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WONDERS

AND

FOOD LUXURIES

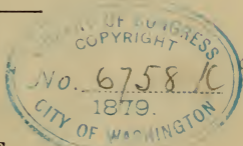
OF

THE SEA.

By John T. King.

WITH ILLUSTRATIONS.

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BALTIMORE.

1879.

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T H E S E A .

“Murmuring sea, beautiful sea,
Dark, heaving, boundless, endless and sublime.”

How few there are who realize that the sea is aught else than a lonely boundless waste of water, to be regarded only with dread, and avoided with aversion.

Comparatively few contemplate it as the teeming abode of millions of countless varieties of strange, wonderful, living organisms, from the microscopic amorphous monad to the unwieldy leviathan, horrid octopus and great whale, of the deep; that in these waters disport and have as their home the greater portion, both in number and variety of species, of God's creation, and that these restless waters, often unfathomable, are so full of beauty, sublimity and life!

Science has demonstrated that the sea covers nearly three-fourths of the earth's surface, that its

superficial area is about 146,000,000 of square miles, and its contents 778,000,000 of cubic miles, and that its average depth is about four miles.

The bed of the sea is the counterpart of the dry land. In it are high mountains and long valleys, and broad plateaus. Upon many of these submarine plateaus the water is but a few feet in depth, while in the deep subaqueous valleys a depth of eight miles has been found.

What a vast expanse and varied home for the inhabitants of the sea! how wonderfully the Creator has adapted it to their nature! how fit an abiding place for them! Truly the surface of the bottom of the Atlantic Sea is diversified with mountain ranges and sublime precipices inconceivable in grandeur, with their perpendicular fall of water over ten miles in height and more than two thousand miles in breadth—from New Foundland to Ireland, and it is a demonstrable fact that there are vast submarine prairies constantly decked in gorgeous floral garniture, over which the great leviathan and whale and the lesser fishes roam, disport and make their home.

In some regions of the submarine continents crops of golden sheen and fructiferous vines grow in inconceivable luxuriance and wave upon the surface for thousands of square miles, looking to the beholders like a vast and boundless prairie of verdant garniture.

In the sea are immaculate coral mountains with perpendicular escarpments of thousands of feet in height, extending for thousands of miles along our coast, in which are deep grottoes, caverns and lofty arches, with innumerable coral pinnacles, spires and domes, that appear like the ornately chiseled interminable facade of some vast and gorgeous cathedral, and the beholder will be fascinated and awed by the beauty, magnitude and grandeur, and will doubtingly ask—could this have been built and so adorned by the insect world?

The sea is divided into three liquid strata or layers of water of differing densities and properties. In the lowest stratum or deepest part of the sea we find the home chiefly of the crustacea, such as crabs, lobsters and other like species; at a depth of five or six hundred feet we enter the domain of the invertebrate and vertebrate fishes and the various mollusks; and the third and superficial stratum we find occupied by minute animalculæ, mostly observable by the microscope.

To what provision of the Creator do the countless millions of the sea owe their existence and subsistence? What preserves the vast bulk of water and maintains its fitness for the support of animal life? Science shows that millions of tons of chloride of sodium or common salt is held in solution, and that it contains also magnesia and lime, and that even silver to the amount of 2,000,000 tons is constantly floating about in its waters.

Then come the innumerable currents and tides, and the continual agitation from winds that incessantly blow upon some portion of its surface, and the unceasing evaporation and uninterrupted contributions of rain from the clouds. All these chemical and physical phenomena, with a thousand others, render the sea a fit and beautiful realm or abiding place for its inhabitants.

The color of the sea is not only a form of beauty, conveying pleasure to the mind, it is for an all-wise purpose, an indispensable function, although the depth of the water influences the color materially. Thus light green indicates shoal water, the lighter the tint the more shallow the depth; dark blue is an indication of vast depth, "off soundings" as sailors would say. Latitudes and localities have an effect upon the color of the sea. That about the Bahama Islands is an exquisite green, looking like emerald or malachite; in the region of Madeira the sea resembles molten turquoise of inexpressible loveliness, fish swimming in it appear transparently blue. It is an indisputable fact that the color of the water of the sea is imparted to the fish which inhabit the particular locality, just as the plumage of birds corresponds to the foliage and forests they inhabit. Why is this? The similitude in color is a protection to them. They are not as noticeable, their presence is not as readily betrayed to their enemies as if they were of different color. Deep

swimming fishes are invariably of bluish tint—example the well-known blue-fish. The parrot-fish is of a scarlet, as vivid as that of the birds in the forests of the neighboring land. The mullet is brilliant brown and gold, and the cod is invariably clad in Quaker gray. Thus these variously colored garbs of these piscatorial gentry of the sea are as multi-colored and as varied in cut as those of Broadway dandies or the Parisian costumer.

The temperature of the sea for a certain depth corresponds to that of the atmosphere. At great depths the temperature falls almost to freezing point, and it is beyond question that the temperature of the sea has a like effect upon the monsters of the deep that it has upon the temperament of man. The barracuda of the tropic seas is as ferocious and savage as a tiger, and cannibal cruelty and voracity is eclipsed by that of the horrible, treacherous, stealthy sea pirate, the “man-eating shark.” The most remarkable trait of this shark is, that with all its ferocity, it seldom attacks negroes, who swim about in the harbors of West India ports amid schools of them fearlessly, but should they espie a white man in the water, the latter feels sure that the day of judgment is near at hand.

That some fish are weatherwise there is no doubt, just as some land animals have a premonition of changes in the weather and the advent of storms, viz.: the ground hog, the common hog, chickens

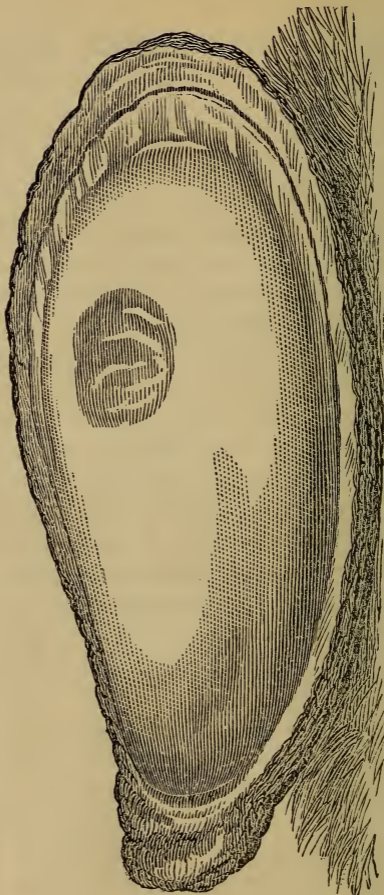
and water fowl. There is no surer indication of the direction of the wind than betrayed by the movements of porpoises. When they proceed unswervingly in a certain direction, as if bound on a mission, ten to one the wind will blow from that point of the compass toward which they are making.

Not only does the sea furnish a vast home to the myriads of animals that live in and breathe in its waters, it is the home of many of the feathered denizens of the air, especially of that beautiful, tiny mysterious little bird, known as "Mother Carey's chicken." This little bird is reared and makes its home upon the sea, thousands of miles from land. It daily, all day long, flits about incessantly; at night it roosts upon the raging billows of the sea, tucks its little head under its wing and goes to sleep amid the roar of the tempest and fury of the blast. It makes the great billow its cradle and the seething foam its sheet. This little bird is safe and fearless, for He who holds these waters in the hollow of His hand, bids the tempest do them no harm.

The sea is the arena of the sublimest phosphorescent and pyrotechnic phenomena exhibited by wonderful nature. This phosphorescence is caused by countless millions of cyclidina, one 12,000th of an inch in length. It is not uncommon in tropic seas to see the phosphorescent current rushing past a ship in a band of light so luminous that one can

easily read the time of night upon the face of a watch, and making a luminous track and the billows, as they are dashed aside by the bow of the ship, look like broad sheets of ruddy flame. Especially is the great Gulf Stream the theatre of sublime electrical phenomena. For a continuous inexhaustible supply of fire-works and pyrotechnic beauties it is without a rival. It gives an exhibition upon the slightest occasion, and no ship ever crosses that wonderful tepid water Rhine of the sea, without being flooded with sheets of vivid lightning and a seeming terrific bombardment from cloud batteries.

These are a few of the general beauties and wonders of the sea. We will now specially consider a few of its best known living forms; organisms that to a vast extent furnish delicious food and luxurious living to millions of the human family, and are the material and basis of the greatest commercial industries upon the globe.



THE OYSTER.

ANATOMY, PROPAGATION AND CULTIVATION

OF THE

OYSTER.

FISH and mollusks possess great advantage over all other animals in the rapidity with which they multiply, the ease with which they can be reared, and the inexpensiveness of their propagation and cultivation by man. Of all the animals subservient to the use of man they alone live in an element in which they can provide nourishment for themselves unassisted, and make no demands upon his aid or resources. Their astonishing reproductive powers are notorious. The common pike lays hundreds of thousands of eggs in one season, the carp and mackerel from a half to one million, the plaice six million, the mullet as many as thirteen millions, and the oyster countless millions of eggs.

In the great cosmogonic scheme or plan there are present and apparent, four persistent bas-relief ideas or designs, of master types of animal life. First, there is the Radiate or *star-like* type of animals and life, as we see in the star-fishes, the corals, the sea-anemones, the sea-urchins, all radiating from a centre like spokes of a wheel; secondly, there is the *articulated* type of life or animals, consisting of a series of rings articulated or united by their edges, more or less movable on each other, as exemplified in insects, worms, crabs, lobsters, and indeed all of the crustacea; and thirdly, the bilateral or two-sided, upper and lower shell, or Molluscan type of animals, such as is presented in the cuttle-fish, clams, snails and oysters: and lastly, we see the *vertebrate* type expressed in fishes, reptiles, birds and mammals, including man, or life embodied in a form in which an internal skeleton is built up into two cavities—one for the nervous centres, cerebral and spinal, the other for the lodgement of the circulatory, respiratory and digestive organs. The vertebrate type, while it is the most largely inclusive or comprehensive, is the most recent, while on the other hand the most ancient forms are the articulate, radiate and molluscan, to which latter type, as before stated, the oyster belongs.

Almost every one is familiar with the immense fecundity of the oyster, a single oyster annually

depositing several millions of eggs. The writer has seen a little branch taken from an artificial bed upon which were adherent thousands of small oysters in all stages of growth from the size of a pin's head to that of a split garden pea. This immense fecundity is in strict obedience to an universal law, to which there is no exception, viz.: That every organic being naturally increases at so high a rate that it provides against total extermination, and on the other hand if not to some extent destroyed the earth would soon be covered by the progeny of a single pair; even slow-breeding man will double in twenty-five years, and at this rate if not suppressed or curtailed by external exterminating agencies, in a few thousand years, there would literally not be standing room for his progeny upon the earth. The elephant is the longest interval or slowest breeder of all known animals, and is capable of breeding or producing young at thirty years of age, and continues to breed until the female reaches ninety years of age. During this long period of sixty years of parturient capacity, only six calves or young elephants are born. Even at this slow rate of increase, in about seven hundred and fifty years, if all were to live, there would be upon the earth, nineteen millions of elephants. The only difference between organisms which produce seeds, eggs, and viviporous offspring by the thousands, and uniporous and slow breeders, is—the

slow breeders would require a few years more under favorable conditions to people either a small or a large district. The condor lays two eggs and the ostrich twenty, and yet in the same country the number of condors predominates. The petrel lays but one egg, yet it is the most numerous bird in the world. Our common housefly will deposit hundreds of eggs, another species, the hippobosca only lays one, yet the latter is apparently as numerous as the former. A large number of eggs is of great importance to those species and genera, where the necessary amount of food for the species is precarious, or which have to depend upon a rapidly fluctuating amount of it, and the number and voracity of their enemies, and to make up for the great destruction that inevitably occurs at some period of life, and this period of greatest destruction is during the ova, larva and infantile or indefensible state or condition of the being, consequently if many eggs are destroyed, many must be produced to meet this contingency, or the species will in a short time become utterly extinct.

While this vast destruction by accident and predaceous enemies of the ova, larva, and young beings of organic beings, inevitably occurs for the wise purpose of keeping their number within proper limits, they as mature organisms have impenetrable and resisting tutaminæ and armor, as we see in shells of crustaceans and mollusca; being

deprived of organs of locomotion, or other means of escape from the assaults of rapacious and predacious enemies, and their powerful jaws of trenchant teeth; they are supplied with dense hard shells, formed of successive layers of calcareous laminæ, impenetrable and refractory to the teeth of more powerful, inimical, aquatic animals, and it is another instance of creative wisdom, that the structure of every organic being is related in the most essential yet often hidden manner to that of all the other organic beings with which it is obliged or likely to come in contact, or from which it has to escape for self-preservation, or which it is destined to pursue as prey, or with which it is forced to come into competition for food or residence.

Thus it can be clearly seen, that the stationary molluscous lowly oyster is not unprovided for, for his propagation and safety. While it has no organs for locomotion, (some naturalists assert that he is capable of motion), or of an offensive character, he is amply provided for to insure his welfare and existence, to protect him from extermination by the ruthless and voracious foes that prey upon his luscious body, and these defences, as has already been indicated, consists of his thick multi-laminous refractory shell, the muddy coloring of the shell, corresponding in color with that of the bed of the river or sea in which he may be found, and chiefly his amazing fecundity. While

millions of their eggs are daily destroyed by predaceous crustaceans and piscatorial gourmands, yet sufficient escape and mature, to keep the species almost constantly up to an uniform numerical standard.

As an article of food for man, but few productions of the vegetable or animal kingdoms are of greater importance, not on account of the general elements of food which they contain, but on account of a specific element; no animal either aquatic or terrestrial contains so large a proportion of phosphorus in their composition, and it is a well-ascertained fact, that phosphorus is one of the most important constituents of the bones and tissues of mammalian organisms, and that in proportion to the supply of phosphorus to the human brain especially, will cerebral energy and mental activity be manifested.

To most persons the generation and propagation of the oyster is an insoluble mystery.

When we consider the low link in the long chain of creation that the oyster supplies, we might regard it contemptuously, and not very remotely they were considered to exist by spontaneous origin.

It is the most difficult thing a scientist can undertake, to make people believe that every living form we see does not owe its existence to spontaneity, but that every vegetable and animal existence

and form is the offspring of two individuals, or of parents. Therefore every oyster is descended from parent oysters, male and female, and such has been its genealogy, long before the earth was green with garniture, or was imprinted by the foot-prints of man, consequently such defamation or slander must be attributable to the stupidity of ignorant calumniators.

Owing to the inchoate state of science the oyster was for a long time unassigned to either the vegetable or animal kingdoms, he was totally an outsider, without origin or parentage, an unclassified nondescript. Plato looked upon the oyster as the typical "Know-nothing" of creation and taught that ignorant people were transformed into them after death. Upon his first appearance in the waters of the globe, his only associates were the star fishes and clams, although no close intimacies, no friendly visiting between them have ever been essayed. Over these the oyster claims superiority, feeling well assured that he is held in the highest estimation, alike by the ignorant, learned, lowly and aristocratic of the land, indeed universally beloved.

However lowly the oyster may be, his complex anatomical structure manifests a beautiful adaptation to the creature's necessities. The thin layer of flesh lining the interior surfaces of the two shells is known as the "mantle," and it is reflected

over or envelopes the entire body of the oyster ; it is truly the oyster's cloak or pallium. This mantle apart from being a beautiful and elegant cloak for the oyster is instrumental in procuring the food with which he is to be nourished. These membranous mantles are fringed at their edges with rows of tiny cilia or soft fleshy hairs of extreme delicacy. They are the oyster's fingers or organs of touch, and this sense of touch resident in these cilia of the mantle is exquisitely acute. The incessant motion of these cilia keep up a constant current in the water that surrounds the oyster, and this stream or current brings with it the spores and animaculæ which constitute the oyster's food, and which are carried away back to the oyster's mouth located near the hinge. The tentacles could very properly be called the "lips." They are the organs for discriminating the food, the oyster's tongue or gustatory apparatus.

The gills are the lungs or respiratory organs, as in fish. The heart like any other animal has its auricles and ventricles, and beats with regular pulsations, and a complete circulating apparatus—arteries and veins are to be seen to perfection. The color of the oyster's blood is a pale bluish white, it may be called opaline, and the circulation and cardiac pulsations are clearly visible. Here, also is his liver, which is always a large organ in all kinds of shell fish. The bile secreted by the

oyster's liver is appetizing, gustatory and digestive, it excites the salivary glands, and causes a free pouring out of gastric juice in those who eat oysters. The large strong muscle connects the two shells, and by alternate contraction and relaxation shuts and opens the valves.

The oyster might by the ignorant be accused of an aimless, indolent life—such is not the case, he is incessantly separating from the circumfluent waters the lime they hold in solution, thereby collecting and making available one of the most valuable constituents of all soil and crops that grow upon the land, and indirectly contributing to the welfare and happiness of every land organism, whether animal or plant.

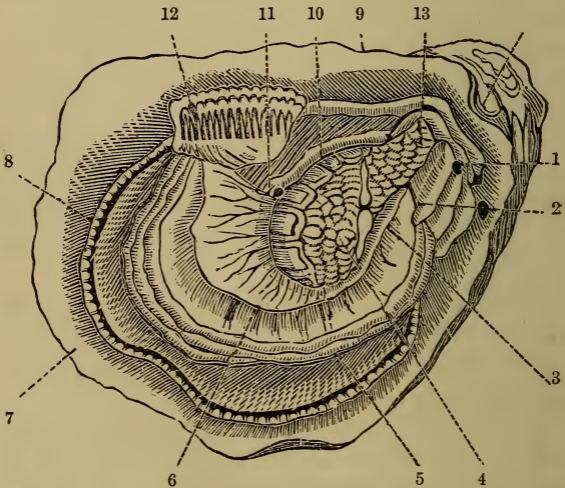
Destroy entirely this almost lowest of links in nature's great chain, and every spear of grass, every forest tree, crop and animal, upon the earth, from the minutest to the greatest, would feel the loss, if not utterly perish.

With the exception of the ubiquity of the Jewish nation, no living organisms are so cosmopolitan or cover so vast a proportion of the world's entire surface as the oyster

Like some people the oyster is of amazing fecundity, a single female oyster will lay millions of eggs, from one to two millions, and a most striking resemblance between oysters and the human population is the excess of female oysters over males.

The sex of the oyster is as decided and cognizable as in animals of other organization. When the female oyster ejects her eggs, they rise to the surface of the water, and come in contact with the simultaneously drifting, fructifying secretion of the male. Immediately upon this contact of the female ova and the vivifying male secretion, they—the ova—attach themselves to any object that may

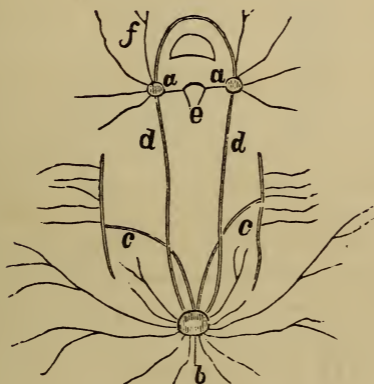
The Anatomy and Internal Organs of the Oyster.



1 Mouth, 2 Tentacles, 3 Heart, 4 Muscle, 5 Mantle, 6 Gills, 7 Lower Valve, 8 Mantle, 9 Anus, 10 Intestines, 11 Liver, 12 Hinge, 13 Right Mantle.

present itself. Upon this, they remain adherent and grow.

If any one should doubt the animal organism of the oyster, he may have proof of the fact by an examination of his anatomy. He will see that he is possessed of all the organs of the higher orders



The Spinal Cord and Nervous System of the Oyster.

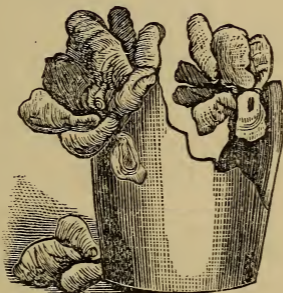
"B" is the posterior ganglion or the "large brain," "C C" are the branchiæ or gills. "D D" is the spinal chord. "A A" is the lesser brain, and "E" is the connecting lever between them. "F" nervous filaments supplying gills and mantle. All animals that travel or are endowed with locomotion have a locomotive ganglion or centre. This ganglion is absent in the oyster, and for the reason, as he does not travel, he does not possess such a functional centre or apparatus for locomotion. Oysters are eyeless and consequently blind, but this optical absence is amply compensated for by his exquisite sensitiveness to all impressions.

of animals, mouth, lungs, stomach, intestinal canal and genital organs. He has a nervous system and a muscular system. What is usually called the heart is a strong muscular attachment between the two shells that enclose him, and if touched with an irritant, he quivers and instantly closes his shell for protection, and will, by a similar act, manifest alarm at a sudden commotion of the surrounding waters.

The young oyster, when a month old, is the size of a large pea; and it will average $\frac{1}{2}$ inch of growth every two months. At six months it is an inch or more in length, and at three years it has attained its usual full size, the same we see in the markets. The shells of oysters appear to be a series of shells overlapping each other like tiles, each layer representing a year's growth, and the whole series indicates the number of years the oyster has lived; just as the number of consecutive rings in the trunk of a tree, the number of teeth in a horse, or the number of rings upon the horns of cattle, indicate the number of years they have lived. The capability of the oyster to repair his shell, if broken or destroyed, is well known, though requiring a longer time than the crustacea, the crab, for example.

The oyster has regular habits. He eats regularly, twice in every twenty-four hours, upon the flood or incoming of the tides, and immediately

thereafter betakes himself to meditation and a postprandial siesta.



A FEAT OF JUGGLERY.

The sexes are so marked that those familiar with them, can readily distinguish them at sight, the females being in excess of the males. The spat at first appears to belong to the vegetable rather than to the animal kingdom; but as it develops in size, the animal nature exhibits a more vigorous and decided character. In a few weeks it is capable of a feeble, independent motion that gradually increases, until the shells are perfectly formed, when it attains the power to open and close them.

The object to which the floating spawn is most likely to fasten is the shell of another old oyster, and this accounts for the fact that, while single oysters only are found in the artificial beds, they

exist in clusters in the natural beds, but any object may be utilized by the spat for that purpose.

The spawn gradually changes its rotund shape, and spreads upon the substance which it adheres, forming a white spot that in time assumes the appearance of a thin, flat shell, though it is soft and friable. It is now called a spat, and is covered by a delicate skin that grows thicker and harder until it becomes a shell. The spat is much sought after



Spat or Young Oyster just hatched from the Egg, magnified 3,000 times.

by fishes, crabs and turtles, and numbers are thus destroyed. The shell begins to harden when the spat attains half an inch to an inch in diameter, and thickens with the growth of the oyster; at one year old it is an inch to an inch and a half in diameter, and its shell is sufficiently hard to place it out of danger from most of its enemies. It may now be used as a plant, though greater size and more age are desirable for stocking artificial beds.

Although ranked by naturalists in a very low scale of animal existence, the oyster is not without

certain physical power, and sufficient instinct for self-preservation under ordinary circumstances, as illustrated in instances where the floating spawn has attached to the inside of the shell of an old oyster while open for feeding. Were the spat allowed to remain there, it would soon so increase in size as to cause serious inconvenience to the old oyster, and eventually destroy its life. But as soon as it attaches in dangerous proximity to the mouth of the shell, the old oyster works it or blows it from its position, and it finds another object, or it fastens to another place on the same shell. It is no uncommon occurrence to find in the natural beds large central oysters literally encrusted with those of smaller size, so arranged as to demonstrate the foregoing fact.

From the great prolificacy of the female oyster it might readily be inferred that the increase would far exceed the demands. A single female oyster contains about two million ova, all of which, under favorable circumstances, should develop into perfect oysters. But in deep water most circumstances are unfavorable to the existence of the ova and spat. They are beset by enemies and casualties until the shells of the young become sufficiently formed and hardened to afford protection.

In the Chesapeake, as in all the oyster waters of this country, the increase is altogether from the natural beds, where the ova and young cannot be

protected. In the deep water the temperature is often too cold for development of the ova, and even when developed many of the delicate spats perish. Planted oysters are not allowed to remain undisturbed a sufficient length of time to enable them to breed. In the most favorable breeding localities, as in Tangiers Sound, the beds grow to such thickness that the underlying oysters are destroyed by the superincumbent weight of the accumulations. Here the beds are two feet and upwards in thickness, with only a few inches of the upper layer of oysters living. Oysters will not survive for any long time when covered with sand, mud, or any other matter ; and sometimes, by a change of current, or from disturbance of the bottom by violent storms, extensive oyster beds are covered by sand and destroyed. The young oysters when they accumulate so rapidly as in the case in Tangiers, add a stratum yearly to the natural beds, and a corresponding stratum underneath must perish. The increase is, therefore, only in the extension of the superficial area occupied by the beds. Here dredging has been found most beneficial, as the dredge relieves the beds of their weight, and spreads the oysters over the bottom. A half century since, the bottom of the Chesapeake was interspersed with numerous isolated beds of small extent and great thickness, but dredging has so scattered them that they now form almost a con-

tinuous bed, covering the whole. Dredging also clears the upper portions of the beds of the accumulations of mud and sand. The ova adhere best to clean objects, and the dirt destroys the delicate spat.

VARIETIES OF OYSTERS.

Notwithstanding the similarity of the different varieties of the oyster, each preserves its identity, and they remain as it were in separate families. The number of varieties found in the Chesapeake has not been precisely ascertained, but it is supposed to be about thirty. Some of them have been imported from the Atlantic coast and others from the southern rivers as plants, but most of them are indigenous. Those in the deep waters of the bay differ from such as are on the shoals, and the same variety is not infrequently found in two rivers, however near their entrance into the bay. Nature has provided thick, hard shells, capable of affording perfect security from their numerous enemies, for those in the deep water; while, in the small and comparatively shallow rivers, where their foes do not exist in such numbers, the shells are thin and easily broken.

Oysters are found in most of the saline waters of the globe, where tides flow and ebb, except in the extremes of temperature, but they attain a condition of perfection, as regards size and quality,

only in the waters of temperate and semi-tropical climates.

Natural beds of oysters exist in moderately deep water, generally from seven to thirty feet, according to the climate, the character of the bottom, and other conditions favorable or otherwise for breeding, and the growth and preservation of the young. They are located near the coast, at the mouths of rivers, or in the semi-fresh water of the bays. Natural beds exist in isolated patches or clusters of indefinite extent and varied thickness. Those on the coast are found in indentations or sheltered localities, as the exposed portions of the ocean are subject to such agitation from violent winds, that the sand or mud of the bottom is disturbed to a such degree as sometimes to cover the oysters. This is destructive to the young, and even old and perfectly grown oysters will eventually perish when covered by sand or mud. The more tranquil the water, other things being equal, the more prolific and flourishing the beds.

Oysters, as regards both growth and quality, are influenced by the condition of the water in which they exist. Those on the Atlantic coast, in the unmitigated salt of the ocean waters, are small and too salt for use, while in the neighboring bays and at the mouths of the rivers, where the out-going fresh water mingles with that of the sea, the oyster attains its greatest size and best flavor.

The Chesapeake Bay and its tributaries afford the most favorable conditions for the natural growth of the oyster, as well as all needful facilities for its artificial propagation and culture. Located in the proper temperature, its bottoms of sand and rock, its abundant produce of sea-moss as a home and breeding place, its waters tempered in degrees of saltness to suit all varieties, and its numerous fresh-water streams, bringing down in their floods a continuous supply of food and other requirements, render the bay superior, in its oyster grounds, to any body of water on this continent or perhaps in the world.

From its waters is obtained a majority of the oysters cultivated and consumed on the American continent. It is a magnificent basin, 200 miles long by an average breadth of 25 miles, in which Providence seems to have accumulated every necessary condition for the propagation and perfection of the oyster. Its direction is north and south; innumerable rivers empty into it. The shores of the bay are indented by a multitude of gulfs, small bays and creeks, and afford innumerable and admirable places of shelter for the habitation and propagation of all kinds of fish and mollusks and their perfect development, so that the oyster of the Chesapeake in consequence of these favorable conditions in which it lives, is in its natural cultivation so large that for the most part it does not need culture, and

can be taken to market directly from the natural beds or rocks as they are called. At the North where, on account of the thickness of the ice in the winter, the oysters are not obtainable, they are carried from the Chesapeake in vessels, in the shell, and they will remain alive in the hold of the vessel for an indefinite time (several weeks,) however cold the temperature may be. There are other localities that produce superior oysters, though only in part native to the places, viz.: the bays of New York, New Haven and Providence, Bird's Island and Hog Island, the St. Charles and Mystic Rivers, Blue Point, on Long Island Sound; Prince Bay, in the East River; Harlem and Shrewsbury Rivers, and Saddle Rocks, the Jersey coast, chiefly from Milk Pond and Absecom Beach, but the Chesapeake is the great natural reservoir and home for excellence of the oyster. The bottom and shores of this bay and its tributaries are pre-eminently the favorite haunts and habitat of the delicious bivalve. Here is the bottom in which they delight to dwell. In pure sand they do not fatten, and grow very little. On muddy bottom they contract an unpleasant taste, and many are killed by being smothered, but in mixed soils of sand and mud they develop to an astonishing degree and attain the most delicious flavor, especially when the water is slightly salt and shallow. The most favorable places are those locations in the small bays, creeks

and mouths of rivers in which the tide ebbs and flows in moderate current, and where they are sheltered from tempestuous winds and disturbing seas. The maximum depth at which they are usually planted is from 4 to 12 feet at low tide. The oysters planted in tidal rivers or in ponds of brackish water, fatten and grow very rapidly, but are insipid in taste compared to those found in purely salt water. In the bedding or planting of oysters, the position of the oyster upon the ground is of no importance, provided the deeper valve is uppermost. When it happens to fall and rest upon this valve in the act of planting, its growth is affected in such a manner that the edges of the shell turn upward as if the animal thus endeavored to obviate the danger to itself arising from this abnormal position.

OYSTERS OF THE CHESAPEAKE BAY.

From Kent Island, within twenty-five miles of Baltimore, to Cape Henry, a distance of one hundred and forty miles, the bottom of the bay is, with slight exceptions, a continuous oyster bed. All the fresh water streams that empty into the bay within the above-named limits are stocked, either naturally or artificially, with oysters, as far up toward their sources as the influence of the salt water extends.

The area of the oyster beds of the Chesapeake and its tributaries may be safely estimated at three thousand square miles. There is, however, great inequality in the quantity of bivalves scattered over the bottoms. In some places they are so few as to render fishing for them unremunerative, though such are exceptions rather than the general rule; while, in other portions of the bay, they increase so rapidly that many perish from the weight by suffocation or want of food.

Some idea of the magnitude of the oyster business of the Chesapeake may be obtained from the following:

The bay is divided into four departments, and each has its proper police regulations. The Baltimore department, which includes less than one-half the oyster fisheries, reports an annual average of eleven million bushels, taken in the legitimate way of dredging and tonging. The reports of both departments aggregate from twenty million to twenty-five million bushels, which are only an approximation to the quantity actually taken. This report does not include the oysters taken from private beds or plantations, owned by the residents on the island and the shores of the bay and rivers, who do not regularly engage in the trade, but cultivate them for their own uses; nor the numbers taken by the "pungeys," canoes, and other small craft that continually depredate upon the grounds without the required license.

IMPLEMENTS OF OYSTER FISHING.

The implements used in oyster fishing are few and simple in construction. They are the dredge, the tongs, and the fork. The dredge is used on the natural beds, in deep water. It is an iron net set in pear-shaped iron frames and furnished with teeth so arranged as to tear the oysters from the beds and gather them into the net as it is drawn over the bottom by the vessel, to which it is attached by means of a long rope. It weighs about one hundred and fifty pounds, and is drawn on



OYSTER DREDGE.

board the vessel by a windlass arranged for the purpose. It is designed to hold about three bushels, though it is rarely filled with marketable oys-

ters at one "haul." When one-fourth of the contents is good oysters, the "haul" is considered a good one. The remaining empty shells are cast back into the water.

The tongs are composed of two iron rakes attached to long wooden poles with an axle set near the rakes. The fisher leans over the side of his boat, and handles this tool with ease in water from two to eight feet deep. It is used chiefly on planted beds. The fork is composed of ten or twelve tines, or prongs, set near one another, and fixed to a long,



TONGS.

stout handle. It is used for fishing in shallow water, on beds where oysters are entangled in sea-moss, and the fisher generally wades in the water in order to manage it easily.

The best planting grounds, all things considered, are found in Tangiers Sound, Pocomoke River, Cherrystone and Occohannoc Creeks, York River, Rappahannock River and Milford Haven, a portion of the bay opposite the county of Dorchester, and of Somerset, in Maryland, and marked off from the bay proper by a chain of islands from Dorchester Hook to Crisfield, the present terminus of the Delaware Railroad. Here the water is comparatively shallow, and the Sound is so completely shielded by islands on one side, and the main land on the other, as to be at all times tranquil. The business of planting, therefore, may be carried on without interruption, and the plants are not liable to be covered by sand.

Good planting grounds are valuable, and are seldom sold; but sometimes they are leased at rates ranging from \$50 to \$400 annually per acre. Sales of lots covered by three to seven feet of water have been made at upwards of \$100 per acre; and the most desirable grounds are valued at rates above these figures, and pay an interest of more than 20 per cent. on that valuation.

There are other excellent planting grounds superior even, in some respects, but they are open to the objection of loss from shifting sands, so destructive to the plants. On the Tangiers bottoms exists a rank vegetable growth called sea-moss, in which oysters become securely imbedded, and

which protects the spawn and the young oysters until their shells become sufficiently hard to afford protection from the numerous aquatic foes that prey upon them.

The boundaries of the planting lots are determined from stakes or small evergreen trees, firmly secured in the mud at the corners. These fragile corner-marks are strictly respected by the neighbors, and a case of trespass rarely occurs.

The plants are allowed to remain from 3 to 5 years. The tonging season commences in September and continues through the following April, it being a rule with the fishermen to close operations before May; as, according to their belief, oysters are unfit for use in any month that is not spelled with the letter R. The breeding season occupies the four months from May to August inclusive, and the oysters are then necessarily not in good condition for use. Consequently those engaged in the business during the other part of the year employ their boats in freighting fruits and vegetables, or turn their attention to trucking, particularly to the cultivation of sweet potatoes and melons, for which the islands and high mainlands are peculiarly adapted.

PLANTS AND PLANTING GROUNDS.

America, whose Atlantic coast is rich in shell fish, is the most favored country in the world in

piscatorial and molluscos treasures, the coast line presents a conformation entirely unique. From Cape Fear, to the extremity of Long Island sandy beaches are almost universally interposed between the ocean and the mainland, which run parallel with the shore at a distance of from one to several miles. These sandy formations make bays, sounds, lagunes, &c., the most favorable localities for the multiplication of fish and mollusks.

In these bays and sounds the waters are less salt, and less agitated by the winds, than the open sea, and thus present all the favorable conditions for the propagation of fish and mollusks—especially oysters. The oysters form immense banks along the shores, and furnish every year a mass of alimentary matter of which it is impossible to form any idea, so largely do they contribute to the sustenance of the population over thousands of square miles of the continent, that a failure of their propagation would be a national calamity. It is estimated that in the city of New York, and the same will hold good in hundreds of cities and towns, especially along the seaboard, that more money is expended for oysters than all the varieties of meat combined. It is moreover estimated that the commerce or trade in oysters in the city of New York will annually amount to from eight to ten millions of dollars, and that the whole trade in the United States in oysters amounts to from seventy-five to

one hundred millions of dollars annually. They have become so necessary an article of food with every class of the population that scarcely a town in the whole country, from the Atlantic to the Pacific, can be found without its regular supply. They are transported in the shell, and out of the shell, preserved in ice, in pickle or canned, to Europe, chiefly put up in barrels.

The great centres of this vast export trade in oysters are Baltimore, Boston and New Haven, and for six months in the year the oyster industry in these cities gives employment to an army of operators, black and white, male and female.

Although oysters will propagate, grow and be edible on almost all parts of the Atlantic coast and its innumerable bays and rivers, some localities suit them better than others. Long experience has shown that those oysters taken from the Chesapeake bay may be transplanted to the waters of all the Northern States without deteriorating in quality, and it is remarkable how much they will improve under certain hydrographic conditions. The oysters of most of the Northern planting grounds originally came from the shores of the Chesapeake bay and adjacent sounds.

The oysters of North America are divided into three species, the *ostrea Virginiana*, or the oyster of Virginia, the Northern Oyster, or *ostrea Borealis*, and the *ostrea Canadensis* or Canada oyster.

While there are local differences in shape, size and flavor of the oysters of the American continent, there are also marked differences between those of America and Europe. The American oyster is more or less elongated. The lower valve is more concave, and the mollusk is more corpulent in body. It is more tender, larger, richer in nutritive elements and generally less saltish of taste, and of remarkable weakness of muscle. On the other hand the European oyster is almost round in shape.

The Virginia oyster has a narrow shell, increasing gradually in size from the top, and moderately curved in the plane of the intersection of its valves. They are generally distorted in figure. The upper valve is almost entirely flat, and the smoother of the two. Both valves present numerous laminæ. The Northern oyster has a shell rounded, curved, ordinarily crooked, and less elongated than the Virginia. The upper valve is flat, and the beak short and bent over, and the shell is very irregular. Its edges are more or less jagged and scolloped, are calcareous in the lower valve, while in the upper they are flexible, and almost membranous. The lower valve is deeper than that of the Virginia species. They attain an immense size. Some species, the Saddle Rocks, of New York, are a foot in length by six inches in width, and equally large oysters are found in Buzzard's bay, Massachusetts.

The Canadian oyster is less elongated than the Virginia. The shell is broad, very white, and laminiferous, the upper valve is slightly convex. Conjointly with the Chesapeake bay and its tributaries, the Albemarle and Pimlico Sounds produce excellent oysters, and from their prolificacy, if undisturbed, would change the hydrography of the coast.

Pliny tells us that the first inventor of the oyster ponds was a certain Sergius Orata. In his day, 600 years B.C., the existence of oysters on the English coasts were not known; and Brundisium, which had almost the exclusive privilege of supplying the whole of Italy, was so far from Rome, that the oysters reached the capital in a very poor condition, often spoiled. It is well-known that oysters and fish are of a better quality in some localities than in others; Orata found in Lake Lucrinus, a spot specially favorable to oyster planting.

This lake, which has a clear bottom and pure water, was connected both with the salt water of the ocean, and with fresh river water, and in the hands of Orata it soon became a gigantic oyster pond, which could at all times supply Rome with oysters of such an excellent flavor as soon to gain the very highest reputation among all the dainty eaters in Italy. These oysters were sent all over Italy in wooden boxes filled with water, to places at great distances from the sea. Athenaeus states

that fresh oysters, carefully packed in jars, were sent to the interior of Asia. The fullest information on the subject of oyster planting we get from the ancient monuments of the time of Nero. These remains consist of two sepuchral urns of glass discovered near Rome. The outside of these urns is covered with a sort of engraving, which, notwithstanding its rudeness, shows very distinctly an ancient oyster pond. In the centre of the engraving is the word "Ostriaria," *i. e.* oyster-pond. The most remarkable thing about these engravings is that a great number of poles are seen driven into the ground placed in circles. This could only have been done for the same purpose as at the present day, *viz.* : to afford to the young oysters an object to which they could cling and grow. It is thus evident that the ancients not only kept a stock of oysters in their ponds, but also let them breed there and become a fruitful source of revenue.

Licinius Murena was the first one who had ponds for fish. Soon most of the rich and noble Roman families possessed their own fish-ponds. Pliny states Lucullus had a channel dug through a mountain near Naples, at a fabulous expense, that he might introduce water from the sea into his fish ponds.

FOOD OF THE OYSTER.

The flocculent organic matter and marine animalculæ subserve the oyster as food. Upon his

shell is almost always attached olive-colored and ruby algæ or sea-weeds, the sporules of which are the bread or manna of the oyster. In like manner does the beautiful "Red Sponge" and the cells of the "Bryozoa" or animate moss contribute to the oyster's larder. There are also to be found upon and about the oyster a sea-weed like growth known as sertularia—which marine animaculæ inhabit, and little sea anemones that look like drops of jelly, but the most important and interesting personage among the attendants upon the oyster is the little "pea crab" with his scarlet jacket and trimmings of gold, from only found living in the oyster, it is called the "oyster crab," *pinotheres ostreum*. It is only the female that has been found in the oyster, and she is the oyster's bosom friend. These little delicate crabs are highly valued by epicureans, and it is a historical fact that George Washington was particularly fond of these crabs, and upon the occasion of his dining at the house of a lady admirer, extraordinary effort was made to procure a half pint of these for his repast, to his great surprise and delight.

There is a very prevalent opinion in the United States—indeed, in Europe—that oysters may be fattened by pouring Indian meal and water on them, and this mode of fattening and feeding them is quite prevalent. It is exceedingly improbable that the meal is of any benefit for the reason that

the oyster is a carnivorous animal, and his stomach is too delicate and not suitably organized to digest corn meal or any other vegetable, farinaceous or graminous food.

ENEMIES OF THE OYSTER.

Oysters have their enemies. There are certain piscatorial monsters that prey upon and destroy many oyster-beds. The powerful and voracious drum fish is chief among them; he is a large coarse fish, weighing often fifty pounds, his dental armature or teeth are large and powerful crushing instruments, and, in the language of an old piscatorial Nimrod, "he is the most damnably audacious foe of all the oyster's enemies." They come and go unheralded, cruise in large "schools" or numbers, make periodical, predatory or piratical excursions to the various oyster-beds, craunching and devouring indiscriminately.

Another virulent and pugnacious enemy of the oyster is the crab. This foe leisurely saunters along sideways, seemingly for recreation or a pleasant stroll, when, coming upon the unsuspecting and peaceful oyster, with his upper and lower shells open, taking his morning or evening meal, watches his opportunity and assails him by indignantly and malignantly throwing sand in the oyster's face. Thus, being confused and in

the act of freeing himself of this sand, and writhing under this barbaric mode of insult and assault, the crab seizes him and drags him lacerated from his shell.

The star fish is another enemy of the oyster. Their mode of attack is as follows: A school of them, in their wanderings, will settle upon an oyster-bed, each star fish fastening himself upon an oyster and enfolding it with his tentaculæ or "feelers." Upon the oyster separating his shells for the purpose of feeding, the star fish introduces his long finger-like appendages and seizes the helpless oyster. This operation is continued until the star fish has made a meal of the delicious bivalves on the "half-shell."

The insinuation of a fine particle of sand or grit between the valves of the oyster when they are separated in the act of feeding is exceedingly irritating to the animal. When it is not possible for him to rid himself of it, and it persistently stays, it is a source of great irritation, and the oyster resorts to the sensible expedient of coating it upon all sides with a layer of pearly matter; this coating becomes globular and smooth by the agitation of the waters, and the vermicular motion of the oyster's tentacles, and thus its irritant action is almost totally counteracted, and such little globular bodies found in oysters are called "oyster pearls."

There is a little crab in all its appointments that for a long time was considered a parasite or verminous inhabitant of the oyster, but this little crab so highly prized as a dainty article by epicures, is a species of crabs, and of distinct species from the *callinectes hastatus* or the *cancer pagurus*. They are found in nearly all the oysters of the Chesapeake bay. They slip in and out of the valves of the oyster when he opens his valves to feed, and is imprisoned when the oyster is done feeding and closes his valves. From 150 specimens of these little crabs taken from oysters from various localities in the Chesapeake bay, every one of them, without exception, proved upon examination to be females, and full of eggs. The males of this species of crab are exceedingly rare; so seldom are they found that it is a matter of astonishment how the propagation of the species is effected and maintained.

QUALITY OF THE OYSTER.

There is a great difference in the quality of oysters of the same size and age. Locality has its influence to such a degree that most natural beds and all planting grounds produce oysters of different flavors. An experienced oyster fisher can, at sight, generally tell the locality from which the oyster was taken; and the epicure accustomed

to the different flavors, can, by taste, designate the bed on which the oyster was grown and fattened.

The oysters of Tangiers are excelled in delicious flavor by those at the mouth of the Cherry-stone River on the coast, Occohannock Creek, and by those in Lynnhaven bay on the west side, and those at the mouths of the James and Nansemond Rivers. The Cherrystones deservedly hold the first rank, but the natural beds are of small extent and their production limited. There are, however, fine feeding grounds in the vicinity of Cherrystone, and all oysters planted there become of superior quality or flavor. The true Cherry-stone, in fine condition, retains its shape and plumpness when cooked, which is that of a cherry seed, and cuts as finely as a tender sirloin, and such qualities or brands of oysters are advancing in price every year.

SADDLE ROCK.

This name is given to all very large oysters, generally to those taken in the East River. The original Saddle Rock oyster was not only very large, but possessed peculiar delicious flavor which gave it its reputation. It received its name because it was discovered near a rock known as Saddle Rock, on the farm of David Alan, situated on the shores of Little Neck Bay, in Long Island Sound. It is a rock about twenty feet high, and

about the same in diameter. The shape of the top of this rock resembles the form of a saddle, and from that circumstance is called Saddle Rock. At low water the land side of this rock is left bare by the receding tide ; in 1827, an extraordinary low tide occurred, leaving the base of the rock and the circumjacent bed of the sea bare of water and exposed. This extreme low tide and recession of water revealed a bed of oysters adjacent to and surrounding the rock. The news of the discovery of these magnificent oysters spread. They soon found their way to the city and commanded fancy prices, selling for \$10.00 per 100. In a short time the Saddle Rock oysters were exhausted, and for forty years there has not been a Saddle Rock oyster in the market.

HOW TO COOK OR EAT OYSTERS.

Americans are the only people who eat soft-shell crabs or "soft crabs," and the only people who eat oysters in the spawning season. It is a fact indisputable that the crab in the act of sloughing, or the oyster during the period of spawning are unwholesome and disgustingly unpalatable.

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 planet," is a truism that will be universally acknow-

ledged, and Brille declares there is no alimentary substance, not excepting bread, which does not produce indigestion under given circumstances, but oysters never, they may be eaten daily, at all hours, without ill effect. As before remarked, all nations of the earth, civilized and savage, feed upon oysters; all terrestrial and maritime dwellers enjoy them, and as far as one can judge, have eaten them from the morning that Adam and Eve awoke in Eden. Galenus says that as a general thing the oysters eaten raw produce witty thoughts, and Pliny attributes to them a purging property, and that the burnt shells are good for the dysentery.

Oysters when not eaten raw are prepared in a variety of ways. They are relished almost equally in every and in all ways that they may be cooked. They are eaten in the form of soup or stewed, broiled, roasted, fried, escalloped, made in pies and into *pates*. They are pickled and spiced, with vinegar and spices. Thus are they a most suitable article of diet for the sick and convalescent.

Figuier declares oysters the glory of the epicure. History relates that the emperor Vitellius could eat one thousand raw oysters at a meal. Seneca, the renowned moralist, confined himself to one hundred raw on the half-shell, at a lunch, with a pint of Roman beer, and Napoleon Bonaparte invariably eat raw oysters, on the eve of his great battles, if it was possible to get them. No morsel

ever glided down the *æ*sophagus of a human being, equal in deliciousness to the fat, plump, saltish raw Lynnhaven or Cherrystone oyster, without any kind of condiment; or, if one should fancy, with a few drops of lemon juice, and a delicate morsel of horse-radish, as a condiment, dropped upon his plump carcass, as he lays upon the half-shell, and the only beverage or drink to be taken along with him, should be finely brewed ale. Thus eaten, the whole of his transcendental lusciousness will be obtained and enjoyed. Next in deliciousness is the broiled, then comes the escaloped, then comes all ways. They are delicious in every way, except cooked in the way that Charles Lamb must have eaten them, *viz.*: On a certain occasion the omnibus on which he rode was stopped by a man who asked, "All full in there?" to which Lamb replied, "I don't know how it is with the rest, but that last piece of oyster pie did the business for me."

In almost every town and city upon the continent there are to be found countless numbers of "oyster houses and restaurants." The larger and finer flavored are used or for sale by the dozen at the counter known as the "Raw Box." In ninety-nine out of every hundred restaurants a sable negro stands and opens with the velocity of an act of legerdemain the plump delicious bivalve. No other living being can vie with the negro in opening oys-

ters at the "raw box." Steamed oysters are a favorite dish with the majority of persons, as originally introduced by Harvey, of Washington; roasted oysters have a peculiar flavor, and a most appetizing odor, and there are but few who do not enjoy them. Especially are they delicious when dropped in a sauce made of melted butter, pepper and sauce, contained in the hot deep valve of the oyster.

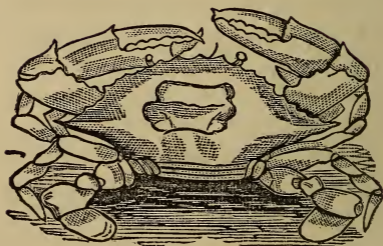
Pickled oysters are prepared with vinegar and spices after being slightly cooked. Canned oysters, which require to be slightly cooked previous to eating, are oysters taken from the shell, slightly cooked, then put into cylindrical tin boxes with a circular hole in the top. When the cans are filled they are closed by soldering a round piece of tin on the opening. They are thus exported all over the country, and to Europe, and also in the way of barrels of opened raw oysters, in which a lump of ice is inserted.

The shells of the oyster give rise to various industries of importance. They are converted into lime by being burnt in large heaps or piles with wood called "lime kilns," and this lime is a most important fertilizer; is superior to other lime because it contains no magnesia. They are useful for macadamizing roads and forming paths in pleasure grounds. Generally, the oyster dealers and packers give the shells away to get rid of their accumulation in and about their establishments.

Oyster shells left inland, and upon the margins of creeks and rivers by the aboriginal oyster-eaters make in many places mounds of vast extent, thirty or forty feet deep, or higher. At Fernandina, Florida, and at other points, they were used as forts during the late war; and as to their antiquity, there is no doubt but that the oyster was eaten thousands of years ago by the Indians or a more ancient race. Indeed, bones have been found in these oyster-shell mounds, osteologically indicating a race different from the Indians, probably antedating or contemporaneous with the ancient mound builders of the continent, and thus has this continent been, through all time, the land and paradise of the oyster.

C R A B S .

(*Callinectes Hastatus.*)



FULL GROWN CRAB.

THE average observer espying a struggling huntsman in the pursuit of those embryonic creatures in their metamorphic stage, vulgarly known as tadpoles, is likely to soliloquise in this wise, "That old chap is crazy," and this is what was said and believed of Sir Joseph Banks, one of England's

earliest and greatest naturalists, and the bailiff who found him groping in a ditch under a drizzling rain with a handkerchief full of frogs and curious insects felt it his duty to arrest him upon a charge of vagrancy, and to take him before the nearest squire or magistrate for commitment. The judicial functionary, upon hearing the charge of the bailiff, had compassion upon Sir Joseph, and discharged him with the following sympathetic reprimand: "Alas, poor gentleman, I am sorry for ye, and pity much your upper story."

It is this class of men, numerically small, who industriously penetrate and explore every field of nature, and investigate the wonders of creation, that humanity is indebted for the profoundest acquaintance and loftiest conception of the multi-form works and infinite designs of the Creator.

This class of aquatic animals, crabs, have been from the earliest times a subject of curious study and investigation, for the crab species was amongst the very first that sprung into existence in the far back period when the Almighty's countenance first brooded upon the face of the deep, and swarmed the oceans with its progeny, thousand of ages before man was created.

Countless myriads upon myriads of these creatures have lived and died before human tongue could give them a name. But there is not now a language spoken upon the earth, nor was there

ever a language ever uttered by man that does not afford a term to designate them.

Their different genera are far more numerous than the families of the human race, and the individuals of the different species simply defy the power of arithmetic to number.

As before stated, they have existed through a period of time far more extended than that measured by the generations of man, and are at this moment as living creatures and fossil remains, only less numerous than the sands of the seas which they inhabit, and their shells, together with other *crustacea* and mollusks, now not only bestrew the depths of ocean from pole to pole, but are imbedded everywhere in the towering mountains and grassy valleys of the solid earth, and furnish the material called marble from which we erect the monumental shaft above the remains of our friends and kindred, vainly aspiring and striving by heaping death upon death to make at least their memories immortal.

The students of animated nature, having under consideration an universal subject, must of necessity resort to an universal nomenclature, and this is found more in the ancient Greek and Latin languages, with which all scientists are more or less familiar.

Therefore, in speaking of the crab, of our common edible crab, to come to an understanding of

its relationship with other species of its genera, we will be obliged, to some extent, to resort to the terms which have become the common language of naturalists.

The crab, then, is an order of a class of *articulated* animals. This term articulated refers to the division of their limbs into articles or sections by exterior joints, and under this general class is marshalled many species of animals and insects inhabiting both land and sea.

The construction of the limbs of a crab, of a bee or of a spider, will suggest to you the meaning of articulated or separated exterior joints.

The division crustacea has been also divided into two general classes. The first of these is what is termed by Cuvier the malacostraca. Of this malacostraca there are several orders, and the first four of these embrace the genus cancer or crab proper.

Under this head our crab is known as a decapod or ten-footed malacostraca. Our common edible coast crab is but a single family of the many thousands which are embraced by the generic term.

The striking forms and splendid and gorgeous colorings with which nature has painted and adorned the different varieties of the crab family, which swarm the tropical seas, is calculated to fill the mind with wonder.

We are all of us more or less familiar with the curiously wrought and beautifully colored shells,

which are brought to us from the tropical seas. We have also seen and know something of the magnificent plumage of the birds which inhabit the tropical forests, and of the rare and exquisite beauty of the flowers which adorn the Southern Savannahs.

Yet, amongst everything that is commonly known of natural development in these favored regions, there are no colorings more rare and striking and no forms more curious and varied than those with which the God of nature has clothed the different species of the common crab.

Their shells are not preserved and transported as rarities like those of the several varieties of conchs, because they are of a more fragile nature and crumble and fade rapidly under the action of the atmosphere.

This animal is too numerous and its families far too diversified, upon land and sea, to admit of any restriction whatever upon the general law of variety in which nature seems so much to delight, and step by step the crab family cover every *stage of demarcation* between the extremes of beauty and the most bestial ugliness. Its size will range when complete from the dimensions of a small field bean to the enormous bulk and weight of 300 pounds.

There are crabs not only of every conceivable variety of colours, but of *shapes, habits, instincts* and *localities*.

There are, in *reference to shapes*, *quadrilateral* crabs, *globular* crabs, *oblong* crabs, *elliptical* crabs, *spheroidal* crabs, *diamond* crabs, *triangular* crabs, and crabs of every conceivable variety of *profile*.

In the matter of color they far exceed the variety of the witches in Macbeth, for there are not only "black crabs and white, blue and gray crabs" but there are crabs of every variety of shade and color, and combination of shades and colorings, and some of them indeed, from their being half of one color and half of another, perfectly divided in the middle of the shell, look as if they might have lately escaped from some submarine penitentiary. There are swimming crabs, running crabs, crawling crabs, climbing crabs and burrowing crabs. There are no flying crabs yet discovered, that I know of, but one variety has attained without wings, to the heights of towering mountains, and the topmost branches of the trees which crown them.

Their abodes are found almost everywhere from the lesser depths of the sea upward and outward to the declivitous slopes of the highest mountains. Some of them are entirely aquatic in their habits, some of them appear to be amphibious, and again may be said to be neither, living entirely upon the sands between high and low water, whilst others take up their abode almost entirely upon the land, returning at intervals to the margin of the sea where their young are hatched in the more favorable humidity of the immediate coast.

Among those which are dwellers in the deep, the larger varieties, including the cancer pagurus, inhabit the greater as well as the lesser depths, whilst the smaller kinds, all the brachyural or short-tailed divisions (which term is used to distinguish them from the macrourus or long-tailed, lobster-like varieties), and every family of the callinectes hastatus, our Chesapeake crab, confine themselves to the shallower waters upon the coast line and its tributary rivers, North and South.

There are two varieties which inhabit the belt stretching along the coast from the beach to the outer bars, and are very rarely seen in other situations. The first of these is one of the varieties what is called the spider crab, an animal very rough and forbidding in its appearance, very little vitality, and with no pinnapeds, or swimming feet which shows it to be the natural scavenger of the bottom of the coast line. The other is one of the most active and beautiful little specimens of the brachyural decapod. Its color is a creamy white, beautifully dotted over the shell and claws with specks of pink and crimson. Although furnished with well-developed swimming feet, and capable of great activity in the water, when thrown upon the sands by turbulent breakers, it will burrow its way backwards with astonishing rapidity beneath the solidly compacted beach, where it will lie concealed until it can take advantage of the returning surf, and

scud with it, as it again retires, to its native element. It is known among scientists as the *hatorynichas ocellatus*, and has frequently been called the lady crab. On the beach of Worcester County it is simply known among fishermen as the sand crab, but the true sand crab is a different animal.

The *pagurus berriadus*—the hermit or soldier crabs, as they are indiscriminately called, which make their election as to whether they will forage for subsistence upon land or sea, and, dividing on the shores where they are hatched, follow the bent of their inclinations, which vary from time to time as exigencies may require.

These are sexapods, or six-footed crabs, with a lobster-like elongation of body, the posterior part of which is unprotected by the carapace or shell which guards the frontal parts. Nature, which omitted in this particular family the complete protection of the body, has given to its various individuals an instinct, if you so please to call it, which enables them to provide it for themselves.

They are called soldier crabs, because, when on the land, they are always on the march, and hermit crabs, for the reason that they take up their residence and live each to itself in some sea shell from which either time or accident or their own beligerent claws have routed the original proprietor, where they ensconce themselves, their tough and pliant posteriors being so formed by nature, as to

be enabled to hold with great tenacity to the shell, which they always carry with them on land and sea, changing it to suit their growth. And when more than one of this family, in search of new domicils, more suitable to their development, happen to meet and dispute about the coveted dwelling, the fiercest conflicts often ensue, and the victor in such a strife not only assumes possession of the tenement, but celebrates his entry by a feast, all to himself, upon his fallen competitors.

In the West India Island rural coast regions "Bernardus," as they call him, is much more familiar, in his nightly depredations, upon the premises and even habitations of planters, than is the common rat with us; and though much more clumsy and with nothing of agility in his movements, his shell, bumping after him as he scuffles across the floor, and always tumbling back with a heavy concussion in his unsuccessful efforts to climb a bed-post, yet he is not regarded as so much of a nuisance or as expert a robber, and is always treated with a sort of patronizing consideration, perhaps, because when compared with the immense ravages committed by others of his kindred he is in a great measure but a harmless intruder.

Nearly all species of crabs may be said to be in nowise particular about their diet. They will attack and devour with great voracity living animals, even each other, and do not object to feasting upon

the dead, even though the subject be far advanced in putrefaction.

With them, if it is not flesh, it will be fish, and if neither "fish nor fowl" as the phrase goes, the most delicate fruits and vegetables, especially of the tropical climates furnish them with their diet, or rather they furnish themselves, with peach leaves, strange as it may appear to those not familiar with their habits, by clambering to the tops of the highest trees and enjoying their repast between earth and sky.

There is, perhaps, no species of crustacea more vicious than the crab. There is certainly none more voracious; and this latter propensity may be the natural compensation for the long fasts which nature has fitted and sometimes obliges it to endure.

As Shylock says of the rats, "There be land crabs and water crabs," but they are all of them perfect gourmands, and supplied with a multiplication of jaws, and some of them we shall see located in most singular situations. And the Jamaica land crab, thus furnished, is well known.

A species of them, however, which has ventured, in higher regions, into the cocoanut and yam plantations to devour the fruit in its earlier stages, sometimes meets with disaster in consequence of a contrivance buckled upon the trees at night, which in their backward descent they mistake for the earth,

and letting go their hold, tumble and smash themselves upon the rocks which are placed below.

Of this climbing crab, Mr. Darwin, of whom you have doubtless heard, has examined a species which is certainly the most remarkable specimen of the genus that has been lately observed. It is a decapod, or ten-footed crab, which is so constructed by nature that it climbs a tree with greater facility than any other known variety; and after the feat is performed is enabled by its powerful claws to break through the hard glazed exterior covering of the full ripe cocoanut, to strip its tough and compacted fibres from the interior shell to pieces, then clearing away the softer matter which closes the eye, with which the stems connect, and finally, after imbibing the milky juice, to extract and feed upon the fruit within, by the aid of an additional pair of long and delicate posterior claws occupying the place of the pinnapeds, or swimming feet of the other varieties.

The Malays and Polynesian Islanders frequently rob their nests under the roots of decayed trees, where they burrow in great numbers of immense quantities of this cocoa fibre, which of late years has become a considerable article of commerce. There is a little crab, in all its appointments, which I was for a long time prone to regard as a mere parasite or vermin within the oyster, but find it to be a totally distinct species. They are familiar

to all, and found in the oysters of the Chesapeake. They slip in and out of the shells of the oyster when his mouth is open to feed, and are often imprisoned within the shells by their closure.

Of over one hundred and fifty specimens, selected from oysters taken in different points of the Chesapeake bay, every one of them, without exception, proved, upon examination, to be a female, and full of eggs.

I have since learned, in pursuing the same inquiry, that Professor Stimpson is the only man who was ever fortunate enough to take one of the males of this species alive, and I am informed by Professor Smith, of Yale, that that was undoubtedly destroyed with his collection in the great fire at Chicago.

It is more particularly upon the few species which are found to be edible, and form, especially in England and America, so important an article of food and commerce, that we shall now dwell.

These all belong to the brachyura, or short-tailed crustacea, as contradistinguished from the lobster species. They are all of them decapods or ten-footed, and like the whole cancer family are supplied with a double set of organs.

As a general class it is difficult to speak with any degree of certainty in regard to the time or the exterior signs of their fitness for the purposes of generation, but is generally supposed to be when

what is called the apron, which covers and contains the abdomen, loses its softness and bluish tint and becomes white and hard. Whether the number of moultings has little or great reference to the arrival of this period, except so far as they facilitate the physical development of the animal, is equally uncertain. But when we come to consider our own variety, the blue crab of the Chesapeake, I shall have something to say, which I have determined for myself.

Unlike other species of the first general class I have mentioned, the malacostraca, these decapods are, according to Cuvier, supplied by a visible ear, a triangular bump near the base of the antennæ or feelers, whilst the remainder of the class not decapods, have both the sense of smell and hearing resident in the body of the antennæ.

Being of a fierce and pugnacious disposition and surrounded by innumerable enemies, nature has not only clothed them with a shell which affords some degree of protection, but has provided them with the faculty of suddenly shedding their claws to escape from danger, and also that of their reproduction, when lost either voluntarily or otherwise, in about ninety days.

It is said of the crab by Godman, who certainly knows a great deal about it, that it has no brain, and its instincts are guided by ganglions of highly sensitive and delicate nerves. Be this as it may,—

call it brain or nerve, and I confess I can see no very marked difference between the two, since the human brain is, so to speak, but a ganglion of nerves and nervous matter; they have attained to an excellent understanding of a surgical operation, for knowing when they have lost a limb that the new member is obliged to start from its joint, they proceed deliberately to bite it off clear, and clean back to the next articulation or joint, so that the new limb might have a chance to form in its little sack, and proceed with its development.

Being also of a highly carnivorous and voracious nature, they are supplied with a double mouth, and two formidable pairs of jaws, well set with teeth on the anterior edge of the shell, and besides these another aid to digestion is provided in the lower part of the stomach at the mouth of what doctors would call the great colon, in the shape of a third set of regular molars.

The outer set, ten in number, five upon each side, are rendered flexible by a series of jointed sections, and in a state of rest are closed over the interior mouth. These are sometimes called mandibles, or maxillary mandibles, and their office seems to be to handle and prepare the food, as so many exterior tongues or a sort of flexible teeth, for its reception at the interior mouth. This mouth is situate just back of these mandibles, and consists of an upper and lower lip and two teeth, regular

bona fide teeth, and in a full-grown channeler just as large and sharp and ivory-like as any in our own heads. They are planted side by side, and not one above the other, and considering the voracity of the creature, may well represent a pair of tombstones over the grave of gone victuals. The mouth opens, not vertically, up and down, as it does in all animals having a vertebræ or backbone, but laterally or horizontally, chopping its food from side to side, as it does in all animals that have no backbone.

Considering these formidable exterior and interior arrangements for the mastication of food, particularly the last set of molars in the bottom of the stomach, it may seem very curious if these animals did not suffer with neuralgia in the jaws and acute pangs near the region where Paddy had the toothache.

The eyes of a crab, as we all know, stand upon movable peduncles, that are capable of being projected, outward and upward, to afford a greater extent of vision; but some of us are not aware that their discs are covered by a multitude of facets each with its separate nerve and pupil, which enables it to embrace thousands of objects in as many different directions.

With this multiplication of the lines of vision similar to that in the common house-fly, if he was not abandoned to such beastly gluttony, it would

be the most difficult thing in the world to net him from the line, whereas it is found by experience, whilst he is engaged with the bait, to be scarcely any trouble at all.

The edible crab caught by fishermen and exposed for sale in the English markets is known to naturalists as the cancer pagurus, and is a very different animal from that which inhabits our own coasts. In the first place instead of the bluish green hue common to ours, it is of a deep lake color, except the dactylli, or pincers on the feeding claws, which are coal black; and the shape of the shell is somewhat rounder. It has no lateral spines, or long sharp projections from the ends of the shell; is several times larger than our own; inhabits the coasts, the shores and mouths of rivers, and grows to an enormous size, the shell of one measuring $3\frac{1}{2}$ feet across the back, being now on exhibition in the British museum.

The ordinary cancer pagurus, which can be bought for three or four shillings in the London markets, are generally about a foot across the shell, and a single claw with the proper fixings will furnish an ordinary breakfast for any reasonable Englishman.

On our California coast there are several varieties of crabs, among them the cancer magister and *C. productus*, whose general shape and dimensions bear some similarity to the English crab, but whilst

many of them are certainly more than twice as large as our own Chesapeake variety, they fall far short in size of the *C. pagurus*. The larger specimens of the English crab inhabit the deeper waters of the ocean channels, and are frequently denominated channel crabs or "channelers." This crab was the largest known to our forefathers when they emigrated to the shores of Maryland, and it was doubtless for this reason that the largest and oldest of our Chesapeake variety were first denominated "channelers," to distinguish them from the younger members of the family. The edible crabs on this side of the Atlantic have been divided into several classes of the genus *callinectes*, our Chesapeake crab being known as the *callinectes hastatus*, to distinguish it from the several other divisions, the *C. laratus*, *ornatus*, *diacanthus*, &c.

There is, one might think, a great deal known about crabs, but when all that is known is aggregated and compared with what is yet to be learned, it appears to be so deficient on so many points, that it is quite unsatisfactory at last.

No one has yet determined with positive accuracy the time required for the ripening of the eggs of the female, but from what data I have been enabled to gather from my own observation, I am convinced that it must be about nine months, the females which are impregnated in September delivering their progeny to the waters in the following

June, and those which are impregnated in November, in the more Southern waters, delivering them in August.

In reference to the number of young produced by a single female in a season, to those who are not familiar with the multitudinous progeny of the smaller marine animals, the simple truth will appear but the invention of wild imagination. But to those who have devoted attention to such subjects, and accustomed themselves by degrees, to the wonderful results of submarine procreation, what would appear to the common appreciation as the acme of all extravagance is simply the rule, whilst what would seem to be eminently natural, as a general rule, is simply the exception with marine animals.

When it is considered that some of the smaller marine animals, a single oyster for instance, may exude 6,000,000 of its progeny per annum, we will not be surprised that the crab, which has a greater capacity for self-protection than the bivalves, and therefore not the necessity of that immense multiplication, which is necessary for it to survive to all time, against its numerous enemies, is capable of reproducing itself at the rate of hundreds of thousands or perhaps millions per annum.

Well, it is not exactly settled that our present particular subject, the callinectes, do produce millions, though it may be millions or may be 100,-

ooo, and the reason why it is not, is that if they were all caught and ranged in single file it would take about a month to count them, and as no old fogey has been found, as yet sufficiently expert and devoted to perform that labor, the only means of ascertainment depended on, is to take the sponge or the ball as it is called by fishermen, which forms under and distends the apron of the female, and count a number of the eggs (which are smaller than a mustard seed, in a given weight of a certain quantity of its bulk, and determine the contents of the whole by calculation.

A fully developed female will exude in one season, about 2,000,000 eggs, ripened and bursting into life as they are given to the waters.

The period of its natural life, either in confinement or a state of nature, has not, as yet, I believe been accurately settled; although it is natural to infer from its habit of burrowing in the mud in the bottom during the winter, and from other circumstances, including the faculty of reproducing lost members, that it was not created for a mere ephemeral existence, and probably lives through a few years—how many it is difficult to determine.

And here, let me say, what may be said of every species of the crab family, malacostraca, entamos-traca, brachyura and macroura, decapods, stomopods, lameapods, aripods, isapods and hexapods, and all kinds and descriptions of shapes, tails,

shells and feet, that their carcasses or shells contain upon analysis, from 60 to 80 per cent. of the phosphate and carbonate of lime, and that the *limulus polyphemus*, or king crab of the lower shores of Maryland and Virginia, which infests our coasts from Sandy Hook to the Bay of Corpus Christi, certainly attains a longevity of not less than 50 years, and is so abundant, at particular seasons, on the Delaware Bay, that an agricultural fertilizing establishment located there, manufactures about 50 tons of them every year, into a first-class manure.

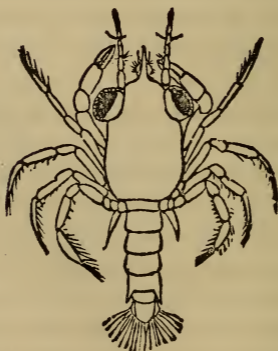
The cancer pagurus, or common crab of the English and Irish channels, without doubt, attains the age of ten or more years, and if our own blue crab does not last through a period of more than two or three, as is maintained by some, it is unquestionably among the most short-lived of its class.

As before stated, all crabs are produced from eggs. In the progress of the blue crab to maturity, it undergoes several transformation of its shape, the zoa, megalops and post megalops stages. It is necessary that all animals should grow, and crustaceans are a sort of hard-shell variety that can not grow without sluffing. The laws of nature find it necessary that our blue crab should grow with great rapidity in its earlier stages, in order to become able to take care of itself, either by flight

or battle. To this end it is enabled to exuviate or sluff, as we say, its outer covering with great rapidity.



Zoea — Appearance of Young Crab immediately after being hatched from the Egg.



Megalops — Second Metamorphosis or Stage of Young Crab.



Third Metamorphosis or Stage of Crab, approaching very nearly to the perfect or full-grown Crab.

In the post-megalops, or third stage of transformation, it will be seen that all that is necessary to make up the adult form in which we generally find it, is the rounding up of the front of the shell covering the eyes, and its lateral elongation, giving the animal its elliptical shape, and its sharp lateral spines.

All these transformations, seem to require not more than 30 days, and when the adult or perfect elliptical shape is attained, at the last stage, the animal will not measure more than $\frac{1}{4}$ or $\frac{3}{8}$ of an inch across the shell.

The different metamorphoses of a crab, previous to the assumption of its adult form, has reference to both sexes, but there is a transformation beyond these, peculiar to the female.

The male is distinguished from the female not only in the shape of the apron, the male having it far more elongated, but also by a marked difference in the colors of the chelipeds or feeding claws.

The *dactyli* or pouches, on those of the male, are of a bright blue, tipped with purple, whilst those of the female are of a bright red tipped with the same color.

Our Chesapeake crab generally makes his first appearance in the early spring in the region of the capes, and more abundantly than elsewhere in Lynnhaven Bay, where they hibernate or pass the winter in immense numbers at the bottom.

As the season advances they make their way up the bay, and generally about the last of June, though they came a week earlier this year, arrive in the Patapsco, from which they begin to take their southward course about the first of August, at about which time they begin very gradually to decrease in our immediate waters.

When overtaken in the change of seasons by a temperature, that they do not consider healthy, they plant themselves promptly in the mud at the bottom of the deepest water at hand, and begin their winter's nap.

Their beds are constantly disturbed by the oystermen, from the neighborhood of Annapolis as far down as Lynnhaven, and they extend still further into the holes, or deep muddy indentations on the bottom along the Atlantic coast.

The first that are brought to Norfolk and Baltimore in the early spring are obtained by the oystermen from the Lynnhaven region.

We have before considered their propensities, and vicious and belligerent nature, so that the manner of their growth, and the exudation of their shells, will about finish up what is to be said of "*Callinectes Hastatus*."

The frequency of moulting the shell is incapable of being reduced to any uniform rule, and is to a great extent arbitrary with individuals, depending much upon circumstances. It may take place at any time during their summer-life, but seems to happen most frequently during the fulling of the moon. There is even undoubted evidence that it may occur during their hibernation in the mud, as they have been frequently dragged up by oystermen in all conditions of moulting from the peeler to the paper-shell.

The process itself is nothing short of a natural wonder. For some days previous to its accomplishment, a thin integument begins to form between the shell and the coverings of the minutest parts of the interior body, and the whole muscular system becomes watery and relaxed, so that it is capable of being greatly compressed without injury to its integrity. Were this not the case, it would be impossible for the animal to withdraw itself entire, posteriorly as it does, and extract its legs with

their new and delicate integument complete, from their more rigid covering, particularly its frontal claws, which are much larger between than at the joints, and could not otherwise be dragged without injury through the narrower portions.

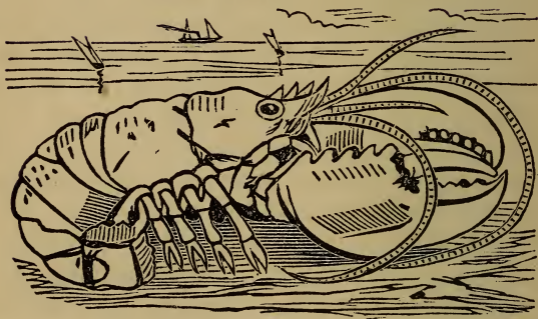
When the process is finally completed, the crab lies, after his exhausting labour, inert upon the sands, with scarcely any power of motion beyond that which is necessary to enable him to settle down, to some extent, in the soft bottom on which he rests. In this condition he is called a soft crab, and thought very nice for a fry. He is soft, certainly, but the way he looks at it, he is something more. He knows he is not drunk, because he belongs to the cold water army, but a sicker crab was never seen—so very sick and weak and watery and nervous—that he is scarcely able to move, and is for a short time a helpless prey to the very meanest of his enemies. Examination will show that he has left behind him a sort of cuticle or skin of every organ in his body, no matter whether it lies longitudinally, laterally or vertically, whether it be large or microscopically small.

You will find in the sluff not only a sort of cuticle of every distinct organ of the internal body, but even that of the molars, mandibles, maxillaries, palpi and antennæ, by which all his finer senses are directed, as well as of the delicate machinery of the stomach, including the grinders at the entrance of

the great bowel before referred to. When he is gone you find that he not only escaped literally "by the skin of his teeth," but that he has extracted his own stomach, as it were, from itself, carrying off the inside and leaving only the skin of the delicate organs behind, by a most inexplicable and magical process. And inasmuch as it must have been necessary for him to avail himself of the full action of this centre of vitality to assist in sustaining him in the enervating labor of sluffing, it must have been first necessary to swallow his own stomach in order to begin the work.

THE LOBSTER.

Homarus gammarus.



THE LOBSTER.

THE scientific name of the lobster is *homarus gammarus* from the Latin name *gammarus*, which again comes from the Greek word *gammaros*. The Italians call it *Gambare di mare* and the

Spaniards *Crabajo*, both of which names evidently come from the Latin. The Illyrians call it *Caranthola*. It does not seem certain whether the Norwegian and German name *Hummer* and the French name *Homar* can be derived from *gammarus*, as our name is very old, and may have its root in the Old Norse verb *homa*, which means to go backward. The English name *lobster* is only a modification of the name *longusta*, applied to the closely related genus, which is specially found in the Mediterranean; and the Dutch name *Zeekruft* simply means a sea-crawfish. In the Scandinavian sagas, especially in their poetical portions it is often mentioned. In Snorre's Edda, in the song *Skaldskaparsmal*, (chapter 75 of the Copenhagen edition,) it is mentioned among fish and other marine animals. In *Olaf den Helliges Saga*, it is mentioned in a song of Bjorn Heldolekæmpe, where the sea is poetically described as the "paths of the lobster." In a similar poetical sense, the word is used in *Olaf Trygvesen's Saga*, chapter 88, by the Skjald Thord Kolbeinsson, where he says that "the wave-horses run over the field of the lobster," meaning the ships that sail on the waves of the sea. In a song by Snigly Holle, in *Harald Haardraades Saga*, chapter 105, the expression, "To be at the bottom with the lobster," is used for drowning. In the Selkollé songs of Einar Gilson, in *Bishop Gudmund's Saga*, the term, "light

of the lobster," equivalent to the fire of the sea, or gold is used. In the same place, the expression "the horse of the lobster mountain," meaning the ship, is used. Finally, there is found in the poem *Liknar-braut*, the expression "land lobster," meaning a serpent or dragon.

The lobster belongs to the class of crustaceans, and among them to the highest section, the so-called order of decapods, which embrace short-tailed (*brachyrura*), and long-tailed (*macrura*) species. The lobster has a great similarity to the common crawfish, (*Astacus fluviatilis*), living in brooks and small rivers, but is distinguished from it by having the last segment of the thorax united with the preceding one, while in *Astacus* it is separate. It was therefore considered by *Mine-Edwards* to be the type of a new genus *Homarus*. Of this genus, the representatives of which live exclusively in the sea, three species are known, viz: *Homarus Americanus Say*, i. e., the American lobster found on the coasts of North America. From this the European *Homarus gammarus* is only distinguished by having a narrow spine on its forehead, and teeth only on its upper margin, while the former species has also teeth on the lower margin. There is finally the little *Homarus capensis*, from the Cape of Good Hope, which is not more than five inches long. The European lobster seems to have its central location

on the southwestern coast of Norway, and goes as far north as Finmarkin, where, according to *Lem*, in his description of the Finmarken Laplanders, 1767, it is found north of Traenen, where he ate very fine ones on the Island of Rhodo, while formerly their northern limit was thought to be the island of Brondo, but he also thinks that they would be found in Finmarken, if people only searched for them. It is very rarely found on the coast of Iceland, where, according to Mohr's "Islandske Naturhistorie," it has been found by Dr. Poulsen in Grondevig, but it does not extend to Greenland or Spitzbergen. It does not go into the Baltic, but is found all over the Kategat, especially near Anholt, Hirsholmene, Laeso and Hjelm, and, according to Mr. Fieldler's report, in the Great Belt as far as Sprogø. On the coast of Bohuslen it is very common, and is said to go into the Sound as far as the island Hveen. On the west coast of Jutland, it is found wherever the bottom is stony, and it is very common near Heligoland.

It is very rare in the inner portion of the bay of Christiania, and not very common in the Limfjord. On the coasts of England, Scotland and Ireland, it is common wherever there is a rocky bottom, especially near Montrose, Orkney, Lewis and Harris islands, and on the southern coast of England, near Land's end and the Scilly Islands. Near the Channel Islands it is common, as well as

near several groups of islands on the French coast. In the Mediterranean, it is not so common, although it is not entirely wanting, but its substitute as an article of food is another large species of crawfish, the *Langusta* (*Palinurus*). It is therefore not spread over a very large extent of sea, but it is found in its central locations in very large numbers, and there becomes an important article of food and trade.

Its general size is 8 to 10 inches from the point of the spine on the forehead to the tip end of the tail. It rarely exceeds this size where large fisheries are carried on; but now and then specimens of much larger size are found in places from which none are exported, and where it consequently has time to grow before it is caught. Thus, Pontoppidan, in his "Norges naturlige Historie," part ii. p. 279, says the very large lobsters are called "Storjer," and that near Utvaer, on the Bay of Evien, a lobster had been seen which was so large and ugly that nobody dared to attack it, and that it measured a full fathom between the claws. This seems certainly to be somewhat exaggerated; but I myself have seen the claw of one which must have been about 18 inches long. Sir John Graham Dalyell says, in his work "The Powers of the Creator," 1827, that he had seen a joint of the left claw of a lobster that measured 9 inches in length. According to this the whole claw must have have mea-

sured 18 to 24 inches, and the whole animal 3 to 4 feet. As a general rule, those that are taken in the fiords of Norway are larger than those which are caught near the islands toward the sea. The color of the animal when alive is generally a blackish green, with several blue spots; but it may also be lighter, especially near the mouths of fiords, while farther out toward the sea it becomes much darker. I may mention as a curiosity that during the year 1868 I found a lobster, one-half of which was of a greenish black, and the other of a light orange color, there being a sharp and clearly-defined dividing line, which ran lengthwise, and divided the lobster in two halves of equal size.

The lobster lives close to the coast, where there is a rocky bottom, among the large algæ; but in winter, when the water grows cooler, it descends as far down as 16 to 20 fathoms, while in spring, when the temperature of the sea rises, it stays at a depth of from 1 to 4 fathoms. It is altogether a coast animal, which very rarely seems to go any distance from its birth-place, if it can readily find there a sufficient supply of food. Sometimes, however, they have been seen in large masses swimming toward the land from the sea, and they have then been caught in nets, having been mistaken for a school of herrings; but this is only a consequence of local migrations, when it goes from the deeper into the shallower waters. It is not able to make its

way through the sea for any length of time by swimming. Its structure certainly allows it to make quick and definite movements, and it can swim freely about in the sea, but this swimming never lasts long, as it cannot keep itself afloat very long. Neither is it able, while swimming, to catch and swallow its food; but it seizes its prey only when it can hold on to something. At the bottom of the sea it can chase its prey, if necessary, with great rapidity, but while eating it remains quite still. The lobster is a very greedy animal, and can swallow great quantities of food, which it seems to find, especially during the night, by its scent, while during the day it keeps quiet and digests. Its food consists chiefly of the roe of fish and of dead fish, but likewise of small crustaceans and other marine animals. When kept in confinement it can live for a considerable time without food. The lobster seems to be able to propagate when it is a little more than six inches long, (at least, roe is only found in animals of this size;) but when the lobster reaches a length of eight inches it contains a great quantity of roe. When ripe the eggs are emitted, but do not fall into the water, as they are held in a hollow which is formed by the bent tail, which, both at the end and on the sides, has leaf-shaped fringes that inclose the space formed by the bending of the tail. Under this tail there is fastened a double row of the so-called tail-feet, to which the eggs are

strung by strong slimy strings. The embryo now begins to develop in these eggs, which are quite numerous, 2,000 to 3,000 in one female, according to the size, and occasionally as many as 10,000 to 12,000. The formation of the embryo does not, however, seem to begin till the temperature of the water has become milder in spring, even if the pairing should have taken place in autumn or winter; for, although loose roe is often found in winter, it is never seen in any degree developed into an embryo. This pairing and the development of the roe seem to take place at different times on the different portions of the coast; for the fishermen themselves, who have such an excellent opportunity of observing them, are not agreed as to the actual time. The development of the embryo seems to take at least fourteen days from the time of commencement, and it can easily be observed till the young break the shells of the eggs and begin to lead an independent life. When the young lobster comes out of the egg it measures only a few lines in length, and does not at all resemble the old lobster, but has a different structure. It does not leave the hollow under its mother's tail immediately after being hatched, but lives there for some time, and later frequently returns to it. It is particularly distinguished by a less complete development of its feelers and tail-feet, and by the feet being exceedingly small, but furnished with long brush-like

branches, with which it swims vigorously on the surface of the water. After having spent some time in this state it changes its skin several times and assumes the shape of its mother, when it goes to the bottom. Its life from this moment till it reaches a size of 5 to 6 inches is entirely unknown; for no young lobsters have been caught, either by fishermen or scientists, the smallest having been found in the stomach of the torsk, so that it is probable that they spend this portion of their life at a greater depth and live in a different manner and on other food than at a later period. There cannot, therefore, be any artificial hatching of lobsters in the sense of artificial fish-hatching, but all that can be done is to keep the lobster imprisoned during the development of the eggs, and thus protect it from the dangers which threaten it and its young. It is impossible to do anything for the tender young, as they die very soon when confined. I see, however, that several persons in France, and Mr. von Eris, in the lagoons of Triest, near Grado, have hatched several millions of young lobsters by keeping lobsters with ripe roe at the bottom of the sea in perforated boxes.

After the lobster has emitted its roe, and the young have left the mother, she begins to shed. She therefore goes to safe places, and does not seem to care much for food, while the old skin is being loosened; the shell finally opens in the back, and

the animal goes into the water naked. It then looks as if it was covered with velvet, on account of the considerable formation of cells which is going on all over its surface. These cells afterward grow hard through small particles of lime, and form the new shell. This shedding of the shell goes on from the middle of July till September, but not at the same time all along the coast, being earlier in the southern and later in the northern part. The lobster thus gets sick, as it is called, toward the end of June. Farther north the shedding of the shell begins still later, and lobsters may be caught all through July.

The crawfish or crayfish, that lives in brooks and rivers, is fashioned after the lobster, only smaller; so one of these can be studied by those of you who live inland. One thing is very certain—he has a great many different parts, very unlike each other. First, you see he is covered with a shell, which, like the mussel's and clam's, is his exoskeleton. This shell is very hard, like stone, and it is colored purplish black with pale spots here and there. The lobsters which you see in shops are always scarlet. When these poor fellows are caught they are plunged alive into boiling water, which turns the black coat red. This outside shell or exo-skeleton is made up of a great many different pieces, instead of two, as the mussel's; but those pieces are shaped and joined in such a way

as to make three divisions of the body—a head, a thorax, or breastplate, and an abdomen. The head-piece of the shell is pointed in front, forming the beak or frontal spine. Behind this head-piece is a groove or seam where the head joins the breast or thorax, making the two pieces of shell which cover the head and breast all one. So the first and second divisions of the body thus joined in one are called the cephalo-thorax or head breastplate. The large pieces of shell, with the seam that covers the back and sides of the cephalo-thorax, is called the carapace or shield. It is the front sharp point of this shield (carapace) that is called the frontal spine or beak. Behind the head and breast (cephalo-thorax) lies the third division of the body—the abdomen—which is made up of seven pieces or joints.

The first six joints are called somites or bodies, and the last joints or tail piece is called a telson, which means end. So the body of the lobster is made up of six somites and a telson; each body piece has a pair of soft-jointed paddles on its under side, and these are called swimmerets or little swimmers. The lower joints of these paddles have two broad, flat toes. The paddles on the last or sixth somite are different from the others; they are wider and turned backward so as to lie at each side of the tail-piece, telson; and these great-fingered paddles, taken with the telson, form what is called the tail-

fin. The under or ventral part of each somite, which lies between the paddles is called the sternum. The rounded upper or dorsal part of the body-piece is the tergum, which means the back. In front of the abdomen, with its somites, is the cephalo-thorax. This cephalo-thorax has a tergum or back part, a sternum, or under part, a pleuron, or side part, and so many things are hanging down from it one can hardly count, much less learn them.

Counting from behind forward, you will find between the lobster's body, or abdomen, and the head, eight pair of jointed legs, one pair much longer and larger than the others, with huge pincers at the ends. All these eight pair are called the thoracic appendages, because they are fastened to the thorax, or breast-plate. The lobster uses the four pairs for walking, and so they are called the ambulatory limbs. The last pair has seven joints, and every joint works in a different direction ; so, when these hind-legs start off, it is hard to tell where they intend to go. The next pair of walking-legs are like the hindmost pair, except that the first joint sends out a piece above it, which is kept out of sight in a little room in the side of the lobster. We shall say more about this room by and by.

The two front pair of walking-legs send up pieces also into this chamber, but the end of the leg is different from the last two pairs, for they have

pincers, or chelæ. Now we have come to the largest pair; the chelæ, or pincers at the ends, are so large and strong that they are called the "great chelæ." They are the lobster's weapons of defense. When he is taken prisoner, that is, seized by one of his claws, he quietly leaves the claw in the hands of his astonished captor, and beats his retreat as fast as possible. He has another odd way of laying down his arms when he is frightened by a great noise, such as thunder, or the firing of a cannon. It is no uncommon thing to find a number of these broken swords lying about among the rocks, showing where there has been a lobster fright or fight. As soon as one claw goes, another takes its place, but it is some time before the new one gets as long and strong as the old one.

You will notice quite a difference between the two large claws, or forceps. In one, the teeth are large and blunt, and in the other they are very sharp. The blunt-toothed pincers the lobster uses as an anchor to moor himself, while with the other he attacks and seizes his prey. So much for the great jaws, or chelæ. The next three pair are called maxilipedes, or foot-jaws, because they act both as teeth, and feet. The hindmost foot-jaw has three divisions. One branch passes up into the side-chamber of the lobster; the middle branch is long and jointed; this, and its fellows on the other side, act as a pair of scissors, cutting the food. The

third branch is joined, and is a walking-leg. The middle foot-jaw (maxilipede) is much like the last, while the front one does not send a piece upward into the side-chamber and one of its branches is flattened out so as to look like leaves. The four walking-legs, the great pincers (chelæ) and the three pair of footjaws (maxilipedes,) making eight pair in all, belong to the lobster's breast (thorax.) Now we come to the head, which is provided with six pair of "hangers-on," or appendages. The two back-pair belonging to the head are called maxillæ, because they lie at the side of the mouth, and are like jaws. The hindmost of the jaws—or maxillæ—on each side has a boat-shaped, or oval shaped, or oval plate which lies at the front entrance of the side chamber, about which we will hear more presently. The ends of the front pair of little jaws (maxillæ) are leafy like those of the front pair or footjaws (maxilipedes.) Now we come to the jaw itself, or mandible, which has strong teeth bears a small appendage, the palp, and lies at the side of the mouth. From all this you see that the mouth of the lobster is well armed with teeth and scissors to tear and cut its food. Counting from the front it has first the true jaws (mandibles;) then the two pair of little jaws (maxillæ;) and these are followed by the three pairs of foot-jaws (maxilipedes), making altogether six pair, which are all turned up against the mouth. In front of the jaw

are two very long jointed feelers called antennæ, but you seldom see them at their full-length; they are easily broken. Next to the feelers (antennæ) are two little feelers or antennules, and last of all, in front, comes a pair of joints which support the eyes, called the optic pair of appendages. Now let us begin with the eyes, and go back to the tail, to see how many pairs of feelers, jaws, hands, feet and paddles the lobster owns. He has six pairs attached to the head, eight pairs to the breast, (thorax,) and six pairs to the body (abdomen); in all, twenty pairs, and very few of these appendages are alike.

You now have a pretty good idea of the exoskeleton, or hard outside part of the lobster, and we shall look next at the soft parts inside. The mouth seems a very good place to begin at, and you will find it between the mandibles or jaws. In front of it is a lip, shaped like an escutcheon, and is called the *labrum*, which means lip. At the back of the mouth is another lip, the *metastoma*, meaning beyond the mouth, and this is looked upon as the lower lip. The mouth as in the mussel opens into a gullet or æsophagus. This meat-pipe opens into a four-cornered box—the stomach—which is very curiously made.

Near the centre of the box, the walls come almost together, dividing it into two parts; the front part is the larger, and it is called the cardiac

end, because in the human body the first part of the stomach points toward the heart, but you see, in the lobster, it points away from the heart. It contains three strong, colored teeth, fastened to a T-shaped frame, and worked by muscles, which are fastened to the inside of the breast plate (carapace). These teeth meet in the middle of the stomach, and form a powerful grinding machine, which crushes the food like stones in a mill. Some times, when you find the empty shell of a lobster on the sea-shore, you can see a perfect mould of the old mill—"the mill wheel gone to decay." How the lobster gets out of his shell, and how he turns the mill out of his stomach, we shall study after a while. The small back part of the stomach is called the pyloric end and it is made inside like a sieve or strainer. The sides are stuffed out in the centre like cushions, and quite covered with hairs. Let us see why. Pylorus means gate-keeper. It protects or guards the intestines from all intruders, such as big pieces of meat and hard bodies. None but the finest particles can pass through the strainer, and hence this pylorus is a very good gate-keeper. The intestine does not go wandering about in the body like the mussel's, but passes straight back, and ends at the anus, at the under part of the tail-piece (telson). On each side of the cephalo-thorax lies a long, soft yellowish green mass. This is the liver, and it opens

into the small, pyloric end of the stomach by several ducts or pipes on each side. Away up in the front part of the cephalo-thorax, at the base of the feelers (antennæ) on either side you may see a soft green mass called the "green gland." This is supposed to be the kidney. Next we will take a look into the side chambers of the cephalo-thorax, and see what the three pair of walking legs the great pincers (chelæ), and the two pairs of jaw-feet are doing in there. In each chamber we find eighteen little, tapering, feathery-like bodies. Each has a central stem, surrounded by fine, feathery filaments. They look very much like so many little bottle-brushes. These are the gill-plumes, and this room is called the gill, or branchial chamber. The gills are placed in two sets, six in one and twelve in the other. The first row is fastened to the six feet or appendages of the breast (thorax) which we found pushing themselves up into the chamber. The other twelve are fastened to the pleuron or side-pieces of the cephalo-thorax. These gills are not covered with stiff hairs (cilia) as the mussel's, so there must be some other plan of moving the water. There is a very curious piece of machinery at the front entrance. You remember the oval or boat-shaped plate in front of the chamber, formed by the hindmost little jaw (maxilla). This plate is called the scapho-gnathite which means the little skiff-like jaw. It is made

on the plan of the Archimédean screw of a propeller, and is set in motion by the jaws. The water enters the back part of the gill chamber by a slit, and it is scooped out by the screw through the opening in front, bubbling and frothing as it goes. Thus, the mechanism of the screw was all worked out in our little lobster long years before it was discovered by the great Archimedes. The tiny net-work of the blood vessels is spread over the frame-work of the gill-plumes, just as you found it on the lattice-work of the mussel's gill-pockets. As the screw propels the water through the branchial or gill chamber the blood takes out the oxygen from the air in the water, and gives back carbonic acid. You remember how the strong hairs (cilia) of the pockets sweep the water along over the mussel's gills, and how the little blood-vessels take up their oxygen and give up their carbonic acid. The gills that are fastened to the legs move when the legs move, and the faster they go the more water they use. So much for the lobsters breathing or respiration. We will leave his circulation, muscles and nerves for another chapter.

The eyes, as you have seen, are away in front at the ends of the first pair of appendages—the eye-stalks. The eye is kidney-shaped; instead of having one window or pupil as your eye has, through which the light enters, the whole front is

divided into squares like old-fashioned window panes. Each square is really a separate eye, and this is called a compound eye. The lobster's eye sight must be very good, for, besides having all those eyes, the stalks are jointed so that they can turn them in different directions. The nerve which goes to the eye is called the optic nerve, and it is connected with each square by pretty rods and cones, which look like those in your own eye. The rods and cones are covered with coloring matter or pigment, which turns red when it is boiled. The optic nerve is a nerve of sensation, because it gives the lobster the sense of sight.

Now, where are the lobster's ears? Not in the foot, as the mussel's but in their proper place—the head. If you look at the base of the little feelers, on each side you will find a little three-cornered slit, covered with hairs. This slit leads into a small sac filled with water. One side of this sac is pushed inward to form a sort of fold or pocket, in which a nerve which comes from the brain or head—ganglia—spreads itself out. The side of the pocket toward the water is covered with fine hairs, and these hairs touch against little bits of sand which get into the water through the outside slit. These particles of sand are like the tiny stones or otoliths you found in the mussel's ear-sac, and they likewise help to increase the sound. The lobster's ear is made on much the same plan as your own ;

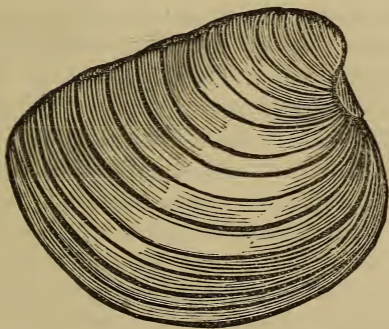
the sac is really a fold of the lobster's skin, which is pushed in as you might push in the crown of your soft hat.

Now, I dare say you are wishing to hear about the lobster's bairns or little ones. The lobster's eggs are covered with soft, sticky glue, which fastens them to the long hairs which cover the paddles under the abdomen. The good mother lobster doubles up her body so that the eggs are all folded inward safe from harm. Hundreds of eggs are carried in this way, and when the lobster is boiled they turn red, and form what is called the coral. The baby-lobsters differ greatly from their parents. Their eyes are very large, and set in the head instead of in eye-stalks. They have a great rounded head-shield (*carapæ*,) and a small body. The limbs are not at all like the lobster's; altogether, he looks as if his eyes and head were running away with him. As soon as he is hatched he begins to swim about and feed himself, and never goes back to the old home. Of course, as he grows, his shell gets too small, but, instead of putting on an addition as the mussel does, he leaves the old house altogether and builds a new one. In three days after the lobster moves out of the old house he has been found all settled in a bran-new one one-third larger. Two round balls are often found in the lobster's stomach, and people call them "crab's-eyes." These balls are made of

lime, which it is said the lobster has been storing up for his new shell. Thus the lobster moves "out of the old house into the new" every year until he gets his growth. Then he lives contentedly under the same roof until he dies, or until some one throws him into a lobster-pot.

HARD CLAM.

Venus Mercenaria.—Quahog.—Wampum.—Round Clam.
Hard Clam.



THE HARD CLAM.

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 "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*. 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 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. 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. 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.

Clams 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.

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 pans, shaded from the sun and placed between the piles in such a way as to be covered by the tides 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.

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 paires doubles, [*Venus verrucosa*,] which are the especial favorites of the people of Marseilles.

The hard clam is of very different appearance from the other, being a Venus (*Venus mercenarius*). Like all of that genus, the shells are chalky, roundish, somewhat globose, ornamented with eccentric ribs, the beaks pointing far forward, with a deeply curved indentation in front, and the color varying from brownish-white to smoke-tint, sometimes painted with waving lines and zigzags of red

and brown, there being so much difference between varieties from different localities and depths that many have been described as distinct species. It has very short siphons, slightly parted at the end, and a large, muscular foot, with a broad, thin edge, by means of which it can burrow in the sand when necessary. The foot and fringed edges of the mantle are white; the tubes yellowish-orange toward the end, more or less mottled with brown and white. Its home is on firm, sandy, and muddy flats, just beyond low water mark, where it is frequently laid bare by spring tides, since it does not burrow like the soft clam, but crawls about only half buried in the mud, or conceals itself beneath the stones and sea-weed. Its food is similar to that of the soft clam, and secured in the same way. It abounds not only on the outer beaches, but also in estuaries, inhabits the oyster-beds, and lurks among the rocks of reefs and inlets from Florida to the Gulf St. Lawrence, although rare and local north of Cape Cod.

The Indians along our whole sea coast have always been accustomed to eat some sort or another of mussels. At Puget's Sound it is the great *Tresus*, which they smoke for winter stores; in California, the oyster and other bivalves; in Gulf of Mexico, the *Gnathodon*, of which the shell roads around New Orleans and Mobile are made; on the Atlantic shores, the oyster, common and

horse mussels, razor shell, cockle, scallop, and our two clams, besides the fresh water unios and anodons. To what an extent these various mollusks furnished sustenance to the wild tribes of the coast and of the Mississippi Valley is shown by the vast banks of cast-away shells that remain to mark the points of aboriginal habitation. The records of exploration show that some parts of the interior of Florida are so full of mounds composed of broken shells and of wide fields stréwed with them, consisting of unios not only, but also of the smaller gasteropods, *Ampullaria* and *Paludina*, that the fact is commonly known to the people living there; while the savannahs of Georgia, the banks of the Mississippi and its tributaries—particularly along the Ohio—and even of the Merrimac and Concord Rivers, in Massachusetts, are dotted with heaps of the mussels existing in those rivers, the animals of which have been consumed by the Indians. The same sort of remains are found on the Pacific slope and in South America. As for shell heaps upon ocean coasts, they are world-wide in their distribution, and often prominent in appearance.

On certain points of the shores of Denmark and Norway, there were disclosed, many years ago, banks of marine shells, sometimes a thousand feet in length, two hundred feet in breadth and ten feet deep. At first these were taken for nat-

ural deposits, but it was observed that here only adult specimens of the littoral fauna were present, and closer examination revealed calcined shells, circles of blackened stones indicating fire-places, fragments of the bones of edible animals, and remains of rude utensils and implements. Thus it came finally to be proved these were the kitchen refuse heaps of ancient mollusk eaters, and are called "Kjockkenmoeddings." This discovery prompted research, and similar deposits were soon found in various other parts of the world. Our own coast is lined with them from the piles which grew up around the door-ways of fishers on the low Florida shores, until their huts stood on hillocks above the reach of the highest tides. The Indians before they were driven back from the coast by white settlers spent a portion of each year at these places, probably the winter months, when the climate of the shore is warmer than that of the interior, while some perhaps lived there permanently, raising in the cast-away shells unconscious monuments of their sea-shore life. At such times the two clams, but mainly the quahog formed the chief comestible. Roger Williams tells us that the Narragansett Indians called the soft clam "sickissuog"—"a sweet kind of shell fish," which, he says, "and the natural liquors of it, they boil, and it makes their broth and their nassaump (which is a kind of thickened broth) and their

bread seasonable and savoury, instead of salt." The hard clam they named "sequannock" and "poquauhock," concerning which old Roger notes: "OBS.: This the English call hens, a little thick shell-fish, which the Indians wade deep and dive for, and after they have eaten the meat there (in those which are good) they brake out of the shell, about half an inch of the blacke part of it, of which they make their Luckahuok or black money, which is to them precious." The black money was worth one half as much as the wampum or white money, and the "blacke part" used was the purple scar inside of the shell, under the beak, where an adducter muscle was attached, for the anatomy of this species is much the same as that of the soft clam.

Then, as now, it appears that all the hard work of obtaining the delicacies fell upon the women. A quaint old book written by William Wood, and published in London in 1634, entitled "Nevv England's Prospect," etc., contains a poem upon the kinds of shell-fish, in which the following elegant verses occur :

" The luscious lobster, with the crab-fish raw,
 The brinnish oyster, mussel, periwigge,
 And tortoise sought by the Indian Squaw,
 Which to the flatts dance many a winter's jigge,
 To dive for cockles and to dig for clams,
 Whereby her lazy husband's guts she crammes."

Not all the shells were thrown away. Various implements were made out of them—arrow-points, scrapers, paint-holders and spoons.

“.....The dainty Indian maize
Was eat with clamp-shells out of wooden trays.”

The especially noteworthy one of these primitive festivals was at the time of green-corn, when a great assembling of sages and warriors with their families was held at the sea-shore, and clams and succulent ears and sea-weed were roasted together in astonishing quantity, amid all the delights of a New England midsummer by the ocean, and every savage amusement. So good a custom merited perpetuation, and has, indeed survived to the present day in a *clam-bake*—that patriarchal institution of New England, where the icy Puritan might permit himself to be won a little from his rigor by the seductive mussel, and the pious maidens enjoyed a momen's timid relax from conscientious austerity in the fun of paying *Periwinkle*. Nor is the custom still extinct, although it is no longer possible that the clam-bake should be a season of universal holiday as of yore. But now and then some great occasion in Rhode Island or Connecticut is celebrated much after the traditional fashion, and the wise and renowned join in the festivity, as in the old days, when Diedrich Knickerbocker and his friends sailed over to Communipaw to discuss

grave questions of Dutch polity as they smoked their pipes beside the sunlit bay until the quahogs were toasted brown, and they could eat them slowly, as befits the viand, and listen to Jacob Steendam as sonorously he sang his "Praises of New Foundlands:"

"En Kreeft, en Krab, en Mossels; Oesters die
Een better is als Europa drie
In veelheyt heel on-kenbaar vorhem, wie
't Mocha onderwinden."

Now the manner of a modern clam-bake is this: a circular heath 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 to morsels from the delicious mass.

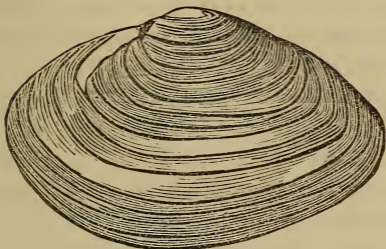
Except for local consumption along the coast, Boston and New York are the chief markets for

clams; but it is difficult to ascertain, or even estimate, the total amounts annually received at these and other ports. A large number of vessels, from fine schooners of hundreds of tons' burden, to ugly little sloops without shape or comeliness, are employed in the trade, but the skippers, as well as those who handle the shell-fish on shore, are a queer class of men, full of jealousy and prejudice, impossible to be persuaded that no harm would result from divulging the amounts of their cargoes or sales during a twelve-month. But from inquiries in Fulton and elsewhere, it appears that not far from two million bushels are received annually at New York of each species. Immense numbers of the hard clams are shipped to the West, packed in ice or preserved in the manner of oysters, since emigrants have taken to the prairies with them the taste for the fry and the chowder, perhaps because they find in their salt flavor the best reminder of the early home by the sea-side.

SOFT CLAM.



Mya Arenaria. — Nannynose. — Mannynose. — Long Clam. —
Soft Clam.



THE SOFT CLAM.

A MOIST and muddy clam is not altogether an attractive object. Yet there is much about it that is interesting. Take up one of those "soft" clams, for instance, and look at it. The two oblong, slight, bluish-white shells hold within an unintelligible yellowish mass, while projecting from one end is a

blackish, wrinkled lump that, upon being irritated, quickly withdraws, throwing out at the same time a stream of water, while the shells shut tightly together. But put this forbidding-looking creature in a shallow pan of fresh sea-water, twelve or fifteen inches in length. Although this, its natural element, is no doubt instantly grateful to it, the animal must be left quietly for a few hours before it recovers confidence. Then the blackened tube—of which a glimpse was afforded before—gradually protrudes from between the margins of the two halves or valves of the shell, and slowly extends itself until a length of several inches is displayed. Now it is easy to see that this organ has two openings at the end, beautifully fringed with appendages like little feelers, and mottled with the richest brown. It really, then, consists of two tubes, one on top of the other, leading to the body of the clam; and if you observe the openings closely, you will see a current of water flowing into one of them, and another current pouring as steadily out of the other. These currents are produced by the tremulous motion of innumerable minute hairs (*cilia*) that line the interior of the animal. The extensile and contractile double tube is termed the *siphon*, and the currents *siphonal currents*.

The anatomy of the clam, like that of nearly all bivalved mollusks, is very simple. Forcing them open, we find that the two halves of the shell are

held together by a pair of strong muscles, but if the animal would keep his doors quite closed he must exert a continued effort, since immediately beneath the hinge, occupying a little cup-shaped projection like a bracket, is an elastic substance which acts to throw the valves a little apart when the muscles are relaxed, just as a piece of India-rubber squeezed into the hinge of a door, would tend to open it as soon as the pressure was removed. Having taken off one valve, we find lining it—and the other as well—a thin membrane called the mantle. The scalloped border which follows the edges of the shells is thickened and united, except a small slit through which the “foot” projects at the end opposite the siphon. The foot is a tough and muscular organ serving as an excavator. Within the mantle are the curtain-like gills, between which lie the muscles that operate the foot and siphon, the abdomen and the viscera, which form the principal edible part. The mouth is just under the forward transverse muscle, and opens almost directly into the stomach. The intestine, after several turns, goes back directly through the heart to its orifice near the mouth. The ordinary length of the shell is about three inches, but it is not uncommon to find it much larger, while the siphon may be projected fully a foot.

In this country the soft clams are found from South Carolina to the Arctic Ocean—where the

walrus, polar bear and Arctic fox feed upon them whenever they have a chance. It is scarce south of Cape Hatteras, and most abundant on the New England coast. It occurs on the northern coasts of Europe as far south as England and France; on the north-eastern coast of Asia, in Japan and in Alaska. It is therefore essentially a northern species, and had the same general distribution as far back as the pliocene and miocene ages of geology.

The soft clams are everywhere denizens of the beach between tide marks. The soil that suits them best is sand, with a large admixture of gravel or mud, but all sorts of places are occupied, where the water is sufficiently brackish, and it is possible for them to burrow. The specimens that live on on the outer sandy beaches have a much whiter, thinner and more regular shell than those found in estuaries; they are often really delicate in texture, and covered, even when full grown, with a thin, yellowish epidermis, making a striking difference between them and the homely, rough, mud-colored specimens usually seen in the markets. Now, as in 1616, when Captain John Smith wrote, "You shal scarce find any Baye, Shallow Shore or Cove of sand, wyere you may take many Clampes," these mollusks are very numerous. More than a hundred, of different sizes, are said to be sometimes dug from a single square foot of ground in Boston Harbor.

On such beaches as I have mentioned, the young clam, as soon as old enough, turns his head down, and pushing out his foot, which he can fold into various shapes,—“now a dibble or spade, a trepan or pointed graving tool, a hook, a sharp wedge,”—he digs his way straight down, six or eight inches into the sand, leaving stretched behind him his siphonal tubes, to keep up his communication with the surface. When the water over him is deep, the siphons are thrust well out; when shallow, as in some tide pool, only the fringe of short tentacles is visible above the closely impacted mud; and when, as happens most of the time, in the case of those clams whose home is near high-tide mark, there is no water over him at all, his tubes are withdrawn wholly into the sand.

Confined in his burrow, deep in the earth, the clam cannot roam in search of food. It is, therefore, to bring sustenance to it, that the tubes are pushed up into the sea, and the cilia set in motion. A current of water is sucked in, bearing microscopic particles as aliment for the stomach, and bringing oxygen to revivify the blood brought into contact with it in the gills. Its burden unloaded, the available residue of the water flows out through the discharging siphon, carrying with it all excrementitious matter. A continuous current is thus kept up. It is never long “between drinks” with this bivalve, which may, perhaps, account for the origin of the adage, “happy as a clam.”

The spawning-season, according to the fishermen, occurs in June and July. The eggs, issuing from the ovaries of the female, find their way into the cavities of the outer gills, where they are fructified. There they develop until the eggs are furnished with little, triangular, vellum-like shells just large enough to see, which are discharged by thousands into the water, and left to take care of themselves. How long it is before they reach a sufficient size to settle down in life and construct a burrow for themselves, is unknown—probably not a great while. It is doubtful, indeed, whether one in a hundred ever fulfils that domestic ambition before being swallowed by some one of the numberless aquatic birds, fishes and crabs, that are on the lookout for just such tid-bits. Nevertheless, the little clams do their “level best,” anchoring themselves by a slender thread to the bottom, and holding on against the currents with all their might. Alas! that so many of these brave little fellows must perish in their youth!

Beds of soft clams are sometimes of vast extent, and are usually found in sheltered parts of the coast, where the action of the waves is not sufficiently strong seriously to disturb the beach. The inside of the long, sandy neck connecting Nahant with Lynn, for example, is filled with them, while on the outside, where the surf pounds, not one is to be found. They are sought at low tide, betraying

their hiding-places, by squirting water up when the sand is shaken or pressed. That is the spot to drive in your spade. From the days of the May-flower hogs have had sagacity enough to discover the situation of the buried bivalves at low water, and to root them out and devour them. Two hundred and fifty years ago old Thomas Morton had found that this diet "makes the swine prove exceedingly," and Long Island farmers are still of the same opinion. Such clams as have been unlucky enough to be washed, and cast high up by some rude breaker, are quickly seized upon by gulls, cormorants, crows, and other large birds that frequent the shore. During the winter months, when ice is often piled high upon the northern beaches, the clams bury themselves more deeply than ordinary, and get along as well as they can. They seem able to endure great cold without harm. Professor Agassiz found within their shells icicles, which did not incommode them in the least.

Leaving for a later paragraph the value of the soft clams as a means of human sustenance, let me speak here of its utility as bait. Our fishermen very long ago learned that most carnivorous fishes, and the cod in particular, have a special fondness for the various species of *Mya*, the codfish of Newfoundland Banks, relying very largely for nourishment upon a species allied to our edible *Mya arenia*. It occurred to them, therefore, that it

would be worth while to take our soft clams to the Banks with them, and the experiment met with such success, that at present more than fifty thousand bushels are employed annually for bait in the cod and mackerel fisheries. The clams are used either alive or salted. In the former case they are enveloped in netting-bags, and kept in the wells with which many of the vessels are provided. If the voyage is to be a short one, the clams may be preserved alive for a considerable period by being kept in a cool place, and stores of ice are now taken on some vessels for this purpose. The majority of the bait, however, consists of the animals removed from the shell, salted and packed in barrels, and much of it is not the edible species, but an inferior one, known to the fishermen as the "skimmer." Salted clams are also used with success in the mackerel-fisheries, according to Lieutenant Broca, where they are used, like the roe of the animal, to attract the fish.

Thus much for the soft-clam, long clam, nanny-nose, maninose, sickissuog, or *Mya arenaria*, as you please to call it.

CLASSIFICATION OF FISHES.

THE great class of fishes is divisible into two great groups, each including a vast number of species. One of the two great groups was known anciently as the *Teleosts*—from the two Greek words *teleost* complete, and *osteon* a bone, on account of their having bony skeletons. The other classifications are the *Ctneoids* and *Ganoids*. *Ganoid* fishes were created or in existence long before the *Teleosts*, and anciently were of strange and varied forms; at present they are few in numbers and restricted in their localities; the most widely distributed type of the *Ganoids* is the sturgeon. In the first of these two great classes—*Teleosts*—we find the *percids* or *perches*, a family very numerous in genera and species, and to be found in the waters of all temperate and tropical countries. They are gregarious, carnivorous and voracious, biting readily at the baited hook. Another branch of this family of *Percidæ* or *perches*

are the *Labracius* or true bass, all excellent food fishes; included in this family is the well-known *Rocus*. The *Rocus* includes the rock fish or striped bass of the sea, and only ascends rivers to spawn, and the white bass which were originally confined to the great lakes and Mississippi system of waters, and now descends to the salt water. In the family of Percidæ, also, are included the black basses, all in high repute for excellence as food as well as for the vigor of the "*play*" and the sport they afford to the angler; also included in this genus are the fresh water trout, the salmon and chub; all are voracious, bold biters and take with savage earnestness live bait as well as the spoon.

In the family of the Percidæ will be found *Cyprinids*, which include the carp and gold-fish, the shiner, dace and roach. The shiners and dace are favorite subjects for the exercise of juvenile skill in piscatorial pursuits; in this family are the *silurids* or cat-fish. There is hardly a pond or river of the temperate and tropical regions of the globe in which they cannot be found. Their varieties are the "blue," "silvery," mud and stone cats, and "channel cats;" some of the latter have been caught in the Western rivers weighing two hundred pounds. Although cat-fish are contemptuously repudiated by many, they are really an excellent food fish, especially the "channel cats."

FISH AS FOOD.

Nearly all marine and fluviated products, whether mollusks, crustaceans or fishes proper, are easily digested, nutritious and palatable articles of food, most of them, especially the fishes, contain a special element—phosphorus, that is an important ingredient in the osseous (*bony*) and cerebral (*brain*) tissues of animals, giving rise when used as food to great mental force and activity in those who largely subsist upon them. Civilized nations cannot do without this important fish aliment without detriment, and it is indispensable to the peasantry and laboring classes of all countries.

The flesh of fish is as nutritious as that of pork, and it is estimated that 100 pounds of fish-flesh contains as much nutriment as 200 pounds of wheat bread, or 700 pounds of potatoes.

PISCICULTURE.

Pisciculture among the Ancients.



THE FISH.

FISHES, from the earliest ages, have been objects of interest to the philosopher as well as to the the people at large, and the mystery in which their habits are enshrouded, by the element in which they live, has rather enhanced the curiosity excited by their appearance, and has lent much of the zeal which the sportsman experiences in pursuit of them. As is usual, too, with respect to subjects which are difficult of observation, romance and fable has lent their charms to invest these beings with marvellous properties, both of body and intelligence, and

truth and fiction are so mingled in the accounts given of their habits by the ancients, that the two are, in some cases, separable with great difficulty. Yet the ancients were, in truth, perhaps, better acquainted than the moderns with the habits of some fishes ; for never has the taste for fish been carried to such extreme, and never has it been gratified at such expense as in ancient Rome. The exorbitant prices commanded by fishes which fulfilled certain arbitrary requisites as to condition and size, naturally directed to them much attention, and fish ponds were formed at enormous cost, while the fishes destined for them were sought for in distant ports, and transported to the ponds or preserves of Roman senators and noblemen, to be fattened for the table, and to propagate their race, and afford a supply of the desired luxury in the finest condition. Pisciculture was indeed carried on in those days with zeal and success, and much could be learned from the experience of that age ; but zealous and skillful as were the ancients, the device of transplanting, or artificially fecundating the ova, and rearing the fishes from the egg seems to have been totally unknown to them.

PISCICULTURE AND SPAWN COLLECTING IN CHINA.

Fish-raising, for economical as well as ornamental purposes, has been practiced from time im-

memorial by the Chinese, and gold fish, so familiar as an ornament of the parlor or drawing-room will be recalled as one of those species for which we are indebted to that singular people. Sports or monstrosities of the gold fish have been cultivated with great success by them, almost innumerable varieties having been obtained, and eighty-nine have been illustrated by a French naturalist, M. de Savigny, in a special work entitled "*Historie Naturelle des Doraeds de la Chine.*" These rarities well show how much nature can be controlled by man, as forms destitute of certain fins, and possessing others double or even more hypertrophied, have been secured and perpetuated. The experience of a people which have succeeded in such efforts would be interesting as well as instructive, but that hitherto furnished has been too vague. They however, avail themselves of the fry which have just escaped from the egg, as well as the eggs themselves, and carry on a considerable commerce in both.

"When the fry have been taken from the water they are as soon as possible put into copper vessels, which are then covered with thin cloth. These vessels should be three-quarters filled with water, which is changed three times a day — morning, noon, and evening. While this is being done, a very fine gauze cover is used to prevent the little fishes escaping from the vessel. Ex-

posure to the sun is to be avoided; the vessels should not be disturbed, and as soon as any of the fishes die, they should be removed.

“The daily food is supplied by the yolk of eggs, which are boiled and mashed up fine. The fishermen advise that the vessel should not be exposed to storms or rain.

“Fish can in this way be kept for two or three months.

“When it is desired to stock a body of water, it is only necessary to place the little fishes in weedy situations, or it will even suffice to throw them in the middle of the water, without any precaution. The fry of each species of fish wanders under the guidance of the mother, who does not abandon her offspring until they are quite large. The fry of the ‘*Kia-you*’ (‘home or domestic fish’) does not wander.”

We have also accounts of European travellers, extending as far back as the first half of the last century, from it would appear that the Chinese had long been accustomed to secure the eggs of various fishes, and that they raised the fishes directly from the egg. Duhalde, a Jesuit father, who published an account of his travels in the year 1735 made known that not far from the town Kieou-king-fou, in the river Yang-tsze Kiang, very numerous boats came from all quarters in the spring to obtain the spawn of fishes. To secure this spawn, the men

devoted to the search for it partially dam the river in certain places, for a distance of nine or ten leagues, with mats and hurdles, leaving only sufficient space for the passage of boats. The spawn is arrested in its descent by these barriers, and thus secured. Much of this spawn is said to be at first undistinguishable by the unaccustomed eye, but those engaged in the fishery readily recognize it, and placing the water containing it in jars, offer it for sale. As may be supposed, it is not certain in all cases what particular fishes the ova thus obtained may give birth to.

PISCICULTURE IN EUROPE DURING THE MIDDLE AGES.

Pisciculture seems to have been considerably practiced in Europe during the middle ages, and especially by the monks, who relieved the monotony of their seclusion by attention to the agricultural and other useful arts, as well as by literary studies. It has been claimed that some of the most esteemed fishes now abundant in the fresh waters of England were introduced during that period; but such accounts are very problematical, and it is probable that most, if not all, had existed there at least from the dawn of the present geological epoch. However this may be, it is certain that species were introduced into new continental waters, and that the monks laid out ponds and raised

therein, in conformity with regular rules, several esteemed fishes, whose habits best suited them for rearing in such preserves. Chief of those were the carp and tench. The pike was also frequently introduced to check the excessive multiplication of the herbivorous species. Artificial fecundation was, however, unknown to the monks, and its discovery is little more than a century old.

DISCOVERY OF ARTIFICIAL FECUNDATION BY
JACOBI.

Jacobi having recognized the nature of the sexual relations of the fishes, and that the female, when spawning, was followed by the male, who dropped his melt over the ova of his companion, and thus fertilized them, inferred that nature may be imitated and assisted by man. He therefore took a clean wooden bucket or shallow tub, and emptied into it a pint of clear water. Taking then a female salmon whose ova were mature, he expressed them by a gentle pressure of the hand down the abdomen, and treated a male fish in the same manner, discharging his melt over the ova.

ARTIFICIAL FECUNDATION.

In 1768, Spallanzani, in the course of his physiological experiments, successfully practiced artificial fecundation in the case of the frog, an animal

of analogous habits. Adanson, the celebrated naturalist and African traveller, was also acquainted with the principles of artificial fecundation, and in a course of public lectures, delivered at the Jardin du Roi, in 1772, clearly explained the principles and *modus operandi*.



Expressing the ova from a female fish; the melt of the male is obtained by a similar process.

Joseph Remy, a fisherman of La Bresse, an illiterate man, but of observant habits and reflec-

tive mind, fearing lest his calling should be interrupted by the threatened extinction of the trout, the capture of which afforded him a livelihood, and like Jacobi, reasoning upon the sexual relations of the fishes, conceived the idea of artificial fecundation. Associating with himself a companion, Antoine Gehin, the two, after long and patient endeavors enlisted the sympathy and active co-operation of several influential men in their district, and prosecuted the, to them, new art with skill and success.

NATURE AND OBJECT OF PISCICULTURE.

Lest some misapprehension may prevail respecting the objects and aims of pisciculture, it may be here remarked that all it can do is to assist nature by the selection of the most favorable situations and conditions for the maturation of the ova, and the protection of them and of the fry from the attacks of the numerous enemies which threaten them.

MODE OF OPERATION.

The process necessary for artificial fecundation and propagation is very simple; the ripe female and a male fish are obtained. The fish should be firmly seized by the hand, and the other hand passed over the abdomen gently but firmly, when the ova of the female and the melt of the male

will be easily squeezed out, the ova and melt thus intermingled in an ordinary vessel and brought to the hatching-house to await development, incubation occurs very rapidly, usually in four or five days. The young fish upon being hatched are mere mingling threads, with an almost imperceptible head, but they are wonderfully agile in their movements. The eggs when first taken, are small transparent globules. They gradually swell and if they have been impregnated by the melt of the male, upon the second day after such contact, a brown speck will show itself in the egg; and in a couple of days more will be swimming around like a vitalized hair. A considerable portion of the eggs die, and the dead ones can always be recognized by their becoming perfectly opaque. Many females deposit several millions of eggs, the computation of the number being accurately ascertained by spreading a definite number in a certain space and computing accordingly.

APPARATUS FOR HATCHING.

Having secured the eggs of certain fishes and fecundated them, these may be transferred to receptacles for hatching them; various patterns have been recommended, but the principles followed are essentially the same in all. A fountain of clear running water—a spring is preferable—from which a stream flows, or may be led, is selected; and if

there is a gradual fall or descent, so much the better. A series of boxes, through which the water will flow, are placed in the position to be fed by the stream, and the floor of each box is covered with gravel or pebbles, which may furnish a bed for the deposit of the spawn.

The salmon or trout will not live in every stream, but there are many species which, though inferior to those royal fishes, are nevertheless very savory and estimable as food, which could with advantage be propagated in many ponds or streams now producing nothing of value, and even regarded as a nuisance, entailing the loss of so much arable land. In Europe, and especially in Germany and France, submerged land is almost or quite as valuable as that which is tillable; and in some situations, alternate crops of corn or vegetables and fish are cultivated. The land after years of cultivation showing signs of exhaustion, is flooded by water, and converted into ponds in which fishes or their own fertilized spawn are distributed, yielding in due time a fruitful progeny. In a few years the water is drained off and the fish sold, frequently affording more profit than the land when cultivated. In England, likewise, a body of water is almost, if not quite, as profitable as an equal extent of dry land; and, it may be added, the same is the case with China. The time is not far distant when our waters, too, will be utilized like those of

Europe and China; and in view of this contingency, it will be well for us to study our native fishes, as well as to inquire what, among foreign species, may be rendered most subservient to our needs, and be propagated with the most advantage, or be the most useful and savory for the table, and, at the same time, involve the least expense in cultivation.

The artificial propagation of edible fishes, is shown by experiments in every quarter to be practicable.

FISH CULTURE NO NOVELTY.

The Chinese, who keep a constant supply of fish in their rivers and canals, notwithstanding the unexampled density of their population, have practiced fish-hatching successfully for centuries. Fish are there so cheap that a penny will buy enough for a breakfast for a small family. An ingenious method of artificial hatching has been adopted, which is worthy of mention, at least as a novelty. The business of collecting and hatching the spawn for the supply of owners of private ponds is extensive. When the season for hatching arrives, the operators empty hens' eggs by means of small openings, sucking out the natural contents and substituting the ova. The eggs are placed for a few days under a hen. Removing the eggs, the contents are

placed in water warmed by the heat of the sun, the eggs soon burst, and the young are shortly able to be removed to waters intended for rearing them.

Mr. Seth Green, Livingston Co., New York gives minute directions for the care of the ova of trout, the mode of packing for transportation, and the proper management in hatching. He is able to send the eggs to any part of the country, or to Europe, without loss, packing in moss within a tin bucket, which is placed in another vessel, with sawdust between them to guard against sudden changes of temperature.

“Large ponds with but little water get too warm in summer and too cool in winter for trout to do well. It is detrimental to have any other fish with trout. Any kind of fish or fish spawn is good for feed. The young should be fed twice per day, very slowly; if fed fast the feed sinks and befouls the trough, and the trout will sicken and die. If fed regularly and the trough kept clean, with a good change of water, and not kept too thick, they will live and do well. If neglected they will surely die.

“The sun, sediment, rats, mice, snails, crawfish, and many water insects are death to spawn. Use fine gravel that has no iron rust in it. The troughs should be three inches higher at the head. The average temperature of the water is forty-five de-

grees, and the fish hatch in seventy days. Every degree colder or warmer will make about six days' difference in hatching. Trout hatch the soonest in warm water. The sac on their bellies sustains them for forty or forty-five days after hatching, then they need food.

“The fish, after hatching, should be fed twice daily for two or three months, then once a day—the grown fish once a day or oftener. For the young fish, liver should be scraped and chopped very fine and mixed with water, to give it about the consistency of clotted blood. Toss this to the fish a little at a time, so that they can catch and devour it before it reaches the bottom of the trough; no more should be given than the fish will eat, because if any is left it will settle to the bottom and foul the water, and the fish will sicken and die. The fish may be fed on curds, fish offal, or other animal matter, provided it be small enough for them to swallow.”

Trout breeding easy.—A family supply of trout may be attained with small expense and little labor by any intelligent owner of a brisk spring of never-failing cold water, if the location is so sheltered as to avoid the risk of overflow from surface drainage. Deep, narrow ponds in ravines protected from the sun's rays, and supplied by spring water through an inch pipe, may suffice for a few specimens, and serve to amuse and instruct

the amateur proprietor ; a fountain capable of filling constantly a two inch pipe will sustain a trout preserve which may prove a source of pleasure and profit.

In October or November go to a trout brook and walk softly along those parts of it that are gravelly and have running water. Peep under the banks and the dead logs until you see a pair of trout lying close together, their heads to the current. With a hand net, dexterously used, both may be captured, and transferred to a pail of water. The female is seen to be the stouter ; she has a less projecting under-jaw, and her fins are not so red. 'Take her up tenderly,' and do not go poking a clumsy thumb into her gills. Pass the finger and thumb with a gentle pressure along the abdominal region, and if the fish is 'ripe,' the eggs will flow out freely. They should be received in a pan of water. Put the female back ; take out the male and press him in like manner, and allow the expressed milky fluid to fall into the same pan. Stir the water with the hand, cover it, and allow it to stand for half an hour. At the end of that time the eggs which had stuck fast to the sides will become free and roll about. Now gently spread the eggs on the gravel of the trough, and the primary work is done. Should the female not prove ripe, keep her a few days in a pool or spring-hole. The fish thus captured for breeders should not be set

free, but kept in a suitable pool till the next season. Such a preserve may easily be made by digging out a place a dozen feet square and three feet deep grating the inlet and outlet, and leading a stream of water through it. The breeding fish here kept will feed voraciously, and will eat refuse scraps of meat, insects, caterpillars, clotted milk, hasty pudding boiled with milk, and small minnows. Thus fed, once or twice a day, they grow rapidly, and a half-pound fish will get to a pound in a year. Meantime, the eggs are growing also, and in their way. After three or four weeks two dark specks appear on each egg, and these, when held to the light, are seen to be the eyes of the embryo, showing through the translucent shell. This is a good time to pack eggs for transportation. Take a tin box, the size and shape of a pint measure, collect also a good handful of peat moss, (*sphagnum*) and wash it clean. Lay a stratum of wet moss in the bottom of the box, and cover the same with a fold of the gauze called 'musquito bar.' On this gauze spread gently a single layer of eggs, and cover them with a second fold of musquito bar. Then put more moss, and another layer of eggs in like manner, and thus continue until the box is full. Put on a cover with a few holes in it, pack the tin in a case of sawdust, and the eggs are good for a month without opening. When they are unpacked take the moss off the top, then lift them out by

the gauze, and place them in the hatching-trough. It will be found that they have developed almost as much in the wet moss as they would have done in the water. The tiny embryo may be seen jerking itself uneasily in its spherical prison; a movement that continues to increase until, after two or three months from impregnation, according to the temperature of the water, the creature bursts its shell and appears in all its grandeur, looking, to say the truth, more like a spiritual polliwog than a real salmonide. This polliwog's character arises from the great yolk sac, or, rather call it, *havresac*, for it bears the thirty days' rations of this recruit. All that time he lies still without foraging. But thereafter we must issue to him, for now he appears as a genteel minnow, with bars on his sides. Twice or thrice a day a little clotted milk, rubbed very fine in water, must be put in the trough, and the fry may be seen eagerly to swallow the floating particles. With enough food, room, and water they will grow fast, and will take larger and larger morsels. At a year old they may be somewhat larger or much smaller, according to their treatment. Their increase will depend on depth of water, and quantity and variety of food."

FOOD OF FISHES.

Fish are divided into fish of prey and peaceful fish, and these into the orders *piscifagi* or fish-

eating fish, *insectivori* or insect-eating fish, and *phytophagi* or plant-eating fish. Thus it will be seen fish require a variety of food. The pike chiefly lives on fish, the perch on fish and insects and the carp on plants and insects. The inference will readily be, that these several kinds of fish should not be placed together, where fish-breeding is the object, for the fish of prey will devour the others. In some cases, fish of prey, the pike, are desirable in fish ponds, that are over-stocked. They devour the small and worthless fish. The diet of the carp is varied, consisting of worms, larvæ of insects, &c., but in some localities, it can subsist exclusively on vegetable food, being especially fond of water cresses and other succulent water plants. This fish may be made very tame in a short time and may be taught to eat from the hand, come to the side of the pond by a certain call, and to follow one around the pond. Carp are sometimes kept and fed in cold weather in a cellar. They are wrapped up in a quantity of wet moss, laid on a piece of net, then laid in a purse. The net is then plunged into water and hung to the ceiling of the cellar. The dipping must be repeated every four or five hours; for its food bread soaked in milk may be given it in small quantities. In a short time, they will eat more, and grow fat by this treatment.

THE ORGANS OF REPRODUCTION AND
FECUNDATION IN FISHES.

Nearly all fishes are male and female. So far as we know there are only three species of hermaphrodites, in which the male and female organs are found united in one and the same individual.

There are three typical forms of female organs or ovaries in fish. One form consists of one or two masses of eggs enclosed in a cellular bag, like the ovaries of birds, from which they escape into and are expelled through the intestinal canal.

The second form, which is the most common among fish, consists of two sacs, each containing thousands of eggs, from which they escape and are expelled externally through a tube or oviduct, and thirdly, in some the ovaries are two long-twisted canals or ribbons running parallel along both sides of the intestines with an external orifice.

The eggs of fishes, like those of other animals, in their earliest development are of microscopic size, and consist of a transparent yolk, which encloses the germinal cell. Upon the side of the disk or cell-wall the embryo or young fish is formed, to which the yolk serves as food. When the egg has entered the oviduct it becomes covered with a layer of gelatinous matter. The fecundation of the egg consists in the entry of the vivifying cor-

puscle or spermatozoon into the egg and its vivifying influence.

In viviparous fishes, those that produce their young alive, the fecundative act takes place or is effected inside of the body of the fish, as in all other viviparous and quadrupedal animals, but in the great majority of fishes the fecundative act is effected outside the body of the fish, in the surrounding water. During the spawning season the male fish pursues and is the constant companion of the female, and, as she ejects her eggs in the water, he simultaneously deposits the vivifying melt upon them, and they are fecundated, and thus can artificial fecundation be accomplished, and be made successfully practicable.

Not only physically is the eel the most notoriously slippery animal known, but his or her sexual anatomy for centuries baffled and defied the most skillful anatomists, and put at naught the savants and philosophers of every school and age.

Aristotle, who lived four hundred years before Christ, and the greatest naturalist of antiquity, pronounced the eel, "born of worms produced from mud." Pliny, who lived in the first century, maintained that the eel rubs itself against rocks, and that the fragments of its skin rubbed off become young eels. Rondelet, as late as the sixteenth century, asserted that "eels are produced from putrified matter." Malpighi, in the seventeenth

century, the greatest anatomist and microscopist of his day, considered them "fatty productions," and called them, "striæ adiposæ." Thus it has taken over two thousand years to find out the true nature and anatomy of the eel, and to demonstrate that they are viviparous, or produce their young alive.

The flesh of eels is a valuable food, and salted, smoked or pickled, is an article of commerce in some countries.

The male organs of fishes consist of the "milts," which secrete the small organic bodies known as spermatozoa, which moving about penetrate the egg, whether in the cavity of the female (uterus,) or external to her body, in the water, and which fructify it, and cause the development of the embryo. In the greater number of fishes these organs consist of two elongated bodies, of several compartments, more or less triangular; by gradual converging they unite and form a single canal or duct, known as the "vas deferens." These two by their union form a single excretory canal, which opens into the urethra, and which has its orifice externally.

While artificial fecundation fulfils the chief requisites for the propagation of some fishes, there are others for which it cannot be employed with advantage. Some will only exercise this function by resorting to natural beds. The construction of an artificial spawning bed is a very

simple matter. A framework of sticks or laths should be made, and to such a framework, boughs, furze and aquatic plants should be fastened by cords, in such a way as to form an irregular structure. They should be held to the bottom of the water by stones and fastened to a stake or post to prevent drifting. Upon these the fish will deposit their eggs.

By this simple contrivance we are enabled to restock our streams and introduce new species, and the many ponds and streams now valueless, and even a nuisance, could be made to furnish abundance of elegant fish food. In Germany and France submerged land is quite as valuable as that which is tillable, and in some localities alternate crops of corn, vegetables and fish are cultivated. The land upon showing signs of exhaustion from cultivation, is flooded by water and converted into ponds, in which fishes or their fertilized spawn are deposited, yielding in due time a bountiful crop of excellent fish, often yielding upon sale, more than any other crop raised upon the land.

PERIODICAL MIGRATION OF FISHES.

Where do fish annually go and come from has been a mystery and a question from the earliest times.

Every spring countless millions of herrings may be seen approaching the coast, followed by schools of whales and porpoises, and the sea is often green for miles from the endless mass of fish agitating its surface. It has long been a theory, tenaciously maintained by Dutch and Irish fishermen that the home of the herring is in the great polar sea, not only because they were seen annually to come from that direction, but as they are the chief and special food of the whale, seal and porpoise whose homes are in the Arctic seas, the inference was strengthened that it was also their habitat. This theory is now known to be fallacious, for it would be impossible for it to live deep under the ice in the Polar sea, and much less spawn, as the roe would then miss the essential conditions for its development, light and warmth.

The generally accepted theory at present is, that herrings have their special dwelling places in the sea, which it does not leave except when it approaches the coast for the purpose of spawning; that neither the structure of their muscles nor fins adapt it for long or transatlantic voyages.

There is likewise proof that the herring lives in very deep water, for in the stomachs of herrings will be found fragments of crustaceous animals that only live in very deep water, as deep as 1800 feet, never less than 360 feet. The *Euchaeta* is the favorite food of the herring, and they are only

found at a depth of between 2000 and 2500 feet. Wherever their dwelling may be it is a well-known fact that they regularly annually approach the coast and shores of both continents to perform the important function of spawning—to deposit their millions of eggs, and it is at their period of their advent to our shores, the spring fisheries, then they are captured in countless numbers; at this period its instinctive desire to deposit its eggs, to propagate its species dominates for the time over all other desires, even over that for food, for it cannot find suitable food in the shallow waters of the coasts and rivers; in these localities it seeks places against which it can press its abdomen, and by this means facilitate the flow of spawn, the expulsion of their eggs. So anxious are they to get rid of their burden of eggs, that they do not avoid the fishermen's net to entrap them, but apparently seek these nets, through the meshes of which they force or squeeze their bodies, thus mechanically receiving assistance in the parturient act. The ova in the average female herring will amount to 68,000, in some they will number 100,000.

During the great migratory journey of the herring they are attended by clouds of different kinds of sea-gulls, who pounce down upon the feeble and dead fish and devour them, and close at hand are vast numbers of whales and cod-fish. The whales invariably keep on the outside along the edges, and

in the rear of the great herring school, never attempting to penetrate any further, but the cod-fish takes his place immediately beneath the school; thus are the poor herrings menaced and environed during their long journey by persecuting and rapacious foes in sea and air.

As before stated, the great purpose of this periodical migration is to reach the shallow coasts, bays and rivers of the continent, for the purpose of depositing their eggs; upon their arrival they seek flat places in shallow water, covered with rough gravel; upon the emission of the roe it is firmly pasted to the gravelly bottom by a peculiar glutinous substance, which hardens in the course of half an hour. In the shell of each and every egg of this roe is a microscopic opening (*micropyle*) turned upward, so that the fructifying male secretion may enter easily, immediately upon the female herrings depositing and fixing their ova to the gravelly bottom. The male fishes that are always in attendance come forward, and deposit their milt upon the roe, and in due time young herrings are hatched out.

The young herrings grow so rapidly that at one year of age they will be from two and a half to three and a half inches in length. During the first year they stay near where they are born. After this year they put out to sea to the home of their parents. As to the age at which the herring

spawns, it will be correct to state that they do not spawn until the fifth year of age, and are from seven to eight inches in size. In Norway small fry herrings are converted into anchovies, and they are the only anchovies we get in the United States.

These great herring fisheries are so important to localities and nations that any interruption to them is looked upon as a dire calamity; so dreadful are they to the minds of men, so presaging of suffering and want, that supernatural agency has been accused of being the cause of their failure of natural food. They were ascribed to the vengeance of the Almighty. Sometimes special causes were assigned for the visitation of the Divine wrath. Absalom Pedersen Beyer thought that the herring fisheries failed because Cristopher Walkenderph had taken tithes away from the clergy and used them for building purposes. And, as late as 1835, it was solemnly announced in the British Parliament that the herring had forsaken the coast because a priest had demanded tithes of his parishioners, and, when herring were scarce on the Dutch coast in 1830, it was proclaimed, that famine had come upon the land because some young men, in mere wantonness, had cruelly abused a herring; and, in Norway, in 1830, no wealthy citizen was allowed to hold a masked ball in his own house for fear that it would vex the Deity, and as a punishment He would cause the herrings to leave the coast.

The manner of spawning of the codfish is different from that of the herring. The codfish has no particular spawning ground or place. It drops its spawn indiscriminately in the sea in the vicinity of coasts. It does not sink and become fixed to the bottom like the herring's. The eggs float and drift about and are fructified by the melt of the male, and are hatched out on the surface of the open sea. As soon as hatched, the young cods begin to devour the peculiar-looking larvæ of the *Balamus* with which the sea is at this time swarming. The eggs of the codfish are of a light yellowish red and small in size. Upon the under surface of the shell is a dark spot, the micropyle, the opening through which they are vivified. The spermatozoa of the codfish are oval, pearl-shaped bodies, to which is attached a tail-like appendage.

The melt of the male and the roe of the female are of less specific weight than the sea water. Consequently both float upon the surface and come unerringly in contact. The first effect of the eggs' fecundation are visible in a few hours, and ever changing phenomena appear until the sixteenth day when the egg is hatched and the young cod makes his escape, and immediately shows his peculiar gulping instincts, and snaps after microscopic animals and algæ. When they get older they live chiefly on herrings, of which they are especially fond, and which constitutes their chief diet.

The vernal migration of shad to our coast annually is well known. They regularly make their journeys to the shallow bays and rivers in vast numbers for the purpose of depositing their eggs, and this is the period of our great shad fisheries. When this is accomplished, they depart, leaving their young after them to grow. These, when old and strong enough to undertake the voyage to the home of their parents in the deep sea, also take their departure in immense schools.

The greatest enemies of the shad and herring are the black bass and eels. They eat up the spawn and large numbers of the young of these fish. The eels fully equal if they do not exceed the black bass in their destructiveness of young shad and shad spawn, and they attack the grown shad in the nets in great droves. Gillers pulling in their nets find them weighted as if with a very heavy catch, and find them full of eels after the gilled shad. As many as a bushel of eels is frequently seen coiled around a gilled shad as the net is drawn up, and so quickly and ravenously is the shad eaten by them that it is said the bones are denuded and the shad a fleshless skeleton almost before its struggles are over.

Shad cannot be hatched successfully in water warmer than seventy-eight degrees, nor can shad spawn (eggs) be carried more than a two days' journey.

All the waters of this country can be filled with fish adapted to them. Every acre of water is worth two acres of land if properly farmed. Spend one thousandth part of the sum spent in tilling the land in cultivating the water and fish may be sold in our markets at two cents per pound.

ANCIENT FISHING LAWS.

We find numerous fishing regulations, from the oldest times, in ancient Saxon, German and other fishing legal enactments, viz.: An ancient Austrian law permitted the king's bailiff and the bailiff of the convent chapter to catch "a dish of fish on Fridays." Again, the fisherman is an appointee to a salaried office, and is not allowed to sell fish to any one, unless he has "called them three times on the bridge." Again, "Every person who sits at his own fire-place may fish in the stream with hook and line." "Servants who fish, without the company of their masters, are punishable."

In Moravia, millers' wives are allowed to fish "every Thursday in the forenoon, and every Friday in the afternoon."

In Germany, the Fishery Court is held every year, on the days of the Fishing Apostles, Philip and James, and on St. Peter's day, and a regular jury is empanelled. The Fish Court is opened by the judge, by solemnly asking, "Is this the right

hour, day and time that I should open the Fish Court, as has been done from times of old?" The foreman of the jury answers, "Your honor, the judge of the Fish Court, since you ask me whether this be the right time that you should hold a Fish court in the country of Ost., I solemnly affirm that this is the day, hour, and time that such Fish Court should be held, seeing that this is St. James' Day." After this formal opening the court proceeds to business.

FISH PRODUCTS.—CAVIAR.

Two sorts of Caviar are manufactured, fresh or grained caviar, and hard or pressed caviar; in either case it is the roe or ova of the several kinds of sturgeon sprinkled with clean fine salt, packed in casks the inside of which are covered with napkin linen; it is also exported in linen bags and tin boxes hermetically sealed. In trade, the caviar made from the roe of the cod-fish is esteemed more highly than that from the sturgeon.

The great consumers of caviar are the Russians and Greeks, no lunch, repast or feast is served without it.

ISINGLASS.

This is the swimming-bladders of fishes, especially that obtained from the sturgeon. Good

Isinglass is white, shiny, half transparent, dry and horny, without taste, without colour, and it will dissolve in water at from 100 to 120° Fahrenheit, without leaving any residue if pure, and upon becoming cold will be a transparent and almost colorless gelatine. Isinglass is very useful for clarifying various liquids, for making fine glue-colors, for giving a gloss and finish to textures, for making plasters, for taking the impress of coins and in our kitchens for making various jellies for table dessert.

FISH-OIL.—COD-LIVER OIL.

Oil is extracted from all portions of the fish, or from some particular portion; it is used for illuminating, lubricating, drying, cooking and mechanical purposes. The so called Cod-Liver Oil used chiefly medicinally is proclaimed to be obtained from the livers of the cod-fish, but it is no exaggeration to state that not one-thousandth part of the cod-liver oil of commerce is extracted from the fish liver, the majority of it is refuse grease and oils with a fishy odour artificially imparted to it.

The Prominent Oyster, Canned Goods and Fruit-Packing
Establishments of Baltimore.

H. F. HEMINGWAY & CO.

Ellicott's Wharf,

BALTIMORE.



Among the many industries of the day that have made immense progress in this country for the past few years is that of oyster and fruit packing. So great is it that at the present time the business now assumes proportions realized by few outside of those who are more or less identified with it. It would indeed be difficult to compute the vast amount of capital invested in the handling of these articles of use and luxury and it is certain that it plays an important part in all the commercial centres, and the trade is considerably ahead of even the most sanguine expectations of far-seeing capitalists who embarked in the packing business years ago.

Among the first, and one of the oldest and most reliable establishments of the kind in the United States, is the firm of H. F. Hemingway & Co., who have been successfully engaged in the business for more than thirty years. They have in connection with the above, branch houses in Rochester, Syracuse, Albany, New York City and Cincinnati, Ohio, besides their mammoth establishment at Clyde, New York, for the packing of their celebrated Genesee Valley Corn, which is one of their specialties and it is well known to be far superior to any packed in this country and is fast gaining notoriety abroad, and large quantities are shipped to all the principal European markets, and so popular is this one article alone that the works are run to their fullest capacity to pack enough to supply the demand. They also have other branch oyster-packing establishments at Crisfield, Md., Norfolk, Va., and one at New Haven, Conn., for summer and early trade and for the New England States; thus it will be seen they have facilities enjoyed by few houses, if indeed by any in the country and the immense quantities of all kinds of canned goods packed and sold by them is evidence of their superior quality. Messrs. Hemingway & Co., are the proprietors of the celebrated "Anchor brand" of oysters which already enjoy a national reputation and are considered superior to any in the American market, and are shipped daily to their branch houses and from them and Baltimore their agents in all parts of the country draw their supplies. One of the characteristic features of this firm is that they warrant all their goods to be exactly as represented, hence the popularity of their productions and the high reputation they enjoy in all portions of the United States.

—ESTABLISHED 1860.—

H. W. HITCHCOCK,

Planter and Packer of

→:OYSTERS,:←

Wharf, Cor. West and Jackson Sts., BALTIMORE, Md.

This well known packing house is recognized as one of the most reliable establishments of its kind in Baltimore and the only one of the largest in the city that is controlled and owned wholly by any one individual, and has been in successful operation for the last nineteen years.

The location of the same being one of the best in the city, situated as it is on the above wharf, where the oyster vessels discharge their cargoes within a few feet of the doors, the oysters being taken from the vessels arriving daily as they are needed by the many hands employed in opening them, thus avoiding any possible chance of having the oysters otherwise than perfectly fresh when packed for customers.

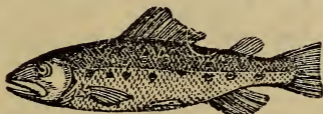
Mr. Hitchcock has spent a lifetime in the business and makes the best grades of oysters a specialty. He owns large oyster beds in different parts of the Chesapeake Bay and its tributaries, having planted at one time on one of his beds in the Patuxent river, fifteen thousand bushels of oysters, and has men employed at those grounds planting and cultivating as well as boats working on the natural beds where oysters grow in their natural state, and as a cultivator and grower of oysters probably stands without a rival in the country, being thoroughly acquainted with all the oyster planting grounds from Maine to the Gulf of Mexico.

One great feature to be observed around this establishment is the neatness used in canning and packing the delicious flavored oysters which he ships, and the process that the oysters go through is such, that with the scrutiny given at the time they are taken from the shuckers' preparatory to packing it is impossible for them to be anything else than an article fit for epicures, on the thousands if not millions of tables on which they have been served for the last score of years, and the oysters shipped from this house now take the lead in 135 of the principal cities and towns in this country and Canadas.

Independently of the oyster business, Mr. Hitchcock has in connection with the above, a department for the canning and packing of fruits and vegetables of all kinds, brought from the richest and best cultivated parts of the State, and the same test, namely, of public approval can be applied to this department as fairly as to the other. Everything is done which would tend to produce an article of a superior character, no fruits being used except those which it is known will stand the process of handling and packing and not be affected in their strength and flavor, and nearly all these goods are taken by regular customers, who will handle none other than those that have stood the test of many years, and with this long business experience and reputation in supplying the country with both luxuries and necessaries, this house in question, bids fair to assume even more gigantic proportions.

SAMUEL M. WEBB & BRO.

DEALERS IN



Fishing Tackle,

278 W. BALTIMORE STREET,

BALTIMORE.

SPLIT BAMBOO & FINE WOOD RODS.

NETS of All Sizes Made to Order.

P. B. SMITH,

Dealer in and Shipper of all kinds of

FRESH FISH,

Hard and Soft Crabs,

MARKET STALLS:

17 Lexington Market,

17 & 18 Centre Market,

1 Hanover Market,

and

102 East Lombard St.

→*BALTIMORE.*←



As a dealer in and reliable shipper of all kinds of Fresh fish, hard and soft crabs, Mr. P. B. Smith has no superior in the trade. Consignments of fresh Fish and Crabs are daily received by him, from the Chesapeake bay and Atlantic coast and are for sale at his stalls in the principal city markets. He makes daily, large shipments of them throughout the West. Persons desiring these luxuries can confidently rely upon having their orders filled promptly, and they will be guaranteed as to their freshness and excellence.

WAGNER'S

World-Famous



Green House,

Ladies' & Gentlemen's

RESTAURANT,

DINING AND LUNCH PARLORS,

190 W. Pratt St., Baltimore.



At this Restaurant every substantial and delicacy of the market can at all times be obtained, served in the most unobjectionable style. Oysters and Game of every kind daily served.

STEAMED OYSTERS A SPECIALTY.

Meals at all hours *a la carte*.

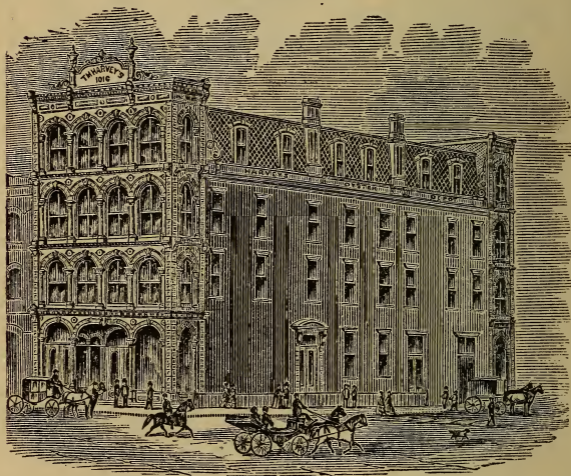
MEAL TICKETS \$5.00 PER DOZEN.

HARVEY'S

OLD ESTABLISHED

Ladies' & Gentlemen's Oyster Saloon & Restaurant

1016 Penna. Ave. & Eleventh St.,
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THE LARGEST OYSTER HOUSE IN THE UNITED STATES.

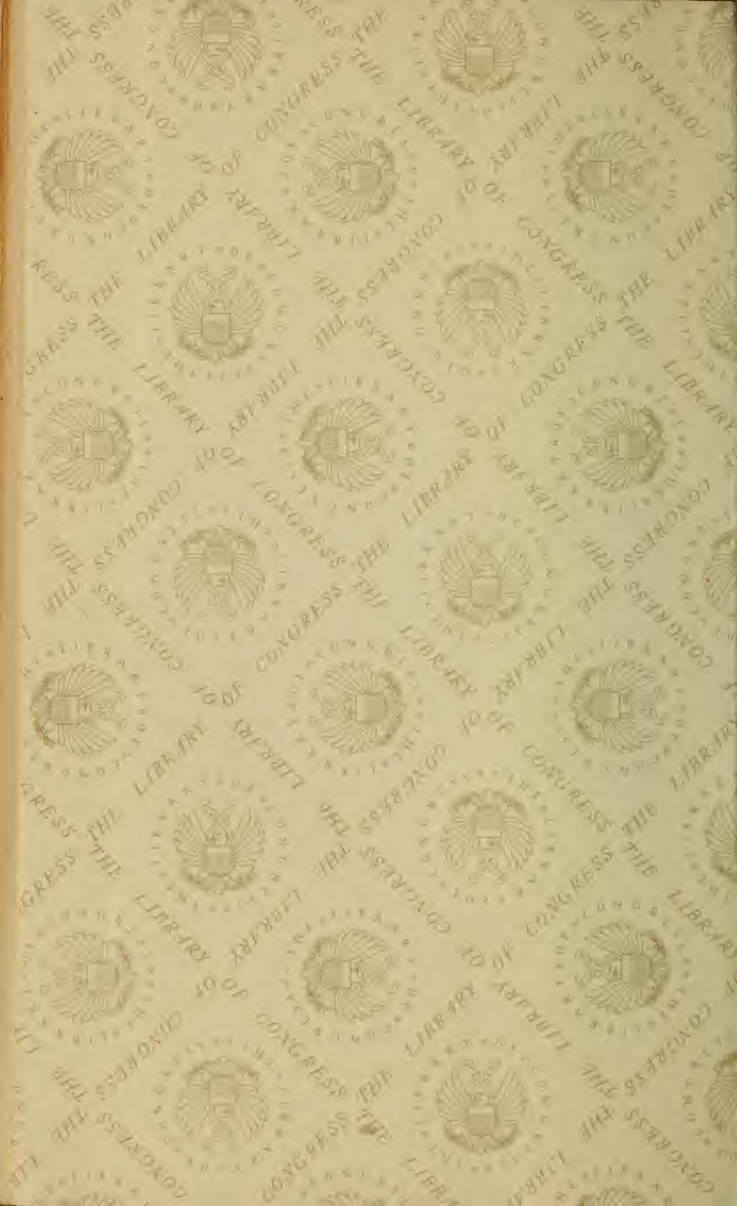
*All brands of the finest oysters that the briny deep can produce
are served with every imaginable dish that can
be called for.*

*THE LADIES' SALOON is one of the handsomest in all its
appointments, and is conducted especially for them.*

Open from 6 A. M. until Midnight. Oysters, Terrapin & Game a Specialty.

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