent the steam from escaping. When the whole is cooked each one helps himself without ceremony. These feasts are delicious beyond description, and it is said no one is ever made ill by them. In former times the most renowned warriors came from afar to take part in them, and now they are attended by persons of the highest social standing, sometimes to the number of several hundreds.

Whatever may be the value of soft clams as a means of sustenance for the people along the coasts, they are still more important to the fisheries of the country. The Americans have for a long time been aware of the marked predilection which many fish, particularly those of the cod species, manifest for the flesh of clams, under whatever form presented to them. Before this fact was proved by experiment the seamen of the banks of Newfoundland and Saint George had frequently observed that cod-fish relied to a great degree for their nourishment upon bivalves similar to the coast clam, called in natural history *Mya truncata*, and which is frequently found in the stomachs of these fish.

Clams are used for bait, either alive or salted, according as the fishery is on the coast or out at sea. In the first instance they are enveloped in pieces of net, and kept in the wells with which the coasting-vessels are generally provided. When they do not possess this convenience, they can still be preserved for several days by keeping them in a cool place. In the second instance, after they are taken from the shell, they are salted and then carefully packed in barrels, and are sold to the owners of vessels engaged in the cod-fisheries off the banks of Newfoundland and Sable Island.

Dr. Gould estimated that in 1840, 40,000 bushels of clams were consumed in the preparation of salt bait, in addition to large quantities used in a natural condition by the coast fisheries.

Salted clams are also used with success in the mackerel-fisheries, in which they are employed like the roe of the animal to attract the fish.

Round clam (*Venus mercenaria.*)*—The round clam is a species of edible Venus, almost as abundant upon the coast as the *Mya arenaria*, and rivals that mollusk as an article of food, although it is of far less importance as bait for the fisheries.

In some places it has retained its ancient name of quahog, by which it was known to the aborigines of North America. The Indians manufactured out of the violet part of the shell colored beads called *wampum*, which served them as money. The mollusks which they used came for the most part from Long Island, called, in the picturesque language of the Mohicans, "the Island of Shells."

The round clam has a regular, thick shell, very convex, with crenulated margins, and three cardinal teeth in each valve. The exterior surface presents numerous concentric lines, and a few more prominent ones. The part near the umbones is always more or less worn. The ligament, of a brown color, is large and very apparent; the lunule is oval; the exterior surface is ordinarily of a dirty white color, and sometimes bluish, according to the nature of the ground inhabited by the animal. There are two muscular impressions, and the interior edges of the valves are

*The "round clam," or simply "clam," as it is called along the coast of the Middle and Southern States, differs in several important characters, especially the armature of the hinge, from the typical species of *Venus*, and is therefore now generally regarded as the representative of a distinct genus, and accordingly called *Mercenaria violacea*.

of a violet color, more or less deep in proportion to the age of the animal. These mollusks, when fully grown, are commonly three inches and a half long, two inches and a half wide, and three inches thick.

The *Venus notata* is a species of clam very nearly allied to the one just mentioned, and is probably only one of its varieties.

Round clams exist in great abundance on the American coast, from Cape Cod almost to the extremity of Florida.* They are generally found on the shores of gulfs, of bays, and of the mouths of large rivers, which are less exposed to the action of the waves than the open coast. Their beds are at a depth varying from 6 to 25 feet below the surface of the water at low tide. Like all the mollusks of that family, they prefer a large proportion of mud with the sand in which they live. They bury themselves only a few inches deep, with the siphons directed upward. During my stay on Long Island, I frequently saw clams caught, the shells of which were covered with sea-weed, a convincing proof of the shallow depth at which they are buried in the soil.

Clams are caught by means of the tongs and the rake, the fishermen stationing their boats over the beds at the proper state of the tide. The tongs in use is exactly like that employed in taking oysters. As to the rake it is entirely of iron, about two feet wide, with semicircular teeth, the curvature of which answers the same purpose as the net-pouch in the ordinary rake. The teeth are separated about a quarter of an inch, and are about two feet long. The rake has a light pole for a handle, from 20 to 25 feet in length, according to the depth of the water over the bottom to be explored.

I would repeat here what I before said in connection with the taking of oysters, that these instruments are exceedingly well adapted for use upon small beds. They not only do not destroy a large number of mollusks to no purpose, as is the case with heavier implements, but, on account of the space between the teeth, small specimens are rarely taken, and the banks are consequently not depopulated.

I have imported from the United States models of the tongs and the rake for the fishery-bureau, since I am satisfied that if they were brought into common use upon our shores they would be of great service to our fishermen. Besides, I have no doubt that, with their aid, beds of mollusks, hitherto unknown, may be found in bays of the ocean or in the Mediterranean. It must be admitted that our present knowledge of the extent of our wealth in shell-fish is still very imperfect, on account of the restraints imposed by the ancient regulations which yet control the ordinary fisheries. The use of the instruments in question does not, however, interfere with the multiplication of fish in the water

*Clams are nowhere so abundant as in Long Island Sound; in the great bay south of this island; in the bay off Sandy Hook; upon the shores of Jersey, and at the mouth of the Delaware. They are also taken in great quantities in Chesapeake Bay, and in Albemarle and Pamlico Sounds.

when employed to explore the bottom of the sea, if the statements of the American fishermen are to be relied upon.

Round clams are the object of an especial industry designed to improve them and to promote the rapidity of their growth. Like the "païres doubles" [*Venus verrucosa*] or clams of the Mediterranean, they are never as delicate in flavor as when freshly caught. Still, in many places depots are formed for these mollusks in sheltered coves or creeks, in order to be ready to supply the exigencies of commerce.*

The fishermen generally supply the dealer directly from the banks, taking care to proportion the supply, as nearly as possible, to the demand. Clams are so hardy, however, that they will at any season live for several days out of the water if placed in the shade. In cool weather they will survive for as many as fifteen days, and may be sent by rail to distant localities in the interior of the continent.

In summer, the consumption of clams in the cities of New York† and Philadelphia is very considerable, much greater than that of the *Mya arenaria*. Like the latter, sold in their natural condition, or out of the shell, they furnish many excellent dishes, the most esteemed of which is clam chowder. Many persons eat the smaller specimens raw, and when flavored with a few drops of lemon-juice they seem to me as palatable as the clovisses [*Tapes virginea* and *Tapes decussata*,] and the païres doubles, [*Venus verrucosa*,] which are the especial favorites of the people of Marseilles.

The acclimation of round clams upon the shores of France offers, I believe, as many chances of success as that of the oysters from Virginia, of which the specimens I brought to France, numbering five or six thousand, are now living on our coast, without appearing to suffer in the least from the change of their native beds. It may be laid down as a principle, that wherever the "païres doubles" [*Venus verrucosa*], the cockles [*Cardium edule*], or the "palourds" or hen-clams [*Tapes decussata*] are found, the *Venus mercenaria* will be equally sure to prosper; success will be only a question of time.

RECOMMENDATIONS FOR INTRODUCTION.

Before closing this exposition of the shell-fisheries of the United States, I must insist upon the utility of propagating the *Mya arenaria* on our sea-coasts. Since my return from the United States, M. Fournier, commissioner of maritime inscription at Dunkirk, has furnished me with some valuable information regarding the same species found in the northern seas, bearing upon this question. This bivalve is

*At New London the ship-merchants build, in addition to their establishments, upon piles at the edge of the sea, special structures for the preservation of round clams. These consist sometimes of floating tanks, which contain several thousands; sometimes of wooden paddocks or pens, shaded from the sun and placed between the piles in such a way as to be covered by the tide several hours every day. The mollusks live for a long time in these reservations, provided too many are not crowded into them.

†At the Washington and Fulton markets, in New York, clams sell for $3.50 a thousand.

found in abundance on the shores of Dunkirk, especially in the fish preserves. To determine the question whether it and those of America were the same, M. Burkardt and myself endeavored to import some from the United States, but without success. I sent for several dozen of them by the captain of one of the steamers which ply between Havre and Dunkirk.

The specimens sent me on the 30th of June, 1863, were of all sizes, and one of them measured a little over three inches in length by two in width. I recognized at a glance the *soft clams* of New England. There were the shells separated at the ends, with the same twisted conformation, through the upper opening of which the animal projected a long muscular siphon, which it could contract so as to draw it entirely within the valves; the same form and size of the cardinal tooth, the exterior color of the shells, of a dun white, in some parts bluish; in short, these shell-fish were, in every respect, identical with those of the United States. Carrying my examination still further, I ate the Myas of Dunkirk in a raw condition, as well as cooked in various ways, and found them excellent. As they came from a basin where the sea-water was not sufficiently renewed, they were somewhat less delicate than those of the banks in the bay of Boston; but if transplanted into a more favorable medium, they would undoubtedly rival the latter.

The importance of the fact that the soft clam of North America lives in the latitude of Dunkirk is evident, as it shows the possibility, I may say the certainty, of realizing Professor Agassiz's programme. Once propagated in several localities on the coast, this mollusk will furnish a bait without rival for the coast fisheries; and when salted, it might be used for the cod-fishery of Iceland and Newfoundland. We know that at certain periods of the year the fishermen along the coast find it difficult to obtain bait; for instance, the fishermen of Havre, who, at the season of fishing for "gross-yeux," sometimes pay five centimes apiece for small cuttle-fishes, and cannot always obtain enough even at that price. The *Mya arenaria* would supply this want.

To plant the exposed sands of Britain and Normandy with these shell-fish would be truly a benefit to the maritime population. If not found there, it is probably owing to the shifting nature of the banks on the shores of Dunkirk, and also the rapidity of the currents. In short, the hydrographic conditions are such that, left to themselves, the *Mya arenaria* is not able to traverse the spaces which separate it from other portions of the coast, where, if transplanted by the hand of man, it would thrive wonderfully well.

The experiment might at least be tried; nor would it cost much, as, the locality once chosen, it would require only a few days to transport a sufficient number of mollusks. One of the steamers guarding the fisheries of the first maritime district might be employed for the purpose.

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