

GREAT INTERNATIONAL FISHERIES EXHIBITION.

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B.

COLLECTION

OF

ECONOMIC CRUSTACEANS, WORMS, ECHINODERMS, AND SPONGES.

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INTRODUCTION.

The fisheries of the United States included in this section gave employment, in 1880, to over 6,000 fishermen, during a longer or shorter season, yielding them a gross stock of more than \$1,200,000. About 1,250 persons were employed in the canneries, and 500 were credited to the wholesale markets, but this does not include a large number of marketmen, who were also interested in other fisheries, from which they could not be separated in the enumeration. The cash capital invested, including the canning interests, was about \$1,000,000. The details of the several fisheries are given below in brief.

CRUSTACEANS.

CRABS.

Over twenty species of Crabs belonging to the coasts of the United States are now regarded as of greater or less practical importance to mankind. The most valuable of these are the Blue Crab (*Callinectes hastatus*), Lady Crab (*Platyonichus ocellatus*), Stone Crab (*Menippe mercenarius*), and Rock Crabs (*Cancer irroratus* and *borealis*), of the east coast, and the Common Crab, Rock Crab, and Red Crab (*Cancer magister*, *antennarius*, *productus*), of the Pacific Coast. The remaining species are utilized simply as bait, or to a slight extent only as food.

The Blue Crab is the common edible Crab of the Atlantic Coast, and ranges from Massachusetts Bay to the Gulf of Mexico. The season for its fishery is of variable duration on different parts of the coast. At New York it lasts from May to October, while in Florida it begins as early as March and continues until December, or, if the weather be mild, through the entire winter. This Crab is eaten in both the hard and soft shell condition, but is greatly preferred, and commands a much higher price, when in the latter state. This is contrary to what holds true with all of the other species of Crabs upon our coast, as well as the Lobster, which are only eaten when hard-shell. However, Soft-shell Crabs are seldom taken in marketable quantities excepting on the New Jersey coast, whence New York derives the greater part of its supplies. The Crab fishery for New Jersey alone amounted to over \$160,000, in 1880. The Blue Crab also forms an excellent bait.

Several different appliances are used in the capture of Blue Crabs,

the most common being the ordinary scoop or dip net, also called crab-net. For attracting the Crabs from depths not easily reached by means of the dip-net, the fishermen resort to baited lines, without hooks, which are used singly or made up into trawls. From a small boat, each fisherman is able to handle several single lines, which are hauled up at short intervals, the Crabs being secured in a dip-net as they approach the surface. The crab-trawl, or trot-line, measures 250 to 700 feet in length, and has small lateral lines arranged at short distances apart. There are several methods of setting it. One is to anchor each end by means of weights, and another to attach the ends to long poles, which are thrust down into the bottom. A man in a skiff rows continuously from end to end, hauling in the lateral lines and taking the Crabs as in the first instance. On the Louisiana coast, the trot lines are stretched along the beaches, the lateral lines being thrown out into the water and hauled in at regular intervals. Seines, hoop-nets, baited with meat, and clam tongs are also occasionally employed for catching Crabs. As the Soft Crabs remain in a semidormant condition, and will not take the bait, they are secured almost entirely by means of scoop-nets from the beaches, or in the hands. Floating cars are extensively employed in some localities for keeping the Hard Crabs until they shall have cast their shells and become soft. Crabs are generally shipped to market in boxes, baskets, or barrels, with or without packing. Small boxes are mainly preferred for the Soft Crabs, which are packed in very snugly in order that they may stand transportation without injury, and so that the moisture will not run too freely from the gills. The Crab catchers consist largely of women and children, especially in the Southern States.

In 1880, there were three Crab canneries in the United States, two being located at Hampton, Virginia, and one at Oxford, Maryland. Only Hard Crabs are canned, the supplies coming mainly from the neighborhood of the canneries. The process of canning Crabs is somewhat similar to that for lobsters, as practiced on the New England coast. The Crabs are boiled or steamed, after which the meats are removed from the hard parts and packed in one and two pound tins, the shells or carapaces being cleaned and sold with the meats, to serve as holders in making deviled Crabs. The refuse is used as a manure.

The Crab fisheries of the eastern coast of the United States, in 1880, amounted to \$328,000 (fishermen's prices), of which the greater part belonged to New York, New Jersey, Delaware, Maryland, and Virginia. South of Virginia, on the Atlantic coast, the Crab fishery is of but slight importance, at present; on the Gulf coast it amounts to about \$10,000 annually, and is mainly confined to Louisiana.

The Rock and Jonah Crabs (*Cancer irroratus* and *borealis*) are eaten only to a slight extent, probably for the reason that their range is coextensive with that of the lobster, which is much more favorably regarded as an article of food. *Cancer irroratus* is caught at the mouth of Boston Harbor, in small quantities, to supply the Boston markets, and both

species are taken for the Newport market, in Narragansett Bay. They are also both used as bait for several species of fish.

The Stone Crab (*Menippe mercenarius*) is very much esteemed for eating, but nowhere occurs in sufficient abundance to supply more than a limited demand. The shell of this Crab is thick and heavy, and the claws proportionately large, furnishing a generous supply of meat. The Stone Crab lives in holes in the mud, which it excavates, and in cracks between rocks, and is, therefore, somewhat difficult to capture. In taking them from their holes, which are sometimes two feet deep, the crabber thrusts down his arm, and seizing the occupant by the elbow of the nearest claw, draws him quickly out, allowing him to fall upon the ground, where he is better able to secure him without injury to himself. The Crab offers stout resistance, and is sometimes taken out piecemeal. The crabber occasionally resorts to digging out his prey. This species is rarely shipped away from the seaport towns, where it is taken, and is, therefore, seldom seen in the larger markets, excepting at Charleston, South Carolina, in the vicinity of which place it is abundant. On some parts of the Florida coast it furnishes the inhabitants with a considerable share of their food at certain seasons.

The Lady Crab (*Platyonichus ocellatus*) is occasionally taken for food on the Atlantic coast, in the same manner as the Blue Crab, but is rarely seen in the markets. In the Gulf of Mexico, and especially on the Louisiana coast, it is an important article of fishery, and large quantities are shipped to New Orleans every season. On the New England coast it is used as bait.

The crabs of lesser importance on the east coast of the United States are as follows :

The Fiddler Crabs (*Gelasimus*) serve as a bait in many localities throughout their range, and are said to be occasionally used as food. One species is destructive to the levees of the Mississippi River, at New Orleans, into which it burrows, in common with a species of crayfish (*Cambarus*).

The Oyster Crabs (*Pinnotheres ostreum*), which live as messmates in the shells of the American oyster, are highly esteemed as food, and are eaten along with the oyster, or cooked or pickled separately. Only the females live in the oyster, the males being free. In the restaurants of Fulton market, New York, where immense quantities of oysters are opened annually, it is sometimes customary to save the crabs for pickling. A related Crab (*P. maculatus*) occurs in the shells of the common mussel (*Mytilus edulis*) and the smooth scallop (*Pecten tenuicostatus*), and is also good eating; but as neither of these mollusks is taken for food, to any great extent, it is known only to naturalists.

The Green Crab (*Carcinus maenas*), which figures prominently in the fisheries of Europe, is only used as bait in this country, for which purpose it is favorably regarded on the southern coast of New England. The Mud Crabs (*Panopeus*), and the Spider Crabs (*Libinia emarginata*

and *dubia*,) are also used as bait, especially on the coast of the Southern States. The Sand Bug or Bait Bug (*Hippa talpoida*) burrows into the sand of beaches at about the level of low tide, and is very frequently employed as bait from New Jersey southward. The Hermit Crabs (*Eupagurus*) are seldom, if ever, put to any use in this country, but several large species occur on our coasts in convenient places for securing them, and in the course of time they will probably come to be utilized.

Six species of Crabs are regarded as edible on the Pacific coast of the United States—the common market Crab (*Cancer magister*), Rock Crab (*Cancer antennarius*), Red Crab (*Cancer productus*), Kelp Crab (*Epiplatys productus*), Yellow Shore Crab (*Heterograpsus oregonensis*), and Purple Shore Crab (*H. nudus*). Only the *Cancer magister* is now extensively used as food, although the other two species of the same genus are said to be equally good as regards flavor. The *magister* is, however, the most abundant species in those localities and depths which are most frequented by the fishermen, and also averages somewhat larger in size. It is captured mainly on the sandy beaches of San Francisco Bay, by means of seines and Crab nets, baited with fish and offal. The principal market is San Francisco. The season continues more or less throughout the year, but the summer catch is much larger than the winter. The Red and Rock Crabs are most abundant on the rocky shores of the northern side of the Golden Gate, where but little fishing is done. The *Cancers* are not, apparently, caught elsewhere for food on the Pacific coast. The Yellow and Purple Shore Crabs are eaten by the Chinese, who spit them upon wires and cook them over open fires. The Kelp Crabs are used by the natives of the Northwest coast. A large "Red Rock Crab" (*Echidnoceros setimanus*), living about the Farallone Islands, off San Francisco, is occasionally brought to the markets of that city as a curiosity, and sometimes brings as high a price as \$10 each. Species of *Chionectes* and *Lithodes* are eaten by the natives of Alaska.

LOBSTER.

The Lobster is by far the most important crustacean occurring upon the coasts of the United States, and gives rise to an extremely valuable fishery. It is confined to the Atlantic side of the continent, and ranges from Delaware, in the south, to Labrador, in the north. The most southern fishery is a small one in the neighborhood of Atlantic City and Long Branch, New Jersey. Lobsters were once moderately abundant in New York Bay, and were taken there for market, but the pollution of the waters of the bay by numerous factories and other causes have combined to nearly exterminate the species. At numerous places through Long Island Sound, Lobsters are sufficiently plentiful to permit of limited fisheries, which are mainly confined to supplying the local demand. Farther east, on the southern New England coast, in the region of Block Island, Montauk Point, the Elizabeth Islands, and Martha's Vineyard, they become much more abundant and afford a very

profitable fishery, extending through the spring, summer, and early fall. The entire coast line of Massachusetts abounds in Lobsters, wherever the character of the bottom is suitable for them, but overfishing has nearly depleted some of the shallow water areas, which were once prolific, as at Provincetown. The sandy shores of New Hampshire furnish only a moderate supply of Lobsters. Lobsters are very much more abundant on the Maine coast than anywhere to the southward, and the yearly fishery exceeds in quantity and value those of all the other States combined. This State is, in fact, the main source of supply for all the principal markets of the United States. The fishery continues in some localities throughout the year, but is most active during the spring, summer, and fall, and especially from April 1 to August 1, when the canneries are open.

The Lobster fishery, as a distinct industry, commenced on the Massachusetts coast about the beginning of the present century, and on the Maine coast about 1840. It has rapidly developed to the present time. At first, Lobsters were frequently found, during the summer, in some favorable localities at or near low-water mark, especially on the Maine coast, where they could be gaffed out from under the protection of overhanging rocks and seaweeds. They rarely occur in such situations now, and the fishery is mainly carried on in depths of a few fathoms to 20 or 30 fathoms, but sometimes in depths of 40 to 60 fathoms. On the coast of Nova Scotia, Lobsters are about as common as on the Maine coast, but farther to the north they become less abundant again. They have been taken on some of the outlying fishing banks, such as George's Bank, but are not fished for at any great distance from land.

The Lobster fishery is regularly carried on by means of wooden framework traps, or pots, generally constructed of common house-laths. They are usually made semi-cylindrical in shape, being flat below, rounded at the sides and above, and with a net-work or wooden funnel-entrance at each end, or at one end only. The ordinary size is four feet long, and about 18 inches broad and high, with two funnels; smaller sizes with one funnel, and larger sizes with four funnels are occasionally used, as are also rectangular-shaped pots. The old style of Lobster pot, employed when Lobsters were more abundant and the fishery less important, consisted of a wooden or iron hoop, of variable size, up to 4 feet or more in diameter, carrying a net, which sagged but little; and furnished above with a cross-hoop arrangement, or with twine leaders, to which the line for lowering it, as well as the bait, was fastened. This style of pot has now almost entirely disappeared from the coast, as it required constant attention, and only a few could be tended by each fisherman. The lath or cylinder pots are baited in the center with cheap or refuse fish, which are fastened on an upright, spearlike holder. They are weighted with stones, and lowered and raised by means of a rope attached to the end of the pot. The number of pots used by each fisherman varies in different localities, ranging all the way from 8 or 10 to 100. The average

number may be said to be about 50 or 60. The pots are set either singly or attached together in trawls, the character of the bottom, abundance of Lobsters, and custom regulating this matter. When set trawl-fashion, the pots can be handled much more easily than otherwise, and this method is generally preferred on the coast of Maine, wherever Lobsters are abundant and the bottom not too rough. The pots are fastened together in strings of 10 or a dozen to 50 or 60, at distances apart of 15 to 20 fathoms, and have a long buoy line at each end. The fisherman pays out his Lobster trawl in a straight line, beginning at one end, and marks the ends with kegs or small wooden buoys. After remaining down a sufficient length of time, generally twenty-four hours, he proceeds to examine his pots, beginning at one end of the trawl and underrunning it to the other. The general arrangement of the trawl is not, therefore, disturbed; but the pots, after they have been examined, fall back again into nearly the same places which they previously occupied. In setting the pots singly, each has its separate buoy line and buoy, and the fisherman passes in succession from one to the other. Where Lobsters are much scattered, this is the preferable way of setting the pots, as they are shifted slightly every time they are hauled, and are supposed thereby to fish much better. The latter method is probably the one most universally employed along the entire coast. It is customary to visit the pots early every morning, or, otherwise, when the tide serves best.

The boats used in the Lobster fishery vary in style on different parts of the coast, and generally correspond with those employed in the other fisheries of the same region. The fishing boats are usually small sail-boats, sloop or cat rigged, and ranging in length from 12 to 30 feet; but row-boats, and especially dories, are very commonly used on the shore grounds. The larger boats usually have compartments at the sides for the stowage of the Lobsters as they are taken from the traps. The fishermen attain considerable dexterity in managing their sail-boats, being able to run up to a pot, haul it, and fill away again without lowering sail. There is also a larger class of boats employed in the Lobster fishery, which act as carriers from the Lobster grounds to the larger markets, such as Portland, Boston, and New York. These are a remnant of the old fleet of well smacks, which were formerly in general use before the practice of icing fish came into vogue. In 1880, there were thirty-six well smacks employed in the Lobster trade; they ranged in size from 10 to 45 tons. In addition, there were also sixty-six registered dry smacks above 5 tons measurement, acting both as fishermen and carriers. The canneries are generally supplied by dry smacks, and the larger fresh markets by well smacks or railroad, large quantities of Lobsters being now carried long distances alive, packed in barrels. The fishermen are mostly provided with small floating Lobster cars, consisting of a rectangular wooden box or old leaky boat, permitting of the free entrance of water, in which the Lobsters are kept until a

sufficient quantity has accumulated to sell to the smacks or carry to market.

Lobsters are extensively used as bait on some parts of the coast.

The principal Lobster markets of the country are Portland, Boston, and New York. Three-fourths of all the Lobsters disposed of to the fresh trade are carried by well smacks or railroad to one or other of these three centers, where they are sold locally or distributed through the country, either alive or boiled, but generally in the former state. The dealers have large cars, in which a considerable stock can be stored awaiting orders. Lobsters are in season during the entire year, but are much more abundant in the markets and much more highly prized as food during the late spring, summer, and early fall. For most Lobster fishermen the season is of short duration, lasting only about two, three, or four months, after which time, and until the next season, they engage in other fisheries, or in farming, mining, or other pursuits. Their season's stock seldom exceeds a few hundred dollars.

The canning of Lobsters in the United States is entirely confined to the coast of Maine; and most of the Provincial canneries are controlled by American capital. Without its canning interests, the Maine Lobster fishery would lose much of its prestige, as the majority of the Lobsters canned are below the regulation size established by custom for the fresh markets. The market-smacks will seldom buy Lobsters measuring less than 10 or 10½ inches in length, and those under this size are sold to the canneries. The canning industry was first started about 1840, at Eastport, Maine, but several years elapsed before it was successfully introduced. In 1880, there were twenty-three canneries in Maine, with a total capital of \$289,000, remaining open from about April 1 to August 1, and giving employment to about 650 factory hands and 2,000 fishermen. The quantity of fresh Lobsters used amounted to about 9,500,000 pounds, valued at \$95,000 to the fishermen. The value of the canned products was \$238,000, an enhancement in value by the process of canning of \$143,000. Seventeen Provincial canneries are owned by Americans, as follows: One each in Newfoundland, the Magdalen Islands, and Prince Edward Island, three in New Brunswick, and eleven in Nova Scotia. The total amount of capital invested in 1880 was \$213,000; 10,000,000 pounds of fresh Lobsters were consumed that year, and the value of the canned products was \$246,000. These products are all exported to Europe and other foreign countries, none passing into the United States.

The total catch of Lobsters on the Maine coast for 1880 amounted to 14,234,000 pounds, valued at \$268,000, first cost, or fishermen's prices. The catch for Massachusetts was 4,315,000 pounds, valued at \$158,000, and that of the entire coast of the several Lobster States was 20,128,000 pounds, worth \$483,000, first price. The quantity of Lobsters handled by the several large fresh markets during 1880 was as follows: Portland, 2,000,000 pounds; Boston, 3,637,000 pounds; New York, 2,500,000

pounds; a total of 8,137,000 pounds. The enhancement in value of these Lobsters in passing through the large markets was \$105,000, making the total value of the Lobster products, as they entered the hands of the smaller wholesale and the retail dealers, \$732,000. The prices received by the fishermen for Lobsters vary greatly, according to their size and the season. Canning Lobsters, which average about one pound each, bring about one cent per pound, but those above 10 inches in length are worth from 4 to 7 cents each.

Legislation relative to the Lobster fishery is entirely under the control of the several interested States, all of which, excepting New Jersey, have passed protective laws. The Maine law is the most lax of all, permitting the capture and sale of Lobsters of any size between the 1st of April and the 1st of August, and of Lobsters above 10½ inches in length the balance of the year. The remaining State laws prohibit the taking of Lobsters at any season below a certain size (ranging from 8 to 10 inches), and make other restrictions as to a close time, &c.

The propagation of the American Lobster by artificial means has been attempted, but so far without much success. Unsuccessful attempts to transplant the same species to the California coast have also been made.

CRAY-FISH.

Although Cray-fish (*Cambarus* and *Astacus*) are very abundant in American rivers, they are not much used as food. Between thirty-five and forty species are now recognized as inhabiting the United States, but only about four species are regularly sent to market. The principal markets are New York, New Orleans, and San Francisco. New York derives its supplies from the Potomac River, at Washington, and from Milwaukee and Montreal. The Washington species is the *Cambarus affinis*, and the Milwaukee, the *C. virilis*. The Cray-fish are received from Washington in the spring, and from Milwaukee and Montreal in the summer and fall. The New Orleans species is the *C. Clarkii*, which lives in the Mississippi River.

The *Astacus nigrescens* is occasionally taken to the San Francisco markets, being found abundantly in the vicinity of that city. Cray-fish are mainly used in this country for garnishing fish dishes. The sales for 1880 did not exceed 20,000 pounds, valued at about \$3,500.

ROCK LOBSTER.

The Rock Lobster, or salt-water crawfish (*Panulirus interruptus*), of the California coast, is related to the Langouste or Spiny Lobster of Europe, and is much esteemed as food. It ranges southward from Santa Barbara, and is taken for food at that place, and at Wilmington, Los Angeles, and San Diego. Large quantities are shipped annually from Santa Barbara to San Francisco. It is captured in large dip-nets, which are

baited, or in traps similar to those used for the Lobster on the east coast. The season extends through the entire year, but in the winter they leave the shallow water, and are more difficult of capture. The catch for 1880 amounted to 210,000 pounds, valued at \$5,600.

SHRIMP AND PRAWNS.

At least seven species of Shrimp and Prawns enter into the fisheries of the United States. They are as follows: The Common Shrimp (*Crangon vulgaris*), the California Shrimp (*Crangon franciscorum*), the Southern Shrimp and Prawns (*Penæus setiferus* and *braziliensis*), the California Prawns (*Pandalus Dance* and *P. sp.*), and the River Shrimp (*Palæmon Ohionis*). *Crangon vulgaris* is common to both the Atlantic and Pacific coasts, but so far as is definitely known, the two species of *Penæus* are confined to the east side of the continent, and both species of *Pandalus* to the west side. *Palæmon ohionis* occurs in the rivers of the Mississippi Valley, and of the southeastern part of the United States. Mr. W. N. Lockington records *Penæus braziliensis* doubtfully from the California coast, and states that a species of *Hippolyte* (*H. brevirostris*) occurs in small quantities in San Francisco Bay, and is frequently captured along with the two species of *Crangon*, and sold with them. Four species of Prawns (*Pandalus borealis*, *leptoceros*, *Montaguï*, and *propinquus*,) abound in moderate to considerable depths of water along the eastern coast, from off Nova Scotia to off the mouth of Chesapeake Bay, and offer special inducements for a deep-water fishery, although they have never yet been taken for market. Two species of fresh-water Shrimp (*Palæmon jamaicensis* and *P. forceps*), which attain a much larger size than any of the above, inhabit the rivers of Texas, and are available as food, although apparently not so used at present.

On the coasts of the New England and Middle States, *Crangon vulgaris* is the only species of Shrimp of marketable size, which occurs in sufficient abundance near the shore to be of practical value to man. Along the eastern part of this district, and as far to the westward as Buzzard's Bay, this common Shrimp is seldom utilized, excepting as a bait by amateur fishermen. At New Bedford, Massachusetts, and Newport, Rhode Island, there is a small and irregular fishery, mainly for the supply of local markets. The most important fishery for *Crangon vulgaris*, on the Atlantic coast, is at the western end of Long Island, New York, where the season lasts from March until the middle of May, the principal market supplied being New York City. About 4,000 gallons of Shrimp were marketed from this region in 1880, but since then the trade has considerably increased. The same species of Shrimp is used as food and bait on the New Jersey coast. The fishery is mainly carried on by means of scoop-nets.

On the coast of the Southern States, the Shrimp fishery has attained considerable development in some sections. Two species of Shrimp have been definitely recognized from this region, *Penæus setiferus* and

Penæus braziliensis, the former being apparently the more abundant. These two closely related species compose the bulk of the large supplies of Shrimp or Prawns consumed in New York and the southern coast cities. They frequently occur associated together in the same localities, and, being so nearly alike in appearance, are not distinguished apart by the fishermen and dealers. *Penæus setiferus* attains a length of six or more inches, exclusive of the feelers, and may measure more than three-fourths of an inch in depth and breadth, in the front or body part. Strangely enough these useful crustaceans are known both as Shrimps and Prawns to the fishermen who take them, as well as in the markets, the distinction being made with reference to size only. According to Prof. Lewis R. Gibbes, of Charleston, South Carolina, the larger individuals of both species are termed Prawns or Sprawns, and the half-grown ones, Shrimps. The Prawns appear in shallow water generally in March, or, in very open springs, as early as the latter part of February, and remain in season for two or three months, after which the supply diminishes, and they retire for a time, apparently to spawn. Their spawning localities are not known, and Professor Gibbes adds that he has never seen an individual carrying eggs. He suggests that they may ascend the rivers to spawn. In June and the succeeding months of summer, the half-grown individuals or "Shrimps" are in season, and "for tenderness of flesh and delicacy of flavor are preferred to the Prawns." In the autumn, they disappear from the coast and move into deeper water, or farther toward the south. *Penæus braziliensis* has been found as far north as the Croton River, at Sing Sing, New York, and from that point ranges southward along the entire Atlantic and Gulf coasts of the United States. It also extends to the coast of Brazil, and has been doubtfully identified from the California coast by Mr. Lockington. *Penæus setiferus* has not been recorded from northward of Norfolk, Virginia, but its southern range corresponds with that of the other species, at least so far as the coast of the United States is concerned. Neither of these species has been found in sufficient abundance north of North Carolina, however, to warrant a fishery for them.

In Delaware, a few Shrimp are used as bait by the fishermen, but the yearly catch is comparatively small. Shrimp are very abundant on the Virginia coast, but, as in Delaware, they are taken only in small quantities for bait, or are captured incidentally in seines while hauling for fish. At Norfolk and Hampton they are occasionally eaten, and at the former place they are especially esteemed as bait for the "Rock." Wherever Shrimp are abundant on the North Carolina coast, they are frequently taken incidentally by the fishermen in their seines, but finding no market for them, they are generally thrown away. No regular fishery has been established on this coast, excepting a small one at Wilmington, where the sounds and bays abound in Shrimp and Prawns, from the last of May until November. These crustaceans inhabit the

brackish as well as the salt waters of this region. They are taken in Shrimp seines, which were introduced at this locality in 1872, and also in skim and cast nets, which have been in use for a much longer period. The Shrimp seines measure from 30 to 40 yards in length, and from 6 to 10 feet in depth, and have a half-inch mesh. The season's catch for each seine is about 500 bushels. Fishing is carried on in the daytime, but not with any precise regularity, on account of the limited demand. The Shrimp are boiled in brine, in kettles holding from 10 to 50 quarts, and are then spread out to dry. They are shipped to market in baskets.

The Shrimp fishery is one of the most important in the vicinity of Charleston, South Carolina. From March to June, the larger Prawns alone are taken, but later the smaller Shrimp replace them entirely. The fishery continues from the last of March, or first of April, until the middle of November, and is carried on mainly within 15 miles of the city, and during the two or three hours of low tide of each night. The boats return to the city before daylight, so as to supply bait to the boat fishermen, after which the Shrimp remaining are sold in small lots to men, women, and children, who vend them through the city. During the first of the season (1880), some six to eight seine-boats, with crews of about six men each, are engaged in this fishery. The catch is variable, being sometimes better in one locality and again in another; and often from 10 to 20 bushels may be the result of a night's seining by one or more boats, while the remainder will obtain only 4 or 5 bushels each. Prawns are considered to form one of the best baits for Whiting, which are in season at the same time, and for this purpose the greater part of the catch is frequently sold. The shrimpers sell the Prawns by the plateful, each containing from one to one and a half quarts, the customary price being about 50 cents per plate. The price sometimes rises to one dollar per plate, or at the rate of about two cents for each Prawn. During the first few weeks of the Prawn fishery, it is one of the most profitable of all the fisheries in this section. Early in May the Prawns become more abundant, and the seines are abandoned for cast-nets, the number of persons engaging in the fishery also increasing at the same time. During the height of the season, at least 75 cast-nets are in use, and, in June, the daily catch per boat exceeds one hundred plates.

The Prawns are replaced by the Shrimp late in June, and the latter remain near the shore until November. The number of shrimpers continues about the same as the prawn-catchers, in June, until near the close of the season; but the price soon falls to 25 cents, then to 15 cents, and finally to 10 cents per plate. The greater part of the catch is sold at home, only a few hundred bushels being shipped away annually. The Shrimp and Prawn fishery of Georgia gives employment to about 400 men during the height of the season, a large part of the catch being sent to the New York markets. The best shrimping season on the Florida coast is during September and October. Cast-nets measuring from 10 to 15 feet in diameter are preferred to the seines. Before ship-

ping, the Shrimp are washed clean, boiled about ten minutes in a very thick brine, and then allowed to steam in a covered basket or barrel, after which they are spread out and dried on a platform of boards.

The Shrimp fishery of the Gulf coast is mainly confined to Louisiana and Texas, although Shrimp may possibly occur in equal abundance in other sections. The greater part of the supplies come from Barataria Bay, Louisiana, and Matagorda and Galveston Bays, Texas. Both seines and cast-nets are used by the shrimpers, who station themselves along the shores in the shrimping region. The season extends, more or less, throughout the entire year; but fishing appears to be conducted mainly from October to April. New Orleans is an important Shrimp market, and derives the greater part of its salt-water supplies from the grassy bottoms of Barataria Bay. The River Shrimp (*Palemon ohionis*) is taken for food in the Mississippi River, near New Orleans, in cane baskets, sunk to the bottom near the banks. Large quantities of Shrimp are canned both in New Orleans and Galveston, for shipment throughout the United States and to Europe. Over 200 persons, mainly women and girls, were employed in this industry, in 1880, the production for that year having amounted to about 310,000 one and one-half pound cans.

The Shrimp and Prawn fisheries of the Pacific coast are mainly confined to the vicinity of San Francisco and Tomales Bays, California, and are controlled almost entirely by the Chinese, who export the greater part of their catch to China. A small quantity is also shipped by them for the use of their countrymen in the Sandwich Islands. *Crangon franciscorum*, being the larger species of true Shrimp, and also generally the more abundant one, figures most conspicuously in the fishery, but *Crangon vulgaris* forms a large percentage of the quantity taken and disposed of. These two species are fished for mainly in the deeper waters (12 to 20 fathoms), near shore, of the two bays above mentioned. The two species of *Pandalus* (*P. Danae*, and *P. sp.*) are found associated together, in moderate depths of water off San Francisco Bay, between Point Reyes and the Farallone Islands, and during the two years prior to 1880 were more commonly seen in the San Francisco markets than formerly.

For the capture of Shrimp and Prawns, the Chinese use a conical, bag-shaped net, about 20 to 25 feet long and 10 feet across at the larger end, which is the mouth. From this end the net tapers toward the other, where there is an opening only about a foot across, to permit of emptying the contents of the net. One side of the mouth, or larger end, is furnished with a line of weights and the other with a line of floats, to hold it open while in use. The opening at the smaller end closes by means of a "sphincter," or puckering string. The mesh of the net measures from one to one and one-fourth inches at the mouth, and gradually diminishes to about one-fourth of an inch at the smaller end. The Shrimp are first carried fresh to the city market, and those remain-

ing unsold at the close of the day are carried back to the Chinese settlement, and put at once into boiling brine, from which, after sufficient boiling, they are taken out and spread to dry upon level plats of hard ground, which have been previously stripped of grass and rendered perfectly smooth. After four or five days' time, they are crushed under large wooden pestles, or trod upon by the Chinese in wooden shoes, for the purpose of loosening the meats from the outer chitinous covering; after which the entire mixture is put through a fanning mill, for the separation of the meats from the shells. The meats are partly consumed at home, or at the various inland Chinese settlements, but are mostly shipped to China. They are worth 5 cents a pound in San Francisco. The shells are utilized as manure, to some extent, about San Francisco; but, like the meats, are mostly sent to China, where they serve as a fertilizer for rice, the tea plant, &c. In San Francisco they sell at about 25 cents per hundred-weight. Both the meats and shells are shipped to China in sacks. The trade is entirely in the hands of Chinese merchants, who ship by way of Hong-Kong.

In 1880, 4,214,000 pounds of Shrimp and Prawns, valued at \$209,295, to the fishermen, were taken and sold on the coasts of the United States.

There are three common species of Mantis Shrimp (*Squilla empusa* and *dubia*, and *Coronis glabriusculus*) living upon the eastern coast of the United States, one or more of which are occasionally used as bait in the Southern States.

AMPHIPODS AND ISOPODS.

There are numerous species of Amphipods occurring upon the American coasts, which act as useful scavengers, both in shallow and deep water. They frequently annoy fishermen by eating the fish caught on trawl-lines. There is also one very injurious species of Amphipod (*Chelura terebrans*), and one of Isopod (*Limnoria lignorum*), which are active wood borers, rapidly destroying submerged timbers, such as the piles of wharves, buoys, &c. They sometimes act in concert, and the results are similar to those attained by the ship-worm (*Teredo*). Numerous instances of their ravages have been recorded. The *Limnoria* inhabits the Pacific as well as the Atlantic coast, but the *Chelura* has so far been recognized only from New England. They are both European species.

KING CRAB—HORSESHOE CRAB.

The curious Horseshoe Crab or King Crab (*Limulus Polyphemus*), which ranges along nearly the entire eastern coast of the United States, is occasionally eaten by man, but its flavor is not of a high order, and there is a general prejudice against it as an article of food. It is, however, frequently fed to swine and poultry on the coast of the Middle and Southern States, and in the same regions is in great favor as a fertil-

izer for crops. It forms an excellent bait for eels, and is fed to them regularly when kept in confinement. In Southern New Jersey and Delaware, there are several factories for the grinding of King Crabs for fertilizing purposes, and there and elsewhere the farmers also prepare them for their own use. They are captured during May and June, when the females, accompanied by the males, ascend the beaches, in immense numbers, to spawn. They are picked up in the hands or with pitchforks, deposited in large piles to dry for one or two months, and then broken up and ground. The product is termed concerine, and is used alone or composted with muck, lime, &c. It is extensively employed by the fruit-growers of New Jersey, Delaware, and Maryland, and is also applied to general crops.

W. O R M S .

Several species of marine annelids are occasionally employed by fishermen as bait, but mainly by amateurs. These animals give rise to no industry, but are generally obtained by those who desire them for their own purposes. The commoner shore species are the ones employed, and include, among others, *Arenicola marina*, the several species of *Nereis*, *Diopatra cuprea*, *Cllymenella torquata*, &c. The common Earth Worm (*Lumbricus terrestris*, L.) is also occasionally used as bait in the fresh waters. Some of the Western Indian tribes use a species of fresh-water annelid (*Ephydra* Sp.) as food. It is prepared dry for keeping.

MEDICINAL LEECH.—The American medicinal Leech (*Macrobdella decora*) is quite widely distributed through the Northeastern part of the United States, and was formerly extensively employed by physicians. In recent times, the practice of leeching has greatly declined. Prior to 1839, there was no regular importation of foreign Leeches into this country, and physicians were obliged to depend almost entirely on the American species, which, for most purposes, is inferior to the European, having less power of attaching itself. This very weakness, however, renders it preferable for many cases, where it is desirable to distribute the blood-letting over a greater surface than would be acted upon by a single European Leech. In 1839, the first importing house for European Leeches was established in New York, and from that time until about 1856 the sale of Leeches rapidly increased, over 800,000, valued at \$90 per thousand, having been imported the latter year. Since 1856, the use of Leeches, and, as a consequence, the quantity imported, has gradually diminished from year to year, until, in 1880, the import trade was only one-seventh in value that of the former year. The prices have also declined to from \$25 to \$50 per one thousand, according to quality. While the American Leech has been collected for medicinal purposes in various localities where it occurs, the main source of supply has always been the eastern part of Pennsylvania, and especially Bucks and Berks counties. Between 1840 and 1850, more

American than foreign Leeches were used in Philadelphia, the market price at that time having been about \$10 per thousand. Now, scarcely more than 1,000 are used there annually. The quantities sold in other cities are so small that we have been unable to obtain figures regarding them. The use of Leeches is again being revived in Philadelphia. Several unsuccessful attempts at breeding both the American and European Leeches have been tried in this country.

ECHINODERMS.

HOLOTHURIANS.—At least three species of edible Holothurians or Sea-cucumbers occur upon the Eastern coast of the United States. They are: *Pentacta frondosa*, ranging northward from New York; and *Holothuria floridana* and *princeps*, belonging to the Southern States. Although the *Pentacta frondosa*, according to the late Dr. William Stimpson, is of good flavor, it has never been used as food. One or both of the Southern species, however, gave rise, in 1871, to a limited industry, which was abandoned after 'two years' time. The Holothurians were collected from the shallow waters of the reefs about Key West, Florida, boiled, cleaned and dried, after the manner of trepang, and shipped to China. Material was abundant and easily obtained at low prices, boys principally being employed to collect it at a certain price by the piece. This industry was confined to the winter season.

SEA URCHINS.—Two species of edible Sea Urchin, related to the edible Sea Urchin of Southern Europe, live upon our coasts. *Strongylocentrotus dröbachiensis*, also European, ranges northward from New Jersey on the east coast, and also occurs in Alaska. *S. franciscanus* inhabits the west coast, from Southern Alaska to San Diego, California. *S. dröbachiensis* was formerly eaten by the native east coast Indians, and is now extensively used as food by some of the Alaskan tribes. *S. franciscanus* is also said to be eaten to some extent; it attains a much larger size than the former species. A third species of Sea Urchin, the so-called 'Sand Dollar,' (*Echinarachnius parma*), inhabits the east coast, and is frequently utilized by the fishermen for making an indelible ink.

STAR-FISH.—The two commoner species of Star-fish of the east coast (*Asterias vulgaris* and *Forbesii*), infest the oyster beds and occasion much destruction, frequently rendering certain sections entirely unfit for oyster culture. *A. vulgaris* ranges northward from New York, and *A. Forbesii* southward from Massachusetts, so that they overlap in their distribution and form a continuous line. The two species are closely related and are not distinguished apart by the fishermen. Their manner of attacking the oyster has never been satisfactorily made out, but Mr. Ernest Ingersoll supposes that they first break off the thin and newly formed edge of the shell, by means of the muscular ring at the entrance to the stomach. Although sluggish in their movements, and while occurring on the oyster beds at nearly all times, they frequently appear

suddenly in immense hordes, and, without warning, destroy thousands of dollars' worth of oysters. The greatest destruction occurs in the latter part of summer and the fall, after the spawning season of the Star-fish. Dredges, beam-trawls, and tangles have been employed to rid the beds of these pests, and in many places large sums are expended annually in keeping the beds free from this most dreaded enemy.

SPONGES.

The American Sponge fishery is now a well-established industry of considerable importance, and gives employment to a large fishing fleet. Prof. Alpheus Hyatt, one of the most recent writers on American Sponges, regards most of the American commercial forms as identical specifically with the Mediterranean, but separates them on subspecific differences. His classification has been adopted in this catalogue. The same subspecies belong to both Florida and the Bahama Islands, but fewer commercial grades are recognized from the former than from the latter region. The American species and subspecies are as follows: *Spongia officinalis* Linn., subsp. *tubulifera*—Glove Sponge; *S. graminea* Hyatt—Glove Sponge; *S. equina* Sch., subsp. *gossypina*—Sheepswool Sponge; *S. equina*, subsp. *meandriniformis*—Velvet Sponge; *S. equina*, subsp. *cerebriformis*—Grass Sponge; *S. agaricina*, subsp. *corlosia*, *dura*, *punctata*—Yellow Sponge. The finest quality of American Sponge is the Sheepswool, the remaining grades being all quite inferior to it. The Florida Sheepswool Sponges now command a higher price than those from the Bahamas.

The Florida Sponge grounds form three separate elongate stretches, along the southern and western coasts of the State. The first includes nearly all of the Florida Keys; the second extends from Anclote Keys to Cedar Keys; and the third from just north of Cedar Keys to Saint Mark's, in Apalachee Bay. The linear extent of these grounds is about 120 miles, and their breadth varies from a few miles to 15 or 20 miles. The total area of the Sponge grounds worked in 1880 was reckoned at about 3,000 square geographical miles, but this does not by any means cover the possibilities of the coast, as many additional sponging areas have been discovered since then. Key West is the principal headquarters for the Sponge fleet. The Florida Sponge fishery differs from the Mediterranean in that no divers are employed. The Sponge fleet consists of over 100 vessels, ranging in size from 5 to 50 tons burden. These vessels are mostly of light draft, and schooner rigged, and have proportionately large decks and holds for the storage of working gear and Sponges. They are well built and fast sailers. The crews number from five to fifteen men each, one acting as cook and remaining on the vessel, while the remainder go in search of Sponges, in couples, in small, light yawl boats called dingies. The sponger's outfit consists of a three-pronged iron hook or spear, mounted on a long pole, and a water-glass,

which is made by inserting a piece of window-glass across the end of a small wooden box or bottomless pail. The latter contrivance enables the sponger to examine the bottom, when the surface is more or less rough. Of the two men in each dingy, one stands at the stern and paddles slowly, while the other kneels down amidships or at the bow, and watches the bottom. As soon as a Sponge is sighted, the boat is quickly stopped, and the "hooker" thrusts down his spear and fastens into it; doing this with ease, even in depths of 30 to 35 feet. Great dexterity is required in this performance. Collecting goes on at all seasons when the weather will permit. At noon and sunset, the spongers return to the vessels and spread their catches upon the decks, where the slime from the Sponges runs off freely. Every Friday night the vessels carry their week's catch to some place on the neighboring shore, where they have one or more inclosures called crawls, 8 or 10 feet square, and situated in depths of about 2 or 3 feet of water. Saturdays are spent in depositing the past week's catch, to soak, and in cleaning that of the week before, which is done by squeezing the Sponges and beating them with a short heavy stick, called a "bruiser." After cleaning, they are strung on rope yarns, about 6 feet long, suspended from the rigging to dry, and afterwards packed in the hold.

The cruises last from four to eight weeks, at the end of which time the vessels return to Key West, a few only going to Apalachicola. The Sponges are piled on a wharf, each variety or grade by itself, and are sold to agents who first inspect and then submit a written bid, sales being made, of course, to the highest bidder. The different grades are sold in a lump, and not by weight or count, the agent being able to estimate the quantity very closely from long experience. The process of bleaching or liming Sponges has been extensively in vogue at Key West, but it is now meeting with much discouragement from the trade, for while it renders the Sponge much lighter in color, it also partly destroys its fiber and makes it less tough and durable. The Sponges are stored in large airy warehouses by the agents, until a sufficient quantity has been obtained to pay for shipping. After a thorough drying, and bleaching, if desired, the Sponges are pounded to rid them of sand, trimmed, sorted, and packed, by means of hydraulic pressure, in bales measuring about 30 by 18 by 18 inches. They are then ready for shipping. The Florida Sponges are all shipped from Key West and Apalachicola to New York, which is the only market for American Sponges, and where they are disposed of to the trade. There are about six wholesale houses in New York for the purchase and sale of Florida Sponges. The value of the Florida Sponge fishery to the fishermen averages about \$200,000 annually.

The Florida Sponge fishery originated about 1852, for, although the occurrence of Sponges on the Florida reefs was previously made known, the species were not supposed to be of commercial value. The industry has gradually developed to the present time, but during the past few

years has remained at about the same standing. The demand for the better grades greatly exceeds the supply. Fully 75 per cent. in value of all the Florida Sponges marketed are of the Sheepswool variety.

Sponge culture has recently attracted the attention of those interested in the Florida Sponge fishery, since some of the older grounds have shown signs of becoming exhausted. The recent successful attempts at raising Sponges from clippings in the Mediterranean have inspired hopes that similar practices might succeed well here, and the first trials have been quite encouraging. In the present exhibit are included four specimens of Sheepswool Sponges, grown from small cuttings at Key West, but not, however, under the most favorable conditions. They are numbered as follows: 771, 772, 773, 774. They were all planted December 8, 1881, in a depth of $2\frac{1}{2}$ feet of water, and represent six months' growth, from an original height of $2\frac{1}{2}$ inches. The smallest specimen was planted in a small cove or bight, where there was little or no tidal current, and hence its slight increase in size. The other three specimens were placed in a tide-way, two being attached by wires and the third by means of a stick running through it. The agent of Messrs. McKesson & Robbins, who made these experiments, states that it requires at least four months for the Sponge to recover from the injury done it in the cutting, which removes the outer skin along the edges of the section. At the end of the first four months no apparent increase in size had taken place, so that the growth exhibited is for two months only. Two hundred and sixteen specimens in all were planted by the same party at the above date, and at last accounts they were doing nicely. The greatest difficulty in the way of Sponge culture about Key West, at present, arises from the fact that the spongers are permitted to fish everywhere without restriction, and it is impossible to select a suitable spot without fear of its being molested. The agent claims that with a grant, protecting a good tidal area of suitable depth and dimensions, he can make Sponge culture a complete success.

BORING SPONGE.—The Boring Sponge (*Cliona sulphurea*) has the power of excavating in limy structures, such as the shells of mollusks, submerged marble, &c. It begins its life as a burrower, as frequently into living as dead shells, and is at times a source of considerable irritation to oysters and other shell fish, but probably does not cause much destruction. In 1878, a cargo of Italian marble, which had been wrecked in 1871 off Long Island, was taken up, and the blocks of stone were seen to be thoroughly penetrated, to a depth of one or two inches, by the crooked and irregular borings of this Sponge. Beyond the borings the marble was still in good condition.

LIST OF THE SPECIES OF ECONOMIC CRUSTACEANS, WORMS,
ECHINODERMS, AND SPONGES EXHIBITED.

CRUSTACEANS.

- Gelasimus minax*, Le Conte. Fiddler Crab. Atlantic coast of the United States, south of Cape Cod. Used as bait.
4109. Newport, Rhode Island. U. S. Fish Commission.
- Gelasimus pugnax*, Smith. Fiddler Crab. Atlantic coast of the United States, south of Cape Cod. Used as bait.
3623. Newport, Rhode Island. U. S. Fish Commission.
- Gelasimus pugilator*, Latreille. Fiddler Crab. Atlantic coast of the United States, south of Cape Cod. Used as bait.
4895. Wood's Holl, Massachusetts. U. S. Fish Commission.
- Heterograpsus nudus*, Stimpson. Purple Shore Crab. Pacific coast, United States, Puget Sound to Southern California.
2056. Monterey, California. Trowbridge.
- Pinnotheres ostreum*, Say. Oyster Crab. Atlantic coast, Massachusetts to South Carolina; living as a messmate in the shells of the oyster, *Ostrea virginiana*. Used as food.
2542. New York Bay. E. G. Blackford.
- Cancer irroratus*, Say. Rock Crab; Jonah Crab. Atlantic coast, Labrador to South Carolina. Used as food and bait.
4896. Vineyard Sound, Massachusetts. U. S. Fish Commission.
4897. Vineyard Sound, Massachusetts. U. S. Fish Commission.
- Cancer borealis*, Stimpson. Rock Crab; Jonah Crab. Atlantic coast, Nova Scotia to Long Island, New York. Used as food.
4596. Off Newport, Rhode Island. U. S. Fish Commission.
4899. Off Newport, Rhode Island. U. S. Fish Commission.
- Cancer magister*, Dana. Common Crab. Pacific coast, Alaska to Lower California; shallow water, near the shore. Used as food.
2553. California. William Stimpson.
5037. San Francisco, California. R. E. C. Stearns.
- Cancer antennarius*, Stimpson. Rock Crab. Pacific coast, Queen Charlotte's Island to Lower California; shallow water, near the shore. Used as food.
2033. California. William Stimpson.
- Cancer productus*, Randall. Red Crab. Pacific coast, Queen Charlotte's Island to Lower California; shallow water, near the shore. Used as food.
2529. San Francisco Bay, California. H. Hemphill.

- Panopeus Herbstii*, Edwards. Mud Crab. Atlantic coast, Cape Cod to Brazil; shore. Used as food and bait.
4539. Newport, Rhode Island. U. S. Fish Commission.
- Panopeus depressus*, Smith. Mud Crab. Atlantic coast, Cape Cod to Florida; shore. Used as bait.
2292. Garden Key, Florida.
- Menippe mercenarius*, Gibbes. Stone Crab. Atlantic coast, North Carolina to Key West; Gulf of Mexico; shallow water. Used as food.
4906. Charleston Harbor, South Carolina. R. E. Earll.
- Carcinus mænas*, Leach. Green Crab. Atlantic coast, Cape Cod to New Jersey; between tides. Used as bait.
4901. Wood's Holl, Massachusetts. U. S. Fish Commission.
- Platyonichus ocellatus*, Latreille. Lady Crab; Sand Crab. Atlantic coast, Cape Cod to Florida; Gulf of Mexico; shallow water, near the shore, and between tides. Used as food and bait.
4894. Wood's Holl, Massachusetts. U. S. Fish Commission.
- Callinectes hastatus*, Ordway. Blue Crab; Edible Crab. Atlantic coast, Cape Cod to Florida; Gulf of Mexico; shallow water, near the shore, and between tides. Used as food and bait.
3904. New York market. E. G. Blackford.
4946. Wood's Holl, Massachusetts. U. S. Fish Commission.
4977. Chesapeake Bay, through Washington market. Mounted by F. A. Lucas.
- Libinia emarginata*, Leach. Spider Crab. Atlantic coast, Maine to Florida. Used as bait.
4902. Newport, Rhode Island. U. S. Fish Commission.
- Libinia dubia*, Edwards. Spider Crab. Atlantic coast, Massachusetts to the West Indies. Used as bait.
4898. Wood's Holl, Massachusetts. U. S. Fish Commission.
4905. Wood's Holl, Massachusetts. U. S. Fish Commission.
- Epiplatys productus*, Randall. Kelp Crab. Pacific coast; California and Oregon. Used as food by the natives.
2139. Pacific coast. Dr. Suckley.
- Hippa talpoida*, Say. Sand-bug; Bait-bug. Atlantic coast, Cape Cod to Florida; between tides. Used as bait.
4719. Wood's Holl, Massachusetts. U. S. Fish Commission.
- Eupagurus pollicaris*, Stimp. Hermit Crab. Atlantic coast, Massachusetts to Florida. Available as bait.
3902. New Haven, Connecticut, on oyster beds. U. S. Fish Commission.
- Eupagurus bernhardus*, Brandt. Hermit Crab. Atlantic coast, from Vineyard Sound northward. Available as bait.
2849. Gloucester Harbor, Massachusetts. U. S. Fish Commission.

- Eupagurus longicarpus*, Stimpson. Hermit Crab. Atlantic coast, Massachusetts Bay to South Carolina. Available as bait.
3339. Buzzard's Bay, Massachusetts; 7 fathoms. U. S. Fish Commission.
- Panulirus interruptus*, Randall. Rock-lobster; Spiny-lobster; Salt-water Crayfish. Pacific coast, Point Conception, California, southward. Used as food.
4907. Santa Barbara, California. D. S. Jordan.
5038. San Francisco market, California. R. E. C. Stearns.
- Homarus americanus*, Edwards. American Lobster. Atlantic coast, Labrador to Delaware. Used as food and bait.
4908. Newport, Rhode Island. U. S. Fish Commission.
4976. New Jersey coast. E. G. Blackford. Weight when alive, 18 pounds. Mounted by F. A. Lucas.
4978. New England coast, through Washington market. Weight when alive, 3 pounds. Mounted by F. A. Lucas.
4981. Coast of Maine, through Boston market. Johnson & Young. Average size of the lobsters now received at the Boston market.
- Cambarus affinis*, Erichson. Crayfish. Middle States, Maryland, Virginia, District of Columbia. Used as food.
4904. Havre de Grace, Maryland. T. H. Bean.
4893. Potomac River, Gunston, Virginia. M. McDonald.
- Cambarus virilis*, Hagen. Crayfish. British America, Mississippi Valley, Texas. Used as food.
4900. Milwaukee, Wisconsin. E. G. Blackford.
- Cambarus Clarkii*, Girard. Crayfish. Louisiana, Texas. Used as food.
3359. Mississippi River, near New Orleans, Louisiana. G. Dunbar's Sons.
- Astacus nigrescens*, Stimpson. Crayfish. California. Used as food.
4974. San Francisco, California. Mus. Comp. Zoology.
- Crangon vulgaris*, Fabricius. Common Shrimp. Atlantic coast, Labrador to North Carolina; Pacific coast, California. Used as food and bait.
4891. Chesapeake Bay. U. S. Fish Commission.
- Crangon franciscorum*, Stimpson. California Shrimp. Pacific coast, Puget Sound to Point Conception, California. Used as food.
2284. San Francisco, California. H. Hemphill.
- Hippolyte brevisrostris*, Dana. Shrimp. Pacific coast, Straits of Fuca to San Francisco Bay. Used as food.
2283. San Francisco, California. H. Hemphill.
- Palæmonetes vulgaris*, Stimpson. Common Prawn. Atlantic coast, Massachusetts Bay to Florida.
2252. Vineyard Sound, Massachusetts. U. S. Fish Commission.
- Palæmon ohionis*, Smith. River Shrimp. Mississippi River and its tributaries. Used as food.
2264. Mississippi River, New Orleans, Louisiana. G. Kohn.
2444—Bull. 27—9

- Palæmon jamaicensis*, Olivier. Rivers of Texas. Available as food.
2064. Brownsville, Texas.
2165. Texas.
- Palæmon forceps*, Edwards. Rivers of Texas. Available as food.
2063. Brownsville, Texas.
- Pandalus borealis*, Kröyer. Deep-water Prawn. Northeastern coast of the United States; 40 to 160 fathoms. Available as food.
4550. Thirty miles off Cape Sable, Nova Scotia; 90 fathoms. U. S. Fish Commission.
- Pandalus leptoceros*, Smith. Deep-water Prawn. Northeastern coast of the United States; 15 to 430 fathoms. Available as food.
4728. Off Martha's Vineyard, Massachusetts; 186-194 fathoms. U. S. Fish Commission.
- Pandalus Montagu*, Leach. Deep-water Prawn. Northeastern coast of the United States; 15 to 116 fathoms. Available as food.
3946. Off Cape Cod, Massachusetts; 70 fathoms. U. S. Fish Commission.
- Pandalus propinquus*, G. O. Sars. Deep-water Prawn. Northeast coast of the United States; 116 to 365 fathoms. Available as food.
4890. Off Delaware Bay; 312 fathoms. U. S. Fish Commission.
4796. Off Delaware Bay. U. S. Fish Commission.
- Penæus setiferus*, Edwards. Southern Shrimp or Prawn. Atlantic coast, Virginia to Florida; Gulf of Mexico. Used as food.
2074. Charleston, South Carolina.
- Squilla empusa*, Say. Mantis Shrimp. Atlantic coast, Cape Cod to Florida. Used as bait.
4118. Stonington, Connecticut. F. G. Niles.
4548. Off Newport, Rhode Island. U. S. Fish Commission.
- Squilla dubia*, Edwards. Mantis Shrimp. Atlantic coast, Southern States. Used as bait.
2057. Savannah, Georgia. R. J. Nunn.
- Coronis glabriusculus*, Stimpson. Mantis Shrimp. Atlantic coast, Southern States. Used as bait.
2052. Garden Key, Tortugas, Florida. Dr. Whitehurst.
- Gammarus locusta*, Gould. Scud. Atlantic coast, New Jersey to Greenland. Scavengers.
2601. Cape Ann, Massachusetts. U. S. Fish Commission.
- Orchestia agilis*, Smith. Sand-flea. Atlantic coast, Bay of Fundy to New Jersey. Scavengers.
4892. Newport, Rhode Island. U. S. Fish Commission.
- Limnoria lignorum*, White. Gribble; Boring Limnoria. Atlantic coast, Gulf of Saint Lawrence to Florida; Pacific coast, California. Destructive to submerged structures of wood.
4903. Casco Bay, Maine. Specimens in alcohol. U. S. Fish Commission.

2290. Wood's Holl, Massachusetts. Wood showing ravages. V. N. Edwards.
2221. San Diego, California. Wood showing ravages. H. Hemp hill.
2240. Eastport, Maine. Wood showing ravages. U. S. Fish Commission.
4981. New England coast. Wood showing ravages. U. S. Fish Commission.
- Limulus Polyphemus*, Latreille. King Crab; Horseshoe Crab. Atlantic coast, Casco Bay, Maine, to Gulf of Mexico. Used as food for swine and poultry, and as a fertilizer.
3385. Wood's Holl, Massachusetts. U. S. Fish Commission.
4979. New Haven, Connecticut. U. S. Fish Commission.
4980. New Haven, Connecticut. U. S. Fish Commission.

WORMS.

- Lepidonotus squamatus*, Leach. Scaly Worm. Atlantic coast, New Jersey to the Arctic Ocean. Used as bait.
217. Eastport, Maine. H. E. Webster.
- Nephtys discors*, Ehlers. Atlantic coast. Used as bait.
216. Eastport, Maine. H. E. Webster.
- Nereis virens*, Sars. Clam Worm; He Clams; Bait Worm. Atlantic coast, Labrador to Connecticut. Used as bait.
208. Naushon, Massachusetts. U. S. Fish Commission.
220. Eastern Coast, United States. H. E. Webster.
- Nereis limbata*, Ehlers. Atlantic coast, Massachusetts Bay to South Carolina. Used as bait.
218. Great Egg Harbor, New Jersey. H. E. Webster.
- Nereis irritabilis*, Webster. Atlantic coast. Used as bait.
212. Coast of Virginia. H. E. Webster.
- Diopatra cuprea*, Claparède Bait Worm. Atlantic coast, Massachusetts to South Carolina. Used as bait.
207. Naushon, Massachusetts. U. S. Fish Commission.
222. Coast of Virginia. H. E. Webster.
- Marpysa sanguinea*, Quat. Atlantic coast. Used as bait.
213. Coast of Virginia. H. E. Webster.
- Arabella opalina*, Verrill. Atlantic coast. Used as bait.
214. Provincetown, Massachusetts. H. E. Webster.
- Rhynchobolus dibranchiatus*, Verrill. Atlantic coast, Massachusetts Bay to New Jersey. Used as bait.
221. Provincetown, Massachusetts. H. E. Webster.
- Arenicola marina*, Linné. Atlantic coast, Massachusetts Bay, southward. Used as bait.
219. Provincetown, Massachusetts. H. E. Webster.
- Arenicola cristata*, Stimpson. Atlantic coast, Southern States. Used as bait.
211. Florida. H. E. Webster.

- Clymenella torquata*, Verrill. Atlantic coast, Bay of Fundy to New Jersey. Used as bait.
 206. Nanshon, Massachusetts. U. S. Fish Commission.
Amphitrite brunnea, Stimpson. Atlantic coast. Used as bait.
 215. Eastport, Maine. H. E. Webster.
Macrobodella decora, Verrill. American Medicinal Leech. Northeastern United States. Used in drawing blood.
 209. New Haven, Connecticut. A. E. Verrill.

Echinoderms.

- Pentacta frondosa*, Jæger. Sea Cucumber. Atlantic coast, New England States northward. Available as food.
 5091. Eastport, Maine. U. S. Fish Commission.
Strongylocentrotus dröbachiensis, A. Agassiz. Common Sea Urchin; Sea Egg. Atlantic coast, New Jersey to the Arctic Ocean; Alaska. Used as food.
 5687. Off Newport, Rhode Island. U. S. Fish Commission.
Strongylocentrotus franciscanus, A. Agassiz. Sea Urchin. Pacific Coast, Southern Alaska to Southern California. Used as food.
 5690. Sitka, Alaska. F. Bishoff.
Echinarachnius parma, Gray. Sand Dollar. East coast, New Jersey to Labrador. Used for making ink.
 5689. Cape Cod Bay, Massachusetts. U. S. Fish Commission.
Asterias vulgaris, Stimpson. Starfish. Atlantic coast, Labrador to New York. Destructive to oyster beds.
 5024. Eastport, Maine. U. S. Fish Commission.*
Asterias Forbesii, Stimpson. Starfish. Atlantic coast, Massachusetts to the Gulf of Mexico. Destructive to oyster beds.
 5688. Wood's Holl, Massachusetts. U. S. Fish Commission.*

SPONGES.

COMMERCIAL SPECIES.

Collection of Florida Commercial Sponges, donated to the United States National Museum by McKesson & Robbins, druggists and importers, New York, 1882.†

- Spongia graminea*, Hyatt. Glove Sponge. Distribution—Florida.
 822. Sal Bunches Sound; depth, 4 feet.
 825. Sugar Loaf Sound; depth, 3 feet.
 943. Cudjoe's Key Sound; depth, 6 feet; two to eight months old; 16 specimens.

* For reference to other specimens, illustrating the method of attacking oysters, etc., see section of Mollusca.

† Unless otherwise stated, each number in this list indicates a single specimen of sponge.

- Spongia equina*, Schm.; subspecies *gossypina*, D. et M. Sheepswool Sponge. Distribution—Florida, Bahamas, Cuba, Mexico.
799. Var. *hirsuta*. Dead Man's Bay; depth, 24 feet.
800. Var. *hirsuta*. Off Pepper Fish Keys; depth, 18 feet.
801. Var. *hirsuta*. Off Cape Romano; depth, 20 feet.
803. Var. *hirsuta*. Off Cedar Keys; depth, 17 feet.
804. Var. *hirsuta*. Off Key Vaccas; depth, 10 feet.
808. Var. *hirsuta*. Metacombe Channel; depth, 8 feet.
785. Var. *alba*. Florida.
792. Var. *alba*. Florida.
833. Var. *alba*. North of Cedar Keys; depth, 18 feet.
806. Var. *porosa*. Off Niggerhead Key; depth, 12 feet. (Reef Sheepswool Sponge.)
811. Var. *porosa*. Off Old Rhoades Key; depth, 10 feet.
832. Var. *porosa*. Off Cudjoe's Key; depth, 15 feet.
798. Off Rock Island; depth, 24 feet.
802. Off Grassy Keys; depth, 12 feet.
805. Off Saint Martin's Reef; depth, 10 feet.
807. Off Anclote Keys; depth, 18 feet.
809. Off Bahia Honda Key; depth, 18 feet.
810. Long Key Channel; depth, 8 feet.
812. Off Anclote Keys; depth, 12 feet. ("Rolling John.")
813. Off Saint Marks; depth, 30 feet.
816. Off Ragged Keys; depth, 10 feet. (Reef Sheepswool Sponge.)
834. Off Marquesas Island; depth, 10 feet.
836. Off Cudjoe's Key; depth, 15 feet.
917. Torch Key Channel; depth, 8 feet; eight months old; three specimens.
918. Long Key Banks; depth, 6 feet; five to eight months old (?); four specimens. ("Rolling Johns.")
919. Anclote Keys; depth, 18 feet; eight months old.
920. Bahia Honda Channel; depth, 12 feet; six to twelve months old; three specimens.
921. Metacombe Lake; depth, 8 feet; eight to twelve months old; eight specimens.
922. Soldier Key Bank; depth, 8 feet; fifteen months old (?); three specimens.
924. Caizar's Creek; depth, 8 feet; eighteen months old.
925. Dead Man's Bay; depth, 18 feet; twelve months old.
926. Marquesas Keys Channel; depth, 18 feet; eight to fifteen months old; three specimens.
927. Rock Island; depth, 26 feet; twelve months old.
928. Key Vaccas Channel; depth, 10 feet; ten to twelve months old; three specimens.
929. Saint Martin's Reef; depth, 10 feet; twelve months old.

930. Crawfish Bar, off Key West; depth, 12 feet; eight to twelve months old; three specimens.
931. Pepper Fish Key; depth, 22 feet; nine months old.
932. Boca Grande Lake; depth, 12 feet; eighteen months old (?); three specimens. ("Rolling Johns.")
933. Metacombe Channel; depth, 18 feet; six to fifteen months old; seven specimens.
934. No Name Key Channel; depth, 12 feet; six to twelve months old; three specimens.
935. Sugar Loaf Sound; depth, 5 feet; six months old; three specimens.
936. Channel Key Lake; depth, 6 feet; six months old; two specimens.
937. Biscayne Bay; depth, 10 feet; six to twelve months old; five specimens.
938. Long Key Channel; depth, 8 feet; twelve months old; three specimens.
939. Key West Channel; depth, 10 feet; twelve months old; two specimens.
940. Contents Key Channel; depth, 10 feet; eight months old; three specimens.
941. Key West Banks; depth, 8 feet; two years old (?); three specimens. ("Rolling Johns.")
942. Off Suwanee River; depth, 18 feet; eight months old.
- 885 to 914, inclusive. Florida; 30 specimens.
915. Off Sugar Loaf; depth, 12 feet. Dried in its natural state, without cleaning.
916. Florida. Preserved in alcohol, in their natural state. Two specimens.
923. South side of the Island of Cuba; depth, 16 feet.
771. Cultivated sponge. Key West, Florida; depth, $2\frac{1}{2}$ feet. Six months' growth from cutting; original height, $2\frac{1}{2}$ inches.
772. Cultivated sponge. Key West, Florida; depth, $2\frac{1}{2}$ feet. Six months' growth from cutting; original height $2\frac{1}{2}$ inches.
773. Cultivated sponge. Key West, Florida; depth, $2\frac{1}{2}$ feet. Six months' growth from cutting; original height, $2\frac{1}{2}$ inches.
774. Cultivated sponge. Key West, Florida; depth, $2\frac{1}{2}$ feet. Six months' growth from cutting; original height, $2\frac{1}{2}$ inches.
- Spongia equina*, Schm.; subspecies *meandriniformis*. Boat Sponge. Distribution—Florida, Bahamas, West Indies, Brazil.
814. Off Alligator Reef; depth, 12 feet.
831. Off Alacrans, Mexico; depth, 10 feet.
- Spongia equina*, Schm.; subspecies *cerebriformis*, Duch. et Mich. Grass Sponge. Distribution—Florida, Bahamas, Cuba.
842. Var. *plana*. Off Sound Point; depth, 8 feet.
841. Var. *calciformis*. Off Jacob's Harbor; depth, 10 feet.

856. Var. *calciformis*. Florida.
 863. Var. *calciformis*. Florida.
 815. Metacombe Sound; depth, 4 feet.
 818. Off Jew Fish Bush; depth, 12 feet.
 821. Off Rock Island; depth, 15 feet.
 824. Couch Reef; depth, 15 feet.
 826. Soldier Key Channel; depth, 12 feet.
 827. Sugar Loaf Sound; depth, 3 feet.
 838. Off Key Large; depth, 8 feet. (Illegitimate Grass Sponge.)
 840. Off Metacombe Island; depth, 12 feet.
 944. Boca Chica Sound; depth, 4 feet; three months old; five specimens.
 945. Long Key Channel; depth, 8 feet; eight to fifteen months old; three specimens.
 946. Metacombe Channel; depth, 8 feet; six to twelve months old; four specimens.
 947. Key West Channel; depth, 8 feet; three to six months old; four specimens.
 948. Sal Bunches Sound; depth, 5 feet; three to five months old; five specimens.
 950. Key Vaccas Channel; depth, 12 feet; four to six months old; four specimens.
 951. Sugar Loaf Sound; depth, 5 feet; six months old; three specimens.
 952. Ram-rod Key Channel; depth, 10 feet; four to twelve months old; three specimens.
 953. Soldier Key Bar; depth, 4 feet; young; nine specimens.
 949. South side of the island of Cuba; depth, 4 feet; two specimens.
- Spongia agaricina*, Pall.; subspecies *corlosia*, Duch. et Mich.; *dura*, Hyatt; *punctata*, Hyatt. Yellow Sponge. Distribution—Florida, Bahamas.
852. *S. corlosia*, var. *fusca*. Florida.
 857. *S. corlosia*, var. *fusca*. Apalachicola.
 869. *S. corlosia*, var. *fusca*. Florida.
 819. *S. dura*. Off Duck Key; depth, 15 feet.
 817. *S. punctata* (?). Barnes' Sound; depth, 10 feet.
 837. *S. punctata* (?). Off Pepper Fish Key; depth, 12 feet.
 820. Off Saint Martin's Reef; depth, 10 feet.
 823. Metacombe Channel; depth, 10 feet.
 828. Off Anclote Keys; depth, 27 feet.
 829. Off Rock Island; depth, 24 feet.
 830. Long Key Channel; depth, 8 feet.
 835. Off Cedar Keys; depth, 12 feet.
 839. Barnett Sound; depth, 8 feet.
 843. Off Marquesas Keys; depth, 18 feet.

844. Biscayne Bay; depth, 13 feet.
 954. No Name Key Channel; depth, 12 feet; four to six months old; four specimens.
 955. Crawfish Bar, off Key West; depth, 10 feet; six months old; four specimens.
 956. Anclote Keys; depth, 18 feet; six months old.
 957. Key West Channels; depth, 8 feet; six to eight months old; three specimens.
 958. Sugar Loaf Sound; depth, 6 feet; five months old; four specimens.
 * 959. Metacombe Channel; depth, 12 feet; three to six months old; four specimens.
 960. Saint Martin's Reef; depth, 8 feet; twelve months old.
 961. Content's Key Channel; depth, 6 feet; four to six months old; four specimens.
 962. Bahia Honda Channel; depth, 10 feet; three to six months old; four specimens.
 963. Pepper Fish Keys; depth, 20 feet; six months old.
 964. Key Vaccas Channel; depth, 10 feet; six to eight months old; four specimens.
 965. Torch Key Channel; depth, 6 feet; eight months old; three specimens.
 966. Biscayne Bay; depth, 8 feet; three to six months old; four specimens.
 967. Rock Island; depth, 24 feet; nine months old.
 968. Off Suwanee River; depth, 18 feet; twelve months old.
 969. Dead Man's Bay; depth, 18 feet; eight months old.
 970. Marquesas Keys Channel; depth, 12 feet; four months old; three specimens.
 972. Soldier Key Bar; depth, 8 feet; twenty-five specimens.

INJURIOUS SPECIES.

Cliona sulphurea, Verrill. Boring Sponge. Atlantic coast, Cape Cod to South Carolina. Bores into oyster shells, submerged limestone, &c.

256. Vineyard Sound, Massachusetts. U. S. Fish Commission.*

* For references to other specimens, representing the younger stages of growth, and the boring habits of this species, see section of Mollusca.

LIST OF ENLARGED PHOTOGRAPHIC VIEWS, ILLUSTRATIVE OF THE LOBSTER FISHERY.

Lobster fishing at Rockport, Massachusetts.

Lobstermen's huts, dories, and Lobster pots, on the shore at Lanesville, Massachusetts.

Lobsterman's hut and pots at Menemsha Bight, Martha's Vineyard, Massachusetts.

Lobster boiling apparatus at Boston, Massachusetts.

LIST OF LOBSTER FISHING APPARATUS.

Series of Lobster pots, contained on one screen, showing the different styles used at present and in former times, on the New England coast. Actual size and models.

PRODUCTS OF THE LOBSTER, CRAB, AND SHRIMP FISHERIES.

For list of canned goods, see section of Products of the Fisheries.