XIV.—REPORT ON THE DISCOVERY AND INVESTIGATION OF FISHING GROUNDS, MADE BY THE FISH COMMISSION STEAMER ALBATROSS DURING A CRUISE ALONG THE ATLANTIC COAST AND IN THE GULF OF MEXICO; WITH NOTES ON THE GULF FISHERIES.*

By Capt. J. W. Collins.

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* This report covers investigations carried on during a cruise of the steamer Albatross, which began January 3, and ended April 6, 1885.

In this connection it seems desirable to include such facts as I have been able to gather relative to the sea fisheries, fishing vessels, &c., of some of the ports that have been visited during the cruise.—J. W. C.

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I.—NARRATIVE OF THE VOYAGE.

1. FROM NORFOLK TO HAVANA.

Leaving Norfolk at 2.25 p. m., on Saturday, January 3, 1885, we steamed past Fortress Monroe, and thence to sea, the ship heading southerly, down the coast, after leaving the Chesapeake.

The wind, which was northeasterly when we sailed, veered gradually to the eastward and southeastward; and on Sunday morning, when we were off Cape Hatteras, there was a fresh and increasing southeast breeze, with considerable easterly swell. The sea and wind continued to increase and change during the day, precluding the possibility of fishing.

Monday morning, January 5, the weather being fine with a light southeast wind and smooth sea, the dinghy was lowered at about 9.15 a. m., and I went in her, with two seamen, and set a tub of haddock trawl-line (about 400 hooks), baited, on every alternate hook, with salt mackerel cut into small sections. The line was set in 79 fathoms, coarse sand with black specks being the distinguishing feature of the bottom, while the position was practically that designated as "station

2311" on the ship's log, this locality being off the Carolina coast, in lat. 32° 54′ N. and long. 77° 53′ W., approximately.

After setting the trawl-line I lay by its lee end in the boat until 10.20 a. m., when we began hauling. There was a strong current running, and soon after the first anchor was aweigh the weather end of the ground line, near the other anchor, parted, and before we got all the line in, the boat had drifted out of sight of the other buoy-flag. Knowing, however, the direction in which it lay, we pulled for it, and sighted it after awhile, but the current ran so strong and the wind also began to breeze up somewhat, making a small choppy sea, that we gained very slowly, despite our utmost endeavors. There was little prospect of reaching the buoy, at least within a reasonable time, unless we had assistance from the ship, which, in the mean time had been engaged in dredging with the beam-trawl at some distance from the boat. We were finally taken in tow by the ship and pulled up to the buoy, when we succeeded in getting the remainder of the apparatus, which, it may be remarked, had become so much deteriorated by previous use that it was decided to condemn the line, the hooks only being of any value.

The results of this "set" were unimportant, the "take" consisting only of three small fish, two of which were hake, *Phycis regius*, and the other an eel, that was identified by Dr. Bean as probably belonging to the genus *Ophichthys*.

The hauls made with the beam-trawl also seemed to demonstrate the fact that the locality was evidently not one that would support an abundance of such fish life as would tend to make it of any importance, so far as the commercial fisheries are concerned.

The prevalence of rough weather during the next two days practically made it impossible to fish, even had it been desirable.

An attempt was made to catch fish by drailing on Thursday, January 8, while steaming across from the Bahama Reefs to the coast of Florida, but nothing was caught.

On the following day, however, while sailing along the Florida coast, south of Alligator Light, we caught five kingfish on drail-lines. These fish appeared to be most abundant near Sombrero Key, where many were hooked and a still greater number struck the drails. But as the ship was steaming about 10 knots, the speed was so great that it was difficult to hook a fish, and the chances of getting one that had been hooked were reduced to a minimum. But allusion is made to this matter more as an episode of the cruise than as being of any special importance, for, as will be detailed in a succeeding paragraph, the locality mentioned is a well-known and much frequented fishing ground for the boats which go after kingfish, and some of these craft we saw at work as we passed along the coast, not far from Sombrero Light.

Nothing in the way of fishing was done at Key West, with the exception of making several "shots" with the capelan seine for the purpose of securing collections of fishes for scientific purposes. The report

on these operations, the different species captured, &c., belongs more properly to Dr. Tarleton H. Bean, who was always present on the several occasions, and who, having the collections in his charge, is the only person capable or entitled to submit a report concerning what was done. This being the case, I deem it only necessary for me to allude incidentally to these operations, both at this time and later during the cruise, and this might not even be required were it not seemingly desirable to remark upon the feasibility of using such apparatus for fishing on the shores which we visited.

We found that while a certain amount of success might be attained at Key West by using a drag-seine for the purpose of collecting, such apparatus could not be profitably employed in fishing for market, at least not where we went. The bottom is composed largely, if not wholly, of coral formation, and even with the greatest care we tore large holes in our seine, while the catch of fish that would be marketable was insignificant.

I wished to make a trip in one of the open boats that were going for kingfish off Sombrero Key. An arrangement was accordingly made with the skipper of one of the boats on Saturday, January 10, to take me on board next morning when he started out. He said he would return on Monday afternoon to sell his fish to the smack that was expected to sail for Havana on Tuesday, and he promised to come alongside the Albatross on his way out of the harbor and take me on board. This he did not do, and consequently I failed to make the trip. I learned later that the date of the smack's sailing was changed to the evening of the day on which we thought to leave Key West, and the boatman did not expect to return to the harbor until our ship had left it.

My time at Key West, during the six days of our stay, was occupied to some extent in obtaining data of the fisheries of the port, and Mr. N. B. Miller volunteered to take some photographs of vessels, boats, &c., that may serve as material for illustration. The fishing industries of Key West are important and support a large percentage of the population of the island, while a numerous fleet of vessels and boats find employment in gathering the ocean products which may be taken about the keys, banks, and along the shores within the radius of 150 miles.

It seems to me desirable that the information which has been gathered relative to the fisheries of Key West and other places visited, particularly in the United States, should be appended to this report. Aside from the interest which may attach to the fisheries themselves, which is considerable, it is only by making a full record of the methods, vessels, boats, &c., now in use that we can form an intelligible idea of the business, and be able to determine whether or not it is desirable to offer any suggestions for improving the same.

On the afternoon of January 15, the ship left Key West Harbor and proceeded to sea. Several hours were spent, in the latter part of the day, in dredging, and in the early evening the ship was headed for Havana, Cuba, where we arrived the following day, passing in by Moro Castle about 8 a. m.

During the four days that we remained in Havana and its vicinity, little transpired that was especially worthy of note in this report, and reference is made to the reports of others for the details of the operations carried on by the ship. A temporary illness during most of the time, as well as my unfamiliarity with the patois spoken by the fishermen, prevented me from gaining as much information as it seemed to me desirable to obtain concerning the fisheries of Havana, and particularly in relation to the demand and supply of the Cuban markets as bearing on the subject of the importation of American-caught fish.

From casual observations from the ship I was able to gain a general idea of the boat-fisheries of the port, and a short row about the harbor in the dinghy on Sunday, January 18, enabled me to obtain some definite information concerning the two leading types of fishing boats that are used, as well as to make rough sketches of them.

Each morning during our stay, when the weather was suitable, a fleet of small sail boats left the harbor about sunrise, and after passing Moro Castle scattered along the coast, chiefly in an easterly direction. These boats fish with hand-lines at a short distance from the shore, where they lay anchored. The bottom about this part of the Cuban coast descends rapidly to a depth of several hundred fathoms at a comparatively short distance from the land, and it is therefore obvious that fishing must be done close inshore. As we passed along the coast the fishing boats were often seen at anchor with their sails down.

Between 3 and 5 o'clock in the afternoon the little fleet return to harbor to market their catch.

The boats used in this hand-line fishery are mostly of one type, which is a poor imitation of the American dory, from which it has doubtless been derived, as has a somewhat similar form of fishing craft in use at Porto Rico. It is a flat-bottomed, carvel-built (the sides made of a single wide board), keel boat, with little flare to the sides, rather straight on top and bottom, sharp, wedge-shaped bow, and stern like that of a dory, excepting that it has, comparatively, very little rake. The stem is heavy, made of hard wood, and rabbited so that the planks fit in flush with its forward part. One of these boats which I examined and measured, and which was evidently essentially the same as others of her class, had six sets of stout timbers, heavy gunwales, two thwarts, was decked, forward and aft, for a length of 2 or 3 feet, had a stern-post outside the V-shaped stern, and gudgeons for hanging a rudder. The following are the principal dimensions: Length, over all, 15 feet; beam, extreme, 3 feet 9 inches; depth, amidships (top of gunwale to floor), 17 inches; depth of keel, 5 to 6 inches.

Both oars and sails are used as a means of propulsion. The rowlocks are heavy wooden cleats fastened to the gunwale and in each of these is stuck a single stout wooden thole-pin, the oar being held to this by a rope becket. A sprit sail and a small jib tacking down to the stem head is, perhaps, the most common rig, but many of the boats carry only a single sail.

Another and larger class of boats, which are purely European in type, are used at Havana, chiefly for the net and seine fisheries, we were told. Many of these were built at the Balearic Isles and brought from Europe to Cuba by merchant vessels trading between the island and Spain. One of these which I had the opportunity of examining had all the characteristic features that distinguish the fishing boats of the region from whence she originated. She was a carvel-built, keel boat, with broad beam, medium depth, ends moderately sharp, rounding at the gunwales, and concave at the water line; a full, round, easy bilge, and curved stem and stern post, the latter rising about 15 inches above the gunwale. The boat had a moderate sheer, and three heavy rowlocks on a side, in each of which was a single thole-pin. An outrigger projected 4 or 5 feet beyond the stern on the port side. The boat was decked, with the exception of an open space amidships, that was 3 feet wide and about two-thirds of her length. The deck was built with a very decided curve upwards (or "crowning" as it is called), so much so that while the center of the beams were but little below the level of the gunwales, the bulwark, amidships, was 15 to 18 inches deep. She carried two lateen sails, the mainsail, as is common on Spanish boats, being much larger than the foresail. The two men who constituted the crew were busy making a gill-net at the time I went on board the boat, and they stated that they fished only with nets.

The following are the principal dimensions of the boat's hull: Length, over all, 24 feet 6 inches; beam, 8 feet; depth, top of gunwale or rail to garboard strake, 3 feet.

There is a fleet of smacks, both sloops and schooners, sailing from Havana, and several of these lay in port. They differ a good deal in size, but in respect to model and rig resemble the smacks of Key West or New England. Indeed, as has been mentioned elsewhere, many of these vessels were built in the United States and have been sold to Cuban parties.

2. FROM HAVANA TO COZUMEL.

Leaving Havana January 20, the ship steered westerly for the island of Cozumel, off the east coast of Yucatan, where we arrived on the evening of January 22, and anchored off the northern end of the island. In the mean time, dredging operations had been carried on off the north side of the western end of Cuba, near the Colorado Reefs, on the day after we sailed from Havana, and the tangle and trawl were also used on or near Arrowsmith Bank during the early part of the day on which we reached Cozumel.

The bottom off the north end of this island has a very gradual slope from the shore for a distance of 5 or 6 miles. The ship's anchorage was about 3 miles from the land, in 5 or 6 fathoms of water. Here the water was so clear that objects on the bottom could be seen, and, indeed, this was practically the case quite out to the verge of the bank.

After anchoring, some small hand-lines were put out and three or four yellow tails (probably *Sciæna punctatus* Linn) and one grunt (*Diabasis formosus* J. & G.) were caught; also a small shark. It was nearly dark when the lines were first put out, and we had not fished long before the sharks gathered around in sufficient numbers to take away the hooks and sinkers from several lines. Just how many there were it was, of course, impossible to tell, as a single fish of this species might play havoc with as many small lines as he took a fancy to bite at. However, we were satisfied that more than one did the mischief, since two lines were stripped of their hooks at the same time. A shark line was put out, but beyond the specimen mentioned no sharks were taken.

At daylight on the morning of January 23, the ship got under way and steamed around to the little village of San Miguel, on the northwest side of the island, where we came to anchor in about 5 fathoms within easy distance of the shore. The beach at the village makes a slight bend, curving in to the eastward, and with easterly winds, which generally prevail, this cove offers an excellent shelter and good landing. But with a norther or even with a westerly wind, which are very liable to come on suddenly in winter, a vessel would be on a lee shore, or at best be exposed to a wind and sea driving along the coast. This being the case, it was, therefore, somewhat risky, to say the least, to attempt any night fishing with gill-nets, since it might at any time be necessary for the ship to get under way and leave the place, and the danger of getting afoul of gear in the night and entangling it in the screws, was one not to be despised, providing the apparatus was set near the ship; to put it far from her would expose it to the sweep of the swift current that ran along the coast. No night fishing was attempted.

Although fish of many varieties appear to be abundant about Cozúmel, there is no fishing, strictly speaking, carried on by the inhabitants. A few fish are sometimes captured by means of cast nets thrown from the hand, but these are seldom used so far as we could learn, and of course the results obtained are so meager that such operations can scarcely come into the category of fishing, as understood from a commercial standpoint.

It would appear that little can be done with hook and line. Nearly every day while we were at the island, the ingenuity of the ship's officers and naturalists was exercised to capture the fish which could be seen swimming about, several fathoms down, in the clear, translucent water. A few specimens of barracuda, also some parrot and file fishes were taken, it is true, but the mouths of the two last mentioned species are so small, and the dentition of such a character, that a hook

might be stripped of its bait by them time after time, until one's patience was quite exhausted, and it was only by a "lucky hit" that a capture could be effected. The parrot fishes are not, so far as I am aware, very highly valued as food, and as a matter of fact, it is probable that a majority of the species in the waters of this region are of little economical importance. No fishing, other than that mentioned above, was attempted, otherwise than for making collections for scientific purposes. To obtain such collections the capelan seine was set several times. The catch, while often very important so far as the capture of different varieties was concerned, was nevertheless always insignificant from a fisherman's stand point. The reason for this may be found in the fact that the general characteristics of the shore are unfavorable for seining. In a few places smooth, white, sandy beaches occur, where it is easy enough to haul a seine, but, unfortunately, these localities are invariably barren of fish-life, with the exception of a limited amount of the smallest varieties that are of no commercial importance. There are long stretches of beach, not only near San Miguel, but more particularly toward the southern part of the island, on its western side, which, seen from a distance, have the appearance of being very favorable localities for landing a seine. But, with few exceptions, appearances are misleading, and we found on close examination that numerous outcropping coral rocks, with jagged edges and sharp points, lay just outside the surf, if they did not show above the water line, and it goes without saying that where these occurred in considerable numbers seining was impracticable. But it was around these particular beaches, that bristled with craggy rocks, and where there was a greater or less abundance of algæ, madrepores, &c., that fish were plentiful. It was not unusual in these places to see some of the larger species, like barracuda, lady-fish, &c., chasing the schools of smaller fish, darting about and leaping out of water, a short distance outside of the surf. Such displays were a great temptation to try the seine, but the result—the destruction of the net—was too self-evident to warrant us in making an attempt to use it. The difficulties encountered may be judged from the fact that on several occasions, notwithstanding much care was exercised in selecting what appeared to be a favorable spot for hauling the seine, it took the whole party of six seamen and two or three others more than an hour to make a landing. The foot-line had to be constantly watched and pulled from beneath the coral rocks by a man in the boat, though, where the water was shallow enough for the purpose, one or two of the seamen waded out up to their arm-pits and shoulders and tended the net, frequently diving under water to detach the foot of the seine from the bottom. Even with all this labor and care, often rendered doubly fatiguing by the blazing heat of a tropical noonday sun, we rarely succeeded in making a haul without tearing more or less large holes in the net; and as the constant lifting of the foot-line from the bottom made the escape of fish possible, the

natural result was that the catch was always small, though, of course, larger than on the smooth beaches.

Many of the less predaceous species of fish that frequent the inshore waters about Cozumel evidently are as much in need of means of concealment from their enemies as they are of food to enable them to avert destruction. Fortunately, the shores of the island are mostly formed of coral, in which the ceaseless action of the waves have worn innumerable fissures and submarine caves, where it is easy for a fish to hide so as to escape the observation of his enemies; and as such localities also furnish a large amount of food suitable to the species found there, it is not at all surprising that they should be more abundant there than elsewhere. It was often interesting and instructive to note the extreme timidity of these hiders, and their remarkable dexterity in concealing themselves. If one stepped suddenly out on a projecting point of the craggy coral shore, particularly if he made much noise, the chances were that he saw not a single fish; or possibly he might catch a glimpse of blue or yellow, or several colors combined, disappearing like a flash—so suddenly, perhaps, as to leave him in doubt as to whether or not his eyes had deceived him. But let one sit quietly down and keep perfectly still, near the edge of the rocks, where they go straight down 10 or 15 feet to the bottom, or are hollowed out into cavernous openings beneath, and he will not wait long before here and there he may see, moving cautiously out from the rocky fissures in the clear depths below, curious little heads from which bright eyes are peering forth to seek the cause of alarm or ascertain if the coast is clear. Reassured at last, they move slowly out from their hiding places, and off a little way among the madrepores, sponges, &c., that one can see on the bottom at a short distance from the surf. Radiant in their many-tinted iridescent hues—blue, yellow, black, silver, and red, varying, of course, with different species, these fishes may be easily observed so long as one chooses to sit perfectly still; but the instant one makes a motion, or a dip-net is thrust into the water, the alarm is taken, and all scurry away for their hiding places, where they are lost to sight in a moment.

Some 5 or 6 miles southward from San Miguel was a little estuary with deep water, a narrow entrance, and several branches or arms. This we visited one day in the steam launch, and as many kinds of fish could be seen, I conceived the idea that perhaps they might be caught by setting a gill-net across the mouth of one of the branches, and then, by splashing and making a noise, so frighten the fish that they would run into the net. This we tried on a subsequent occasion, but our success was limited to the capture of two individuals. There was no doubt but that we frightened the fish badly enough, but their habits of hiding under rocks proved too much for us, and despite our utmost endeavors to drive them out of the branch, and thus into the net, they invariably succeeded in escaping to their favorite retreats with the two exceptions above alluded to. The most careful attempt to catch them in a dip-net

was only time wasted. We managed, however, to take a few parrot-fish and box-fish on hooks.

Should the capture of the fish of this region ever be a matter of commercial importance, it is probable that they might be taken in considerable quantities in gill-nets set at night, but the presence of many large predaceous species, among which sharks are not uncommon, would compel the fisherman to watch his gear with a never-failing vigilance to prevent its destruction.

It may be mentioned that porpoises appear to be numerous about the shores of Cozumel, and we frequently saw large schools of them close in to the land, passing up or down the coast, and apparently feeding.

For reasons already named, I kept no record of the different kinds of fish captured at Cozumel, and reference is made to other reports to supply this omission, as well as the details as to date, &c., of the seine hauls; the latter I have, but it is obvious that they would be of no importance here, and properly belong elsewhere.*

3. FROM COZUMEL TO PENSACOLA.

Our stay at Cozumel ended on the evening of Thursday, January 29. On the morning of the same day we left San Miguel and steamed down the west coast of the island, some 14 or 15 miles to the southward, and while a party of us were ashore with the seine making hauls on the beach and otherwise engaged in collecting, the ship made some dredgings in the deep water outside the plateau that slopes away very gradually, for a distance of a mile or so from shore, when the bottom drops suddenly down, like a mural cliff, to a depth of 100 or 200 fathoms.

Our seining operations on this occasion were conducted under considerable difficulties. Aside from the trouble that arose from the seine being almost constantly afoul of the bottom, thus, on one occasion, at least, requiring hours of incessant toil to make a single landing, the afternoon was excessively hot; the sun shone in unclouded brilliancy most of the time, sending down a burning blazing heat, that was greatly intensified by being reflected from the white sand beach, and which the light air of wind then blowing scarcely modified at all. It was almost unendurable, and sometimes we were nearly blinded with the glare from the beach, as well as with the perspiration that streamed down our brows and filled our eyes. However, the work went on until it was time to return to the ship, and no one suffered seriously from the exposure.

On the day after leaving Cozumel, January 30, we made several attempts to catch fish with hand-lines on Campeche Bank, that lays to the

*As it is the privilege as well as the duty of others to report upon the ichthyology, as well as other matters relating to Cozumel, it seems necessary for me to give only such facts as pertain particularly to fishing; though in writing of a place so little known and so interesting on many accounts as is this island, there is, of course, more or less temptation for one to stray somewhat from the subject one may be dealing with. This I have tried to avoid.

northward of Cape Catoche. The first trial was made about 8 a. m., when two lines were put out, soundings having been previously taken (at 7.42 a. m.) in 26 fathoms, on white coral bottom (station 2360). No fish were taken on this occasion. Several dredgings were then made with tangles and beam-trawl at stations 2361 and 2362. From the latter position the ship steamed 8 knots on a southwest by west course, and at 10.37 a. m. sounded in 21 fathoms, on red and white coral bottom (station 2363, lat. 22° 7′ 30″ N., long. 87° 6′ W.). A number of lines were put out, but, with the exception of one small fish that was of no commercial value, nothing was caught. A haul was made with the beam trawl at this station, bringing up, among other things, a large amount of dead shells and coral, also a few small fishes, none, however, of any economic importance.

After the trawl was up, the ship steamed northward about a mile, and at 11.25 a. m. sounded in 22 fathoms (station 2364, lat. 22° 08′ N., long. 87° 06′ W.). Eight or ten lines were put out—baited, as before, with salt mackerel and the meat of live conch shells—and we engaged in fishing until a little after 1 p. m., the fish biting the best, perhaps, about noon. Fifteen large red groupers were caught, and probably twice that number lost after being hooked. Some got away after being brought alongside, and in several instances they parted the snoods and went off with the hooks. The fish weighed from about 9 to upwards of 15 pounds apiece.

After the fish ceased biting, the beam-trawl was put out and a dredging made. In this instance, as before, the trawl brought up considerable quantities of dead shells and dead coral, among other material, the general character of the haul indicating what fishermen usually designate as "dead bottom."* As a rule, this kind of ground is more or less destitute of animal life that may serve as food for the larger and more valuable kinds of ground-feeding food-fishes, and it is seldom that they are found in great abundance in such localities.

Later in the day, the ship steamed northwardly, and dredgings were made at station 2365 (lat. 22° 18′ N., long. 87° 04′ W.), in 24 fathoms; station 2366 (lat. 22° 28′ N., long. 87° 02′ W.), in 27 fathoms; and at station 2367 (lat. 22° 38′ N., long. 87° 00′ W.), in 124 fathoms. At the two first-mentioned positions a line was put out for a few minutes, but nothing was caught. The last haul with the beam-trawl was made after dark.

From Campeche Bank the ship proceeded directly to Pensacola, and on the afternoon of February 2 we reached the navy-yard at that port and made fast to the pier.

4. FIRST RED-SNAPPER TRIP FROM PENSACOLA.

On the following morning, in compliance with the request of Captain Tanner, I went to the city of Pensacola, some 5 miles above the navy-

*For details of the material taken in these dredgings reference is made to the reports on the collections obtained during the cruise.

yard, in the steam launch, to meet Mr. Silas Stearns and invite him to go on board the ship to have an interview with the captain relative to the red-snapper fishery and our proposed cruise on the grounds where the snapper is taken. Mr. Stearns, as I learned, had left Pensacola the previous evening, with a party of friends, for a boating and hunting trip to the eastward, his intention being to stay two or three weeks, and, perhaps, extend his cruise upward of 100 miles. It was deemed desirable to have some one to go out with us who was familiar with the snapper fishery, and failing to get Mr. Stearns, upon whom Captain Tanner had depended, I was requested to engage some one to go in his stead. Accordingly, on Wednesday, February 4, I again went to the city and had an interview with Mr. A. F. Warren, senior member of the fishing firm of Warren & Co., of which Mr. Stearns is the junior partner. Mr. Warren kindly offered to permit his foreman, Mr. Asa Ward, to make a trip with us, and as Mr. Ward cheerfully assented to this arrangement, and besides had the reputation of being one of the best experts in the port—having commanded a smack in the snapper fishery for several seasons—the offer was very gratefully accepted.

On this occasion I also purchased some lines and sinkers, so that a set of gear might be rigged suitable for catching red snappers, since the hand-lines on the ship had become more or less deteriorated and out of repair after two years' service.

As the navy-yard steam-launch, upon which I had gone to the city, would return after a short stay at Pensacola, I decided to remain at the town until the next day, in order that I might make some investigations concerning the fisheries of the port and other points on the adjacent coast. I am under obligations to Mr. Warren, not only for the valuable information furnished by him, but also for the important assistance he rendered in procuring me interviews with persons who were best able to supply the facts I wanted. The result of these interviews is given in the appended notes on the fisheries of Pensacola and other points on the west coast of Florida.

I returned to the ship on the afternoon of February 5, and busied myself during the latter part of the day and evening in rigging the fishing gear, which, however, was not completed until the next day. On the morning of the 6th I went in the steam launch to Pensacola and got Mr. Ward, it having been decided that we should leave port in the evening, so that we might reach the fishing ground off Cape San Blas the next morning.

We got under way late in the afternoon, and, after pulling off the lumber-loaded three-masted schooner Fannie Whitmore, of Rockland, Me., which we came across on our way out, grounded on the western side of the channel, near the ruins of Fort McRae, we steamed out to sea and headed to the eastward. There was a light southwest breeze and smooth sea in the evening, with a promise of a good day on the morrow. This promise was verified. The morning of the 7th was fine, with

a light southeast breeze, and the weather continued favorable throughout the day, the wind increasing slightly, and veering a little, perhaps, but not enough to be considered a material change.

At 5.45 a. m. a sounding was taken in 16 fathoms; fine white sand, lat. 29° 31′ N., long. 85° 36′ 20″ W. Our object was to get on the "Old Cape Ground," a well-known and favorite fishing bank for red snappers off Cape San Blas, and which lay a little farther offshore, where the water was deeper, the depths most generally resorted to in this region at this season being from 26 to 31 fathoms, though during the spring and summer snappers are frequently taken inshore in much shallower water.

After making the sounding alluded to above the ship headed to the southward, and two successive soundings were made, one at 6.25 and the other at 6.55 a. m., without deepening the water, that last mentioned giving only 15 fathoms. Finally, at 8.11 a. m., we sounded in 27 fathoms (lat. 29° 16′ 20″ N., long. 85° 34′ W.), on a bottom of gray and black sand and shells. The bottom as well as the depth was favorable, and lines were immediately put out, baited with salt mackerel. No sooner had they reached bottom than first one and then another of those fishing had a vigorous bite, and a few minutes later several red snappers were landed on deck, and also some porgies and a red grouper. A dozen lines were now out, and fishing began in good earnest, but success was at first often interfered with by the hooks being stripped of bait before a fish could be caught. If a fish failed to swallow the hook sufficiently for its point to fasten in his mouth he invariably took the bait, as long as mackerel were used, the result being more or less "water hauls" that were certainly not satisfactory to those engaged in fishing. But this difficulty was soon averted by using bait cut from the sides of the porgies, and very excellent and tough bait this was; but this is about all that the species is good for, as it has a strong, disagreeable odor that makes it repulsive for food.*

The snappers caught on this occasion were small, the largest not exceeding 10 pounds in weight, while the average would probably not be above 5 pounds. Porgies were almost as numerous as the snappers, and even more so after a little while. They served a good purpose in supplying us with bait, but their skill in "skinning" the hooks proved a source of annoyance. After the fishing had continued for twenty minutes or a half hour, the ship drifted away from the snappers, and nothing could be caught except porgies. The ship then got under way the fish were counted, and it was found that 30 red snappers, 3 red groupers, and 25 porgies had been caught. It may be remarked incidentally that Mr. Benedict, the resident naturalist, made an examination of all the fish taken on this and subsequent occasions during the day, for the purpose of securing parasites and making other observations.

* Porgies are used for food at Key West, where, curiously enough, it is said that they do not have the strong odor that is their chief characteristic about Pensacola.

After steaming to windward a short distance, possibly a little farther than we had drifted, the ship hove to again and the lines were put out. This time we were fortunate enough to stop directly on the center of the school, and the fish not only bit with the utmost eagerness, but they were much larger and finer than those previously taken, and besides there were very few of other kinds. No sooner would the hooks reach bottom than they would be taken; pairs of large snappers were frequently caught, and so eager did they become that they chased the gear up in the water. It frequently happened that if one started his line from bottom with only a single fish on it another would bite the free hook before it got far up. In one instance my line was fouled and stopped running for a moment, when about half way to bottom. When it was free I found it "loaded," and pulled in two fine snappers that averaged 15 pounds each, at the least. As is well known, the red snapper is one of the gamiest of sea fishes, consequently it requires some muscle and grip to continue pulling in such big and active fish, particularly when two at a time come as often as one. Every one began fishing barehanded, and, as a consequence, it was not long before all had their hands more or less blistered by the lines, and gloves, mittens, &c., were in requisition. For nearly an hour or more the fishing continued in good earnest, but at the expiration of that time the ship drifted off the school, as before, and not a single fish could be caught. While we were steaming to windward again opportunity was afforded to sum up the results, which were as follows: 80 red snappers, the largest weighing 21 pounds, 2 groupers, and 6 porgies. A large number of the snappers would tip the scales at 12 to 15 pounds, while not a few were heavier.

The ship hove to after going a short distance, but on this occasion we were less fortunate than before. Only seven snappers were caught, but these were of extraordinary size, the largest weighing 27½ pounds, which would seem to be about the maximum for the species, since we are told that one is seldom seen to exceed or even equal this in size. Besides the snappers, we caught two or three gags and a single porgie. It was not long, however, before we could not catch anything, and the ship then shifted her position again. The remainder of the day was spent in dredging with the beam-trawl, but no more fish were taken, notwithstanding lines were put out at nearly every station. The material dredged up from the bottom consisted for the most part of dead shells, dead corals, black sand, gravel, &c., with which were many small crustacea, small octopods, and worms, also a few little fish, and some other material. In one locality "live bottom" was found, many live corals, shells, sponges, &c., being brought up in the trawl. The fishermen claim that patches of bottom of this character are the favorite haunts of the red snapper. In another place (station 2375, in 30 fathoms, lat. 29° 10′ N., long. 85° 31′ W.), where we made the last dredging of the day, large numbers of flat sea urchins, called "sand

dollars" by fishermen, came up in the beam-trawl. Where these occur, either in northern or southern seas, the bottom is usually barren of such fish life as would be of any economic importance.

On the evening of the 7th, the ship steered for Pensacola, where she arrived and made fast to the navy-yard wharf on the following morning. Monday, Dr. Bean and I went on a seining expedition along the west shore of Pensacola Bay. Six seamen were detailed to go with us in the dinghy to assist in handling the apparatus. We carried both the capelan seine and the Baird collecting seine, but, notwithstanding the men worked with much willingness, volunteering to wade into the water whenever there was any probability of securing fish, the results obtained were rather unimportant. Our lack of success was chiefly due to the fact that a cold westerly wind was blowing, and this lowered the temperature of the shallow inshore waters to such an extent (according to the local fishermen) that the fish would not "play in."

5. FROM PENSACOLA TO NEW ORLEANS AND RETURN.

On the afternoon of February 10 the ship left Pensacola and stood out to sea.

While at Pensacola, Mr. Warren had shown me a chart on which a bank of considerable size, with an average depth of about 40 fathoms, was laid down between Pensacola and the passes of the Mississippi, in a position where the twenty-ninth parallel of north latitude cut its southern edge, and the eighty-eighth meridian, west longitude, crossed nearly at its center. On some of the more recently published charts no soundings are laid down in this particular locality, which is some distance outside of the 50-fathom line of shore soundings, while on others it is marked as "uncertain." The fishermen, therefore, have been in some doubt as to whether such a bank really existed or not, and as they fully believed that, if it did exist, red snappers and other species of food-fishes would be found in abundance on it, they have naturally felt much interest in having this fact fully determined. On one occasion a smack attempted to find the bank and failed, but as she was provided with no nautical instruments for determining her position, it has always been a mooted question whether or not she sounded in the right locality. So important was the settlement of this question considered that Mr. Stearns, in a letter addressed to the Commissioner of Fish and Fisheries, mentioned this as a matter deserving of special investigation by the Albatross whenever she should visit this part of the Gulf of Mexico.

Having made this seemingly necessary explanation, it only remains to be added that a series of soundings were made on the 11th, with the purpose of determining whether or not such a bank exists in the locality alluded to.

The following data, extracted from the official records of the ship, show where the soundings were made and the depths obtained:

[Date, March 11.]

Depth.	Lat., N.	Long., W.	Character of bottom.
Faths.	° ′ ″	° ′ ″	
43	29 22 00	87 46 30	
99	29 17 30	87 49 00	
206	29 13 00	87 51 30	
362	29 08 30	87 54 00	
599	29 04 00	87 56 30	
740	28 58 15	88 00 00	
698	28 54 00	88 02 30	
747	28 56 30	87 58 30	
611	28 59 00	87 55 30	
739	29 02 45	87 53 00	
573	28 59 30	88 06 00	
486	28 58 20	88 14 00	
324	29 03 15	88 10 00	
210	29 07 30	88 08 00	
68	29 14 30	88 09 30	
46	29 19 30	88 11 30	Gray mud.
35	29 21 45	88 14 00	Gray sand.
32	29 22 30	88 17 00	Gray sand and mud.*
30	29 22 15	88 21 00	
36	29 17 30	88 21 00	

* The character of the bottom, like the few instances given, was unsuitable for red snappers and similar food-fish to live on.

Several hauls were made with the beam-trawl on the afternoon of the 11th, in about 500 fathoms, and excellent results were obtained.

On the 12th we entered the South Pass of the Mississippi, and the following day reached New Orleans, where the ship remained until March 1, she having been opened to the public, at the wharf near the Exposition grounds, from the morning of February 20 until our departure. It is, perhaps, proper to remark in this place that the Albatross proved a great attraction, and during her stay at the Exposition she was thronged by a crowd of sight-seers, many of whom were gentlemen and ladies who were interested in scientific work and who found in the ship and her apparatus and collections material so instructive and attractive that some of them came on board repeatedly and frequently made it a point to bring their friends and relatives.

The two days after we left the Mississippi, March 2 and 3, were spent in dredging in deep water in the northern part of the Gulf. On the 4th the entire day was spent in dredging and trying for fish along a stretch of ground off Mobile. The first attempt to catch fish was made at 6.30 a. m., in 54 fathoms (lat. 29° 17′ 15″ N., long. 88° 05′ 30″ W.), but nothing was caught. Eleven other trials were made in course of the day, in from 22 to 40 fathoms, at intervals of about 2 to 4 miles, but no success was met with, not even a bite having been felt on the lines, several of which were put out whenever the ship stopped. The series of soundings and trials for fish were not run in a straight line, but in a sort of zig-zag form along the ground, the ship first heading in at an angle on the bank toward shallow water and then off. This method offered the greatest probability of success. The last attempt to catch fish was made late in the afternoon, in 22 fathoms, on fine white sand, the ship's position being 29° 40′ 30″ N. lat., and 87° 32′ 30″ W. long. The soundings for the day, in the order of their occurrence, between

the first and last trial for fish, were as follows: Thirty-two fathoms, sand, gravel, broken shells; 25 fathoms, gray sand; 35 fathoms, yellow sand, black specks; 27 fathoms, gray sand, broken shells; 36 fathoms, fine gray sand, black specks; 30 fathoms, coarse sand, black specks, stones; 25 fathoms, gray sand, black specks; 25 fathoms, coarse sand, black specks, broken shells; 22 fathoms, fine white sand. As will be seen the depth and character of the bottom are precisely the same on the two last soundings taken, although they were made more than 4 miles apart. It would appear somewhat strange that not a single food-fish was taken over all this extended area. But the dredgings made with the beam-trawl brought up very little that might serve as food for fish so active and voracious as either the red snapper or grouper. According to Mr. Stearns, red snappers are often found abundant over this ground, and, indeed, still farther inshore, a few weeks later, in April and May, when they are near their spawning season. He thinks that they go in at such times on the sandy bottom to spawn, where their eggs may be less liable to attacks from crustacea and numerous species of predaceous fish that are plentiful a little farther out, in deeper water. He is also of the opinion that it is possible some schools of snappers might have been found in 35 to 47 fathoms, a little outside of the northernmost soundings obtained by us. Although the snappers that are caught to the eastward, in the vicinity of Cape San Blas, are taken in from 27 to 31 fathoms (and on one spot in a less depth) in winter, the fishermen say that they must go in deeper water on the grounds off Mobile.

Early on the morning of March 5 the ship arrived in Pensacola and made fast to the coal wharf at the navy-yard.

6. SECOND RED-SNAPPER TRIP FROM PENSACOLA.

During the forenoon after our arrival at Pensacola I went to the town in the steam launch, at Captain Tanner's request, to see Mr. Stearns and ask him to come on board the ship, which he did. He wished to make a trip with us to the snapper banks, and on his return to town made arrangements to do so. He accordingly came on board again the next day (March 6), and at 5.15 p. m. the ship left the navy-yard and steamed to sea. After getting outside the bar the course was laid for the "Old Cape Ground," off Cape San Blas. At a little before 6 o'clock on the morning of the 7th we began fishing, in 30 fathoms; bottom of gray sand, black specks, and broken shells; the ship's position being lat. 29° 16′ 19″ N., long. 85° 49′ 30″ W. Several hand-lines were put out, these being baited with mackerel, but only one grouper was caught; one of the men reported hauling a small red snapper alongside, but he lost it. At 6.30 the ship started ahead and steamed nearly 2 miles southeast by east, where soundings were taken in 29 fathoms; bottom same as before; position, lat. 29° 16′ 00″ N., long. 85° 47′ 30″ W. The fishing lines were put out as soon as the ship stopped, and almost immediately a grouper and snapper were caught. We fished almost an

hour in this berth, the total catch being as follows: One amber fish (*Seriola*); 1 scamp (*Trisotropis falcatus* Poey); 1 large black grouper or gag (*Trisotropis brunneus* Poey); 2 spotted hinds (*Epinephelus drummondhayi* Goode & Bean); 6 red groupers (*E. morio*); 2 porgies (*Sparus*); 9 red snappers (*Lutjanus blackfordii* Goode & Bean).

It may be remarked that as soon as it was practicable fresh bait—grouper and porgie—was used instead of the salt mackerel. It appears, however, that the red snapper is not fond of grouper bait, and unless he is very hungry will not take it readily. The fishermen usually "point" their hooks with some sort of bait which is attractive to the snapper, putting the coarser kinds on the shank.

At 7.40 the ship started ahead on an east by north course, and ran 20 minutes, when soundings were taken in 31 fathoms, bottom as before (lat. 29° 17′ 20″ N., long. 85° 45′ 30″ W.). The lines were hove out as soon as the ship stopped, and fishing continued for 55 minutes. The catch in this berth was 7 snappers, 6 groupers, 2 spotted hinds, and 2 scamp. After this, twenty-eight more trials were made for fish during the day, with the result given in the following table, which also contains the positions, depth of water, &c., where soundings were taken and lines put out. As a rule, the ship stopped from 5 to 10 minutes in each position, except when fish were caught, when the stay was longer. The last sounding was taken at 5.56 p. m., when it was nearly dark and too late to carry the investigation farther, though there appeared to be some fish in this berth.

[Date, March 7.]

Depth	Lat., N.	Long., W.	Character of bottom as shown by the lead.	Remarks.
Faths.	° ′ ″	° ′ ″		
30	29 18 40	85 43 30	Gray sand, black specks, broken shells.	No fish.
27	29 20 05	85 41 30	....do	Do.
29	29 19 00	85 41 45	....do	Do.
25	29 18 15	85 41 00	....do	1 porgie.
29	29 17 30	85 40 15	....do	2 groupers, 1 porgie.
28	29 16 45	85 39 30	....do	6 red groupers, 5 red snappers, 1 porgie.
31	29 16 00	85 38 45	....do	5 red groupers, 2 snappers, 1 porgie.
33	29 15 11	85 38 00	Gray sand, black specks	No fish.
32½	29 15 10	85 37 09	Fine gray sand, black specks.	Do.
31	29 15 10	85 36 00	....do	Do.
29	29 15 40	85 35 15	Fine gray sand	Do.
25	29 16 15	85 34 30	Coarse, black sand, fine shells.	Do.
27	29 15 00	85 34 30	White sand, black specks, fine shells.	Do.
27	29 14 00	85 33 30	Fine sand, black specks	Do.
26	29 13 00	85 32 30	Fine white sand, black specks.	Do.
26	29 12 30	85 32 00	Coarse sand, black specks, fine shells.	Do.
29	29 15 10	85 34 30	Fine white sand, black specks.	Do.
29	29 16 39	85 36 00	do	Do.
27	29 17 10	85 36 30	Fine white sand, black specks.	Do.
27	29 17 50	85 37 00	Fine sand, black specks, broken shells.	Do.
28	29 18 30	85 37 30	Gray and black sand, broken shells.	Do.
26	29 19 15	85 38 00	....do	Do.
26	29 19 40	85 39 20	....do	Do.
26	29 20 05	85 40 40	....do	Do.
26	29 20 30	85 42 00	....do	Do.
28	29 19 45	85 42 50	....do	Do.
28	29 19 20	85 43 15	....do	Do.
28	29 19 00	85 43 15	....do	10 snappers, 8 red groupers, 2 black groupers.

The scarcity of red snappers on this ground may be considered somewhat remarkable, considering that only a few years ago they were abundant. However, from their peculiar habit of going in schools that cover only a limited area, it is often difficult for the fishermen to find them, and sometimes a whole day will be spent in sounding and trying to catch snappers without meeting with any material success.

At this season, we are told, it is more difficult to find good snapper fishing than in winter. The fishermen say that the schools appear to be somewhat broken up, the fish are moving about, and it is believed they are up in the water chasing smaller fish that come on the coast in the early spring.

After the last sounding was made, and some fish taken, the order was given to set the large gill-nets to ascertain if any red snappers could be taken in them. There was considerable difficulty in getting the two nets ready; they got fouled up and had to be cleared, and besides, sinkers had to be prepared for them. Consequently, considerable time was occupied in preparing them for setting. In the mean time the ship had, of course, drifted off the spot where the fish were caught, but she steamed back to the place, or as near to it as could be judged.

At 8.30 p. m. the dinghy was lowered, and Mr. Stearns and two seamen went into the boat with me to set and haul the nets. As soon as the boat was well clear of the ship we began setting the gear. It was a slow job, for the twine fouled a good deal here and there on the dinghy, and in the darkness was more or less difficult to clear, while the boat jumped about considerably, notwithstanding there was only a moderate breeze and a small choppy sea. We got the nets set at 9 p. m. and began hauling at 10.40. There was somewhat more wind and sea by the time we began to haul; the current ran quite strongly to leeward, and as we had to pull the net in over the boat's side, thus keeping her broadside to the sea and tide, it was a heavy drag to get the apparatus up. We returned to the ship a little after midnight. No fish were taken. The nets set on this occasion were each 50 fathoms long, and 3 fathoms deep, when hung. They had a 9-inch mesh, and were made of strong linen twine, such as is used in the manufacture of cod gill-nets.

After the dinghy was hoisted, the ship steamed to the westward 7 or 8 miles, and hove to for the night. During the forenoon of the 8th trials were made for fish on nearly the same ground that we fished over the previous morning. Satisfactory results were not obtained, however, and about 10 a. m. the ship started to the southeast for the "New Cape Ground," the locality aimed at being about 40 miles from the starting point.

The following tabulated statement will show where the trials were made, the catch, &c.:

[Date, March 8.]

Depth.	Lat., N.	Long., W.	Character of bottom as indicated by the lead.	Remarks.
Faths.	° ′ ″	° ′ ″		
30	29 16 15	85 42 30	Gray and black sand, and broken shells.	No fish.
29	29 16 45	85 41 00	.....do.....	4 groupers; 1 red snapper; 1 spotted hind
29	29 15 30	85 40 15	.....do.....	4 groupers; 1 red snapper.
31	29 17 45	85 42 00	.....do.....	No fish.
27	29 20 30	85 44 00	.....do.....	Do.
29	29 19 30	85 45 00	.....do.....	Do.
29	29 20 15	85 45 40	.....do.....	6 red groupers; 2 red snappers.
28	29 21 00	85 46 20	Gravel and broken shells.....	No fish.
31	28 51 20	85 10 00	Gray sand and broken shells.	Do.
30	28 52 10	85 09 20	Coarse gray sand and broken shells.	Do.
29	28 53 00	85 08 40	Gray sand and broken shells.	Do.
28	28 54 00	85 08 00	Gray sand, black specks, and broken shells.	20 red snappers; 2 black groupers.

The snappers taken in the last berth were much larger and finer than any that had been caught before on this or the previous day. As soon as the fish were struck the order was given to set the trawl-line, which was already baited and placed in the dinghy, with the other necessary apparatus, in readiness for use. The boat was lowered at once, and I went in her, with two seamen, to set the gear. As soon as the dinghy was well clear of the ship's stern we began to put out the line, and set it to leeward, which was nearly in the direction that the current was running. Unfortunately, the trawl-line was too far to leeward to cross the spot where the snappers were found, and, as a consequence, no food-fishes were taken on it, the catch being three eels, each about 15 inches long, and two other small fish of no economic value.

The day was well advanced when the trawl was set, and it was a little past 5 p. m. when we returned to the ship. In the mean time, while the boat had been out, a dozen or fifteen fine snappers were caught on board the ship about one or two cable's length to windward of the weather trawl-buoy. As soon as the dinghy was hoisted, the ship started ahead on her course for Pensacola, where she arrived, and made fast to the navy-yard wharf, about 3:30 p. m. on the 9th.

Before concluding the account of the trip above described it should be stated that during the two days the ship was on the fishing ground the weather was fine, and the wind moderate, consequently there was a good opportunity for obtaining observations to determine the positions accurately, and nothing to prevent a boat from going out whenever it seemed necessary.

We laid at the navy-yard three days. On the afternoon of March 11 Mr. Benedict and I started off in the dinghy for a cruise about the bay, hoping to capture some porpoises, which appear to be abundant there. Although we saw numbers of them, and they seemed especially plenty about Santa Rosa Island, they were too wary for us to get near enough to kill them. Despite numerous attempts, we could not approach close

enough even to shoot at them with any hope of success, and as for striking them with an iron, it was entirely out of the question. On one occasion we both discharged our guns simultaneously at a school, and doubtless hit some individuals, but it is probable that the shot struck them only in their backs, where they would have no very marked effect. The porpoises were "playing" about in the shallow water near the island, apparently feeding on small fish, and one would naturally suppose they could be approached without difficulty. But they invariably noticed the presence of the boat when within 40 to 60 yards of it, and would disappear to come up at a greater distance.

7. FROM PENSACOLA TO TAMPA.

About 5 o'clock on the afternoon of the 12th the ship cast off from the navy-yard wharf and stood out to sea. The two succeeding days (March 13 and 14) were spent in dredging to the southward of the snapper grounds, between 87° 27′ 00″ and 85° 33′ 30″ west longitude, in depths varying from 111 to 724 fathoms.

On the morning of the 15th the ship headed toward the fishing grounds off Cape San Blas, and a continuous series of dredgings and trials for fish were carried on throughout the day. The first two soundings, 88 and 60 fathoms, respectively, were made outside the snapper bank. To ascertain, however, if there were any food-fish in deeper water than they are usually caught in, a snood, with a baited hook attached, was bent to the sounding wire before the first sounding was taken. Nothing was caught on this hook, though it was tried several times, even after we got into shoaler water. But this failure is not so much to be wondered at, for on the same occasions we did not catch any fish on the hand-lines, a number of which were put out to try for snappers whenever a sounding was made (after we got on the bank), and also after the beam-trawl had been hove up. Indeed, every effort was made to catch fish whenever a chance offered, and where we failed it is fair to assume that there were none.

The following tabulated statement of the day's work shows the positions where these trials were made, and contains other data bearing on the investigation:

[Date, March 15.]

Depth.	Lat. W.	Long. N.	Character of bottom as indicated by the lead.	Remarks.
Faths.	° ′ ″	° ′ ″		
88	28 42 30	85 29 00	Gray mud	Here (station 2403), the beam-trawl was put out. Many small fish, crustacea, and a few living shells were taken. No large food-fish were caught; no fishing lines put out.
60	28 44 00	85 16 00	Gray sand	No food-fish taken. The beam-trawl was used. It brought up a number of fish, none of them of any commercial value and most of them very small varieties. There were also some crabs, dead shells, &c. The general character of the material taken indicated "dead bottom," and the presence of large flat sea urchins ("sand dollars"), such as we took here, is considered a "sign" of barren ground by fishermen.

[Date, March 15—Continued.]

Depth.	Lat. W.	Long. N.	Character of bottom as indicated by the lead.	Remarks.
Faths.	° ′ ″	° ′ ″		
30	28 45 00	85 02 00	Coarse sand, broken coral.	No food-fish taken. A dredging was made with the beam-trawl. Quantities of dead shells, with a few small fish, and several forms of invertebrate life were taken; nothing however to indicate the presence of food-fish.
26	28 46 00	84 49 30	.....do.....	Tried for fish when sounding was taken, but without success. The beam-trawl was put out and brought up about the same kind of material as before, though this time there were a few live shells. After the trawl was hove up the fishing lines were put out and 1 red grouper was caught.
24	28 47 30	84 37 00	Coral and broken shells	No fish.
24	28 48 00	84 36 00	Sand, coral, broken shells.	Do.
24	28 47 00	84 35 50	..... do	Do.
23	28 46 00	84 35 40	.....do	Caught 4 red gropers. Steamed ahead about three times the ship's length to try for snappers, but caught nothing in new position.
24	28 45 00	84 35 30	.....do	Caught 1 red snapper soon after the ship stopped, but not getting any more, ship changed her position about one-quarter of a mile. Put out lines again but caught nothing.
24	28 44 00	84 35 29	Sand and coral.....	No fish were caught, but the men reported feeling fish nibbling at their hooks Those were probably porgies.
24	28 43 00	84 35 30	Sand, coral, broken shells.	No fish.
26	28 42 00	84 35 40	Sand with black specks and broken shells.	Do.
26	28 41 30	84 35 50	Coarse black and gray sand, coral.	Do.
27	28 41 00	84 36 00	Gray sand, black specks, coral.	Do.
26	28 40 45	84 35 30	White sand, black specks, broken shells.	Do.
26	28 40 00	84 32 40	White sand, broken shells.	Do.
24	28 42 00	84 29 50	Yellow sand, black specks, broken shells	Do.
22	28 43 20	84 28 00	Coral	Do.
23	28 41 00	84 27 00	Fine white sand, broken shells,	Caught 2 red groupers.
21	28 44 40	84 26 00	Coarse gray sand	No fish.

One cannot help being impressed with the idea that the distribution of red snappers in this region is not what might be expected, and, though fares of these fish may be taken on this ground, it is evident that they occupy only a very limited area on it. It is certainly remarkable, to say the least, that we should have made nineteen trials and caught only eight groupers and a single snapper.

The last sounding and trial for fish was made after 6 p. m., at twilight, after which the ship lay drifting until the next morning.

As soon as daylight (5.30 a. m.), on the morning of the 16th, the work of "trying the ground" was again commenced and continued unremittingly throughout the day. These investigations were made to the southeastward of where we worked on the previous day, and a considerable number of the soundings were taken and fishing lines put out on a piece of ground which of late has become quite celebrated for the number of good fares that have been taken from it. Nevertheless, we failed to find good fishing, or anything approaching thereto, and considering that two of the largest fares of the winter were caught here only a few days before, the conviction is forced upon one that

either the fish had, in the mean time, left the ground, or else to find them it is necessary to sound every few fathoms, in fact, to literally "try every inch of the bottom." The result of the day's work is given in the following table:

[Date, March 16.]

Depth.	Lat., N.	Long., W.	Character of bottom as indicated by lead.	Remarks.
Fathe.	° ′ ″	° ′ ″		
21	28 50 00	84 32 30	Broken shells.....	No fish.
24	28 45 00	84 33 15	Fine white sand, black specks, broken shells.	Do.
27	28 40 00	84 34 00	Fine white sand, black specks.	Do.
24	28 38 45	84 28 30	Fine white sand, broken shells.	Do.
24	28 32 45	84 27 00	Coarse gray sand, broken shells.	Do.
21	28 28 00	84 25 00	Coral	10 red snappers and 1 grouper were taken here in a half hour's fishing. The snappers seemed to be not very abundant. The small beam-trawl was put out; it brought up some sponges, several species of little fish, sea urchins, hydroids, &c.
24	28 25 00	84 21 00	Coarse sand, black specks; shells.	No fish.
23	*28 21 00	84 18 00	.....do	Do.
22	28 20 00	84 12 00	Gray sand	Do.
21	28 19 45	84 06 00	White sand, black specks, broken shells.	Do.
21	28 15 45	84 02 35	.... do	2 red snappers and 10 groupers caught at this position; fished about 20 minutes.
22	28 11 45	83 59 10	.....do	No fish.
23	28 07 45	83 55 40	White sand, black specks.	1 grouper.
22	28 03 45	83 52 15	Fine gray sand, black specks.	No fish.
22	27 59 40	83 48 50	Coarse sand, broken shells.	Do.
22	27 55 30	83 45 25	Gray and black sand..	No fish. This sounding (and trial for fish) was made at 5.42 p. m., and closed the operations for the day, so far as fishing is concerned. Later, the ship headed in for Tampa Bay, and a series of soundings were taken in the evening, but these were for other purposes, and need not be detailed here.

A little after midnight the ship anchored off Egmont Key, and early on the morning of the 17th got under way and ran into Tampa, going as far up the bay as her draught would permit. She anchored off Gadsden Point at 9.30 a. m. While going up the bay arrangements were made to go on a seining expedition to the mouth of Manatee River, some 5 miles below the ship's anchorage, on the southeastern side of the bay.*

We noticed, while passing, that there were some beaches about the entrance to the river that had the appearance of being good seine hauls, but elsewhere in the vicinity of where we anchored the indications were not favorable. The capelan seine having been put in the dinghy with other necessary articles, before the ship dropped anchor, the boat was soon after lowered and a party of us started for the Manatee. Lieutenant Baker, Ensign Swift, Mr. Lee, three seamen, and myself made up the party.

* The charts of this section do not agree as to the location of Manatee River. On some of them its mouth is placed near the lower part of Tampa Bay. The large-scale Coast-Survey chart of the bay is my authority for the location given above, which is doubtless the correct one.

With a strong head tide and light wind, our progress was necessarily somewhat slow, but with the assistance of the oars we reached the first beach on the point northeast of the entrance to the river about 11 o'clock. As we ran in across the broad shallow plateau that extends outwards from this point we frequently saw large fish going along over the bottom, but they were too far off to definitely determine what they were, though we thought the most of them were sharks. Nearer the land fish were seemingly abundant. They could be seen jumping out of water here and there, and occasionally a small school of mullet were noticed running along not far from the beach. Landing some of the party with the guns, baskets, buckets, &c., that had been brought along, we shoved off and immediately threw over the seine. Unfortunately for our complete success, so far as the capture of a large number of fish was concerned, the seine was too deep and too heavily leaded for the shallow water. The bottom was covered with algæ, and the bunt of the seine became so filled and clogged with it that considerable difficulty was experienced in making a landing; and notwithstanding our best efforts, this could not be done quickly enough to prevent a large number of mullet from jumping over the cork rope, while more of them were seen to escape by running around the ends of the net. But, even with these hindrances, we made a very fair haul, landing about a barrel or more of fish, among which were mullet, crevallé, catfish, sea trout, sheep's-head, and bill-fish, besides several kinds of smaller ones. Subsequently we made two other shots with the seine, and, in addition to the varieties mentioned above, we took drum, big-eyed herring [?], two shovel-nosed sharks, and some other kinds of fish that none of our party were familiar with.

Our second haul was made around the point from where we first landed, and at the mouth of the river. Fish of various kinds were very abundant here, jumping out of water in all directions over a large area. The water was shallow, from 2 to 6 feet deep, and from shore to shore, a distance of half or three-quarters of a mile, we could see fish springing into the air. But the loose algæ was even more plentiful here than where we had first set the seine, and as a result we had great difficulty in making a landing, and the mortification of seeing the fish we had inclosed jump the cork rope or dart by the wings of the net. However, we got several varieties that had not previously been taken, and, considering that we were not anxious to catch large quantities, the result was fairly satisfactory. But with a larger-meshed seine, 70 or 80 fathoms long, and about 6 feet deep, we could doubtless have filled our boat in a short time.

Sharks are seemingly abundant here. Besides the two small ones taken in the seine, we saw a large one come in near the shore in the shallow water. As he swam about, near the point, his dorsal fin was plainly seen above the water's surface. Of the other species, mullet were apparently most plentiful, but big-eyed herring, crevallé, sheeps-head, and catfish were also abundant. Fish-hawks were numerous, and

evidently had no difficulty in supplying their wants, since in such shallow water they could easily capture all the fish they required, as we had a chance to observe.

We returned to the ship about 5 p. m. The steam launch met us, after we had sailed about a mile from the point, and took the dinghy in tow.

Were it not for the presence of so many sharks, pounds could probably be used here with great success. But the destruction of any netting left in the water for a considerable length of time would be inevitable. It is possible, however, that a brush weir might be successfully used, but it is probable that the toredo would injure it to such an extent that it would have to be rebuilt at comparatively short intervals. Therefore, while the demand for fish can be supplied by using seines that are inexpensive and seemingly well adapted for work in the shallow waters of the coast, there is little inducement to make any very radical changes in the apparatus employed.

8. FROM TAMPA TO KEY WEST.

Early on the morning of the 18th the ship got under way and ran out of Tampa. After getting outside the channel, or fair-way, buoy, she steamed offshore on a southwest three-quarter south course. The day was fine, with a light westerly breeze, and after we were well off from the land a series of soundings and trials for fish were begun and continued until night, and also on the next day. The general direction of these researches, after we reached a depth of 28 fathoms, was southerly and southeasterly, or nearly parallel with the coast line. The following is a tabulated statement of the work done on the 18th and 19th:

[Date, March 18.]

Depth.	Lat., N.	Long., W.	Character of bottom as indicated by the lead.	Remarks.
Fath.	° ′ ″	° ′ ″		
18	27 16 00	83 10 00	Gray and black sand..	Stopped to pick up small sharpie that was adrift; put out lines; no fish.
25	27 08 30	83 19 30	Coarse gray and black sand.	No fish.
26	27 04 00	83 21 15	Coarse gray sand and broken shells.	Here, 1 red snapper, 2 groupers, and 1 porgie were taken. As soon as we began to catch fish the beam-trawl was lowered and dragged along the bottom as the ship drifted. The trawl was on the ground about fifteen minutes. It brought up a large mass of material (about 1½ barrels), most of which was sponges of various species, 3 of them being very large cup sponges. There were also a few live corals, bryozoa, hydroids, shells, and some small fish. A scarcity of dead shells, dead corals, &c., was noticeable, and contrasted strongly in this respect with the grounds we have previously dredged, particularly in those localities where no fish were caught.
26	26 58 00	83 22 30	.....do.....	In this position, where we stopped less than fifteen minutes, 2 large red snappers (one weighing 20 pounds), 1 black grouper (25 pounds), and 4 red groupers were caught. As previously explained, our object was not to catch quantities of fish, but only to ascertain if there were any in the positions where we stopped; therefore ten or fifteen minutes was generally long enough to determine this, after which the ship stood on for a new berth unless the trawl was put over.

[Date, March 18—Continued.]

Depth.	Lat., N.	Long., W.	Character of bottom as indicated by the lead.	Remarks.
Fath.	° ′ ″	° ′ ″		
27	26 53 00	83 24 00	White sand, black specks, broken shells.	No fish.
28	26 47 30	83 25 15	Fine white sand, black specks, broken shells.	No fish. Rake-dredge put out.
29	26 42 30	83 22 45	Coarse sand, black specks, broken shells.	No fish.
28	26 38 00	83 20 00	Coarse sand, black specks.	1 red snapper.
27	26 33 30	83 15 30	Fine white sand, black specks.	1 red snapper (weight 20 pounds). Made a dredging with the beam-trawl and brought up a number of sponges that were filled with small crustaceans, worms, &c. In handling these our hands were filled with minute spicules that caused a troublesome irritation for several days. Some large holothurians also came up. A second haul was made, going faster, in hopes to catch some fish in the trawl, but none were taken. This was the last attempt made to catch fish for the day, since it was 6.24 p. m. when we stopped to sound, and therefore about dark. The ship lay drifting till next day.

[Date, March 19.]

26	26 28 15	83 11 00	Fine white sand, black specks.	No fish. This trial was made at daylight (5.22 a. m.).
28	26 23 15	83 11 15	Coarse gray sand, black specks, broken shells.	No fish.
27½	26 18 30	83 08 45	Fine gray sand, black specks, broken shells.	In this position we caught 12 fine red snappers and 1 grouper in ten minutes. The fish were exceedingly abundant, and were caught in pairs as fast as the lines were put out. They followed the gear up and were seen in the water alongside of the ship. Almost as soon as we struck fish, the beam-trawl was put over and a dredging made. It was left on the bottom only a few minutes. A considerable quantity of material was brought up in the trawl, among which were eight or ten different species of sponges, and also many live corals, bryozoa, hydroids, small crustacea, and several varieties of small fish. Of the latter a small species with yellow tail and pectorals was most numerous, there being 14 of this kind. Some ascidians were also taken, while the sponges were found to be filled with animal life, worms being most numerous.
27	26 12 30	83 06 30	Coarse gray sand, black specks, broken shells.	1 grouper.
25	26 08 30	83 03 45	Fine white sand, black specks, broken shells.	Here 3 groupers, 1 scamp, and 1 porgie were caught. Fished ten minutes.
24	26 04 30	83 01 00	Fine sand, black specks, broken shells.	No fish.
24	26 00 00	82 57 30	.....do.....	No fish. A dredging was made with beam-trawl, which came up heavily loaded, the bulk of the material being large cup sponges.
25	25 54 00	82 59 30	Fine white sand.....	No fish.
25	25 49 00	83 01 00	.....do.....	Do.
27	25 44 30	83 02 30	Sand and coral.....	1 red snapper caught; 2 others hauled up and lost.
27	25 39 30	83 01 00	Gray sand and broken shells.	The catch was 3 red snappers and 1 grouper. Several other fish were reported hooked, but broke away. Fished ten to fifteen minutes.
27	25 34 30	83 01 00	Gray sand, black specks.	No fish.
28	25 29 30	83 01 00	Coarse gray sand, broken shells.	Do.
27	25 24 30	83 00 00	Gray sand, black specks.	Do.
27	25 19 30	82 59 30	Gray mud, broken shells.	Do.
27	25 14 30	82 59 00	Gray mud, fine sand, broken shells.	Do.
27	25 09 30	82 59 00	Broken shells.....	Do.
26	25 04 30	82 59 15	Fine white sand, broken shells.	Do.

The last sounding, on the 19th, was made after 6 p. m., when it was nearly dark. The beam-trawl was put out here. After it was up the ship headed on her course for Key West, where she arrived the following morning.

The investigations that were made after leaving Tampa may fairly be considered as probably the most important work done on the cruise in the direction of making researches on the fishing grounds. The region lying between Tampa and the Tortugas, outside of a depth of 20 fathoms, has never been resorted to by fishing smacks, and it is certainly questionable if any one knew that red snappers could be taken on the ground we went over. That they are more generally distributed here, in depths of 26 to 27 fathoms, and far more abundant than on the grounds visited by the snapper fishermen of Pensacola, seems clearly established by the result of the researches made.

In view of the growing demand for the red snapper, and the fact that the fish on the old grounds are believed to be more or less depleted and becoming scarcer every year, the importance of this discovery, if it may so be termed, can scarcely be overestimated, since it opens up an additional field of broad proportions that there is good reason to suppose will be profitably worked in the future. Its nearness to Tampa, which has the advantages of an excellent harbor and railroad communication, are features that should not be overlooked, for if the distance from Pensacola is too great to run fish there they can be shipped from the nearer port.

In the latter part of the day on which we arrived at Key West I engaged a boat fisherman to catch some kingfish, and late on Monday afternoon, March 23, he got back, having taken all I wanted, besides a considerable quantity more. The fish having first been split, they were taken on board the ship and salted. These were purchased with the intention of experimenting with them, to ascertain if they can be smoked so as to make them a desirable article of food.

9. FROM KEY WEST TO WASHINGTON.

Early on the morning of March 30 the ship got under way and proceeded to sea, on her way north. A moderate to light head wind prevailed, but the next day the wind blew strong. The weather moderated during the night, and shortly after daylight, April 1, a dredging was made with the beam-trawl in 440 fathoms, a large mass of live corals, hydroids, sponges, bryozoa, &c., being obtained. The ship then steered north-northeast, and another haul was made with the trawl in the afternoon, sponges of various kinds being the chief part of the material taken. At 6 p. m. the ship stopped, and soundings were obtained in 86 fathoms, lat. 31° 54′ 45″ N., long. 79° 17′ 00″ W. Several fishing lines were put over, baited with salt mackerel, but nothing was caught, though we kept the gear out a half hour.

About 1 p. m., April 2, another attempt was made to catch fish in 95 fathoms, at station 2417 (lat. 33° 18′ 30″ N., long. 77° 07′ 00″ W.), but none were taken.

A haul with the beam-trawl was made near this place; sea urchins, of the "sand-dollar" type, and a few small fish (of which little skates and flounders formed the chief part) being the principal material taken. This is probably at all times "barren bottom." Another dredging and trial for fish with hand-lines were made about 6 p. m., in 107 fathoms (lat. 33°, 34′ N., long. 76°, 40′, 30″ W.), but we caught no fish, and a limited quantity of spiny sea urchins was nearly all that the trawl brought up.

From this time until 10.01 p. m., April 3, the ship was under way, steaming up the Gulf Stream. At the hour above mentioned the officers began taking a set of serial temperatures at intervals of 20 miles, beginning in the Gulf Stream, in 2,340 fathoms (lat. 36° 30′ N., long. 73° 14′ W.), and running in a west-northwesterly direction. This work was continued uninterruptedly until 6.20 p. m. on the 4th, when the ship was in lat. 37° 9′ 23″ N., long. 74° 30′ 30″ W. Not far from this position, in a depth of 65 to 100 fathoms, it was deemed desirable to try for fish, since here, on previous dredgings last year, various forms of life had been found abundant that were known to exist in great numbers on the grounds where the tilefish (*Lopholatilus chamæleonticeps*) was found previous to the remarkable mortality that occurred to that species in the spring of 1882, since which time not a single individual has been seen. Among these different animals a peculiar kind of crustacea, known as *Munida*, was found on the tilefish bank in great abundance, but, strange as it may seem, this also practically disappeared at the same time that the *Lopholatilus* was destroyed in such numbers. As these would be excellent food for large, voracious, bottom-feeding species, like the tilefish, it has been inferred that where the *Munida* is found plentiful there also it is probable (or possible) that the *Lopholatilus* may be caught. Therefore, the fact having been determined by previous investigation that this particular species (as well as some others that were contemporary with the tilefish) were plentiful just inside the Gulf Stream, in the locality named, the importance of ascertaining what kinds of fish could be taken on the same ground will be apparent.

But at the time we reached the proper locality, on the 4th, the wind blew up so strong from the westward that it kicked up a choppy sea and made it impracticable to do any fishing. The ship, therefore, lay by, steaming to windward only enough to hold her own, or a little more, until the next morning. About 6 a. m., on the 5th, a depth of 104 fathoms was obtained, and a haul was made with the beam-trawl (station 2420; lat. 37° 03′ 20″ N., long. 74° 31′ 40″ W.).

The trawl was on the bottom only a short time, but nevertheless brought up large quantities of *Munida*, eighteen specimens of small hake (*P. regius* [?]), several small tiger sharks, some small skate (*Raia*),

hermit, and other kinds of crabs, small octopods, &c. Many stones, wave-worn and of various kinds, came up, these having the appearance of beach rocks, or such as one sometimes sees pulled up from the bottom on the northern fishing banks. There were also many specimens of a hard, clayey substance, more or less perforated with holes of considerable size, but just what this is, or rather what causes such a formation, I believe has not yet been determined. Taken as a whole, this bottom must be excellently well adapted to the support of many kinds of fish life, particularly such as might be of commercial importance.

As soon as the trawl was up, several fishing lines were put out in 67 fathoms (lat. 37° 3′ N., long. 74° 33′ W.), and we continued fishing for about three-quarters of an hour. Eight dogfish (*Squalus acanthias*) were caught. These were so plenty that several pairs were taken on a single line. Nothing else was caught on the lines, however, and little else could be expected where these pests of the fishing grounds are abundant. For such is their pugnacity and greediness that they generally prevent all other species from taking the hooks, and not uncommonly, when they swarm in a locality, they drive other fish from it. This being the case, it will readily be understood that it is yet difficult to say precisely what kinds and what quantities of fish can be taken here, when the region is not infested by dogfish, which is probably a large part of the summer and fall.

Another matter that should be considered is this: we had only salt bait to use, and as tilefish have always, when taken, been caught on fresh bait, we are left in doubt as to whether they would bite at any other. The presence of such large quantities of live food that is suitable for them would lead one to suppose that they will not bite at salt material. However, this is not so important in the present case as it might be under other conditions, since, as has been explained, the presence of so many dogfish on the ground would doubtless render abortive all attempts to catch other fish, whatever bait was used.

A second trial was made in 98 fathoms, about 2 miles northeasterly from the position given above, but nothing was taken on the lines.

The ship then headed for the Chesapeake, and the work of taking serial temperatures was resumed. The importance of making these observations on temperatures at this season will be apparent to any one at all familiar with the habits of many species of our migratory fishes. About this time, or a little earlier, the mackerel, shad, and river herring or alewive, make their appearance on the coast in the latitude of the Chesapeake and a little north of it, while the menhaden, bluefish, and other species come a short time after. It is now a well recognized fact that the varying conditions of ocean temperature influence the movements of fish in a remarkable degree. This being the case, it need scarcely be added that the observations made must materially aid in the scientific study of the species referred to.

It may be remarked that we saw no schools of fish of any kind while

running in. It is probable that the strong westerly wind and rather cool weather might prevent mackerel from schooling, since it is well known that they do not "show up" much when such conditions prevail.

Porpoises were playing about the ship on the morning of the 5th, and I tried to harpoon one. He was too far under water, however, for the iron to fasten, and no other opportunity was presented for making a capture, since the school left the ship's bow immediately after.

We entered Chesapeake Bay late on the afternoon of the 5th, and arrived at Washington at 1.30 p. m. on the following day.

II.—NOTES ON THE FISHERIES OF KEY WEST.

A.—The sponge fishery.

The most important fishery of Key West is that which has the sponge for its object, and this may be reckoned among the leading industries of the port. Originating about 1852, when it was first understood that the sponges of this region were of commercial value, the business increased rapidly until it reached nearly its present limit several years ago, since which time the advance has been comparatively slow.

Although it is not my purpose, in these notes, to give much statistical data, it may nevertheless be said that citizens of Key West who are competent to judge estimate that at the present time a fleet of about 60 to 80 vessels, ranging in size from 5 to 50 tons, and fully 200 sail boats, 18 to 20 feet in length, are employed in this industry, while the aggregate number of fishermen who man this fleet is not far from 1,000. The above is doubtless an underestimate, for Hall, in his "Report on the ship-building industries of the United States" (Vol. VIII, Tenth Census), says:

"At Key West there are owned about 100 vessels, ranging from 5 to 25 tons, costing from $500 to $4,000 each, employed in the sponge business, * * * and about 300 boats, of less than 5 tons register, for sponging and other fishing, costing from $100 to $500 each."

A local authority states that for the year ending January 1, 1884, the large amount of "3,663 bales, or 206,945 pounds, of sponges were bought and shipped from Key West, the total amount paid for same, reaching $244,309.50."*

The commercial forms of American sponges are specifically identical with those of the Mediterranean, according to Prof. Alpheus Hyatt, who is one of the best recognized authorities on this subject, but he finds that there are some subspecific differences.

There are five kinds of sponges taken by the Key West fishermen, though these may possibly be subdivided into grades according to their size or other qualifications. They are (1) the sheepswool sponge (*Spongia equina* Sch., subsp. *gossypina*), (2) yellow sponge (*S. agaricina*,

* "The Key of the Gulf" (Key West), December 20, 1884.

subsp. *corlosia*, *dura*, *punctata*), (3) velvet or "boat" sponge (*S. equina*, subsp. *meandriniformis*), (4) grass sponge (*S. equina*, subsp. *cerebriformis*), (5) glove sponge (*S. officinalis* Linn., subsp. *tubulifera* and *S. graminea* Hyatt). The most valuable of these is the sheepswool sponge, and, according to Rathbun, "The Florida sheepswool sponges now command a higher price than those from the Bahamas."

1. FISHING GROUNDS.

The most important sponge grounds resorted to by the Key West fishermen are about Rock Island, Anclote Keys, Saint Mark's, in Apalachee Bay, and Cedar Keys. "The Florida sponge grounds," according to Rathbun, "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."

Within the past few years some of the larger vessels have made trips to the coast of Yucatan, but the sponges taken there were inferior to those of the Florida coast, and consequently the fishery in that region has been abandoned, for the present, at least.

Formerly sponges were found in abundance in shallow water on any of the grounds now resorted to, those nearest Key West being, of course, the ones that were chiefly visited in the early days of the industry. At that time and, indeed, until a comparatively recent date, the fishery was carried on near the land in depths not exceeding 18 feet, and often good results were obtained in 5 or 6 feet of water. But the eager pursuit of the sponge by many hundreds of men has eventually caused its depletion in the shallow waters, where it could most easily be procured, and, as a consequence, it must now be sought farther out, in greater depths, even as deep as 40 feet or upwards, where, sometimes, the distance from the coast is so great that the low land cannot be seen.

Sponges are abundant in many of the deeper localities, but fishing there is attended with many difficulties and cannot be carried on except when the water is clear and the weather fine. Consequently, when the conditions are unfavorable for working in the greater depths, the fishermen resort to the reefs where the water is shallow, and though their captures may be comparatively small, they thus manage to utilize time that otherwise would be of no value to them. It is obvious that the increased area of fishing ground, which is obtained by this venturing into waters so much deeper than those formerly worked, is of vital consequence to the industry in question, since the operations

of the fishermen are extended over a much wider region, and while one locality is being depleted of its sponges another may have an opportunity to renew its crop. It is the opinion of sponge dealers and fishermen with whom I conversed at Key West that if the sponges should be left unmolested for a year they would be quite as abundant as they ever were, even on many of the old grounds where the water is shallow. The fishermen say that on some of the reefs, where the depth does not exceed from 6 to 15 feet, sponges are numerous, but of small size, owing, of course, to the fact that before they have time to grow large they are captured.

In this connection it may be well to mention that this constant harrowing of the grounds, while it certainly has some undesirable features, is nevertheless believed by competent judges to be advantageous in improving the quality of the products obtained. It is asserted that a bar which may be stripped of large sponges will have a succeeding crop much finer in quality than those first taken. No special reason is assigned for this, but it is altogether probable that it may easily be explained by those familiar with the localities and the life habits of sponges.

On some occasions, and particularly in 1878 and 1880, it is claimed that the yield of the sponge grounds has been seriously affected by the "poisoned water" which appeared off the Florida coast, and proved so fatally destructive to all forms of marine life, sponges included. This destruction of sponges was referred to by Mr. Ernest Ingersoll in a letter to Professor Baird, in 1881, "On the fish mortality in the Gulf of Mexico." He writes: "In regard to some of the manifestations of this deadly influence in the sea during 1878, Mr. John Brady, jr., an intelligent captain, told me that the time of year was January, and that the 'poisoned water,' to which universal belief credits the death of fishes, could easily be distinguished from the clear blue of the pure surrounding element. This discolored water appeared in long patches or 'streaks,' sometimes 100 yards wide, drifting lengthwise with the flow of the tide. The earliest indication of it was the floating up of vast quantities of dead sponges, chiefly 'loggerheads.' All those seen by Mr. Brady were less than 40 miles north of Key West, in what is known as 'The Bay,' nor has anything of the sort been seen at any time outside (*i. e.*, southward or eastward) of the Florida Reefs; but it was soon discovered that all of the hitherto profitable sponging grounds lying off the coast as far north nearly as Cedar Keys, and particularly off Anclotes had been ruined. These grounds are only now beginning to show signs of reproductiveness in sponges. * * * In the case of the sponges, only a few of other species than the loggerhead would be seen floating; but when they were hooked into, all were found dead, though still clinging to the bottom. When a sponge dies naturally it gradually becomes white at its base, through the loss of its sarcodal matter, but all these were observed to have turned black. The abandonment of these sponging grounds from the reefs to Cedar Keys, during the three or four

years following this attack, entails a loss which it is hard to estimate, because partially compensated in the increased price of the article in the market due to its consequent scarcity, and because at all times the product there is an uncertain quantity; but I hazard the opinion that $100,000 would not repair the damage to this business interest alone. Had it not been for the fortunate discovery just at that time of the sponge-tracts off Rock Island, northward of the Suwanee River, almost a famine in this article would have ensued."*

Mr. Silas Stearns, who has had exceptional opportunities for becoming familiar with the subject which Mr. Ingersoll refers to, is authority for stating that the sponge fishery about Anclote Keys was not to any appreciable extent injuriously affected by the poisonous water. He was there in 1878, 1879, and 1880; part of the time employed as an expert by the United States Government to investigate the fisheries of Western Florida and collect statistics of them for the Tenth Census. On one occasion he took a boat-load of sponges himself near Anclote, in 2 fathoms of water, a feat that pretty effectually settled the question as to whether the sponges were all destroyed in this region.

In regard to the discovery of the sponge grounds off Rock Island, which Mr. Ingersoll says occurred "just at that time," Mr. Stearns tells me that this region had been known long before the date alluded to. He also states that there is little or no probability of any new discoveries being made of this kind, since almost every foot of ground that might by any possibility bear sponges has been carefully worked over. He says that he has himself dragged a boat-dredge nearly the whole length of the coast south of Pensacola, and no results were obtained except on grounds well known.

Sponge culture has of late attracted the attention of those engaged in the Key West fisheries, since the almost exhausted state of many of the old grounds from over fishing and natural causes renders it desirable to aid nature, if possible, in increasing the supply of sponges. The success which has attended attempts at raising sponges from clippings in the Mediterranean gave reason to hope for equally good results here; and the experiments already made seem to indicate that the culture of sponges may be made remunerative in the waters of Florida. The process of sponge culture, as detailed to us by parties at Key West, is comparatively simple. A sponge is hooked up from the bottom and brought to the surface of the water, but is never lifted into the air. It is then clipped into small pieces and fastened on a wire or stick, which is afterwards fixed to the bottom as firmly as practicable. For the first four months the "clippings" do not show any increase in size (it taking them this length of time to recover from the injury done by cutting), but later they develop with considerable rapidity.

While it is believed that unquestionable advantages may be gained by introducing sponge culture in Florida, it is nevertheless a subject

* Proceedings of United States National Museum, Vol. 4, 1881, page 75.

that seemingly requires the most careful consideration on the part of the State government to enact such laws and regulations as may tend to its success without interfering with the general prosperity and freedom of those who are more directly engaged in obtaining this product of the seas. At the present time the fishermen are bitterly opposed to the introduction of any methods for cultivating sponges in the manner above alluded to. This opposition arises from the fact that they, being chiefly poor men, naturally anticipate that in the event of sponge culture being adopted on a large scale, the entire control of the industry will pass into the hands of capitalists, who, should they succeed in securing legal control of large areas of ground, would have it in their power to prevent the fishermen from visiting localities which they now consider as their own—an inherited and natural right, of which no one should be empowered to dispossess them. They also fear that, with extraordinary privileges given to capital, they would have to encounter a competition that would eventually drive them all out of the business or compel them to submit to any terms that their wealthy competitors may dictate. The feeling is so strongly antagonistic to this that some of the fishermen do not hesitate to express their determination of proceeding to extreme measures for preventing its accomplishment. At the same time they would advocate the policy of sponge culture, and believe it might prove a blessing to them, providing laws are framed to limit the area of ground which any single individual could hold, and also to make it impossible to dispose of such a tract to any other person, the property reverting to the State whenever the original owner or planter ceased to use it. This, it is believed, would effectually prevent a consolidation of the areas cultivated under one head, or place them in the hands of a few individuals who might control the trade. Whether or not these crude suggestions can be formulated into such shape as to make them of practical use is one of the problems that should engage the attention of those who are charged with the responsible duty of legislating on this subject, should it ever be deemed wise to make sponge culture the object of special enactment.

2. VESSELS AND BOATS.

The largest vessels of the sponge fleet, those upwards of 35 tons register, have, in most cases, been originally designed for other trades, but it has often been possible to purchase them much cheaper than it would cost to build a vessel, and therefore schooners not intended for the business have been put to work in it. The smaller craft, however, particularly those less than 30 tons, have, with few exceptions, been built for the particular industry in which they are employed, and which requires special features in a vessel, both in the form and minor arrangements. With comparatively few exceptions, the vessels upwards of 8 to 10 tons are schooner rigged. They carry a single topmast, and no jib-boom, unless in some instances an adjustable jib-boom is rigged

out and the sail set "flying" without a stay. They are beamy, shallow, center-board craft, with a very light draught, a quality that is essentially necessary in a vessel which must knock about the shoal water on the reefs, where sponges occur, or frequent shallow, barred harbors like those of the Florida coast in the region that they visit. They are sharp forward, have a projecting cut-water or "long head," as it is called; a moderately raking, curved stem; considerable rise to the floor; rather quick turn to the bilge; a long, lean run; slightly overhanging counter and broad square stern, the latter being much thinner at the sides than in the center, although this feature is scarcely prominent enough to characterize it as being of the pattern commonly called a V-shaped stern. They are flush decked, and have no bulwark or waist, but instead a so-called "log gunwale," varying from 10 to 18 inches in height, which runs along the sides from the knight heads to taffrail. Chain cables are used, and, as a rule, short-shanked anchors, while the vessels are generally provided with some form of patent windlass. The larger craft usually carry a galley on deck, a small box-like affair about 5 or 6 feet square, in which the cooking is done. The larger schooners have a forecastle under deck and a trunk cabin, the latter generally of tolerably large dimensions. I noticed, however, that the cabins of the vessels I was on board of were peculiar in having no berth boards, as may be seen on northern-built craft. This feature appears to be somewhat general, too, on the vessels of this region, for the same arrangement was found on some of the smacks built at Key West, though other smacks had cabins similar to the same class of schooners built in New England. Instead of berths there are extraordinarily wide lockers, extending out from the vessel's side some 5 to 7 feet, according to the size of the cabin. A wide bed can be made up on these, on which several persons may lie, an arrangement which utilizes the space to the best possible advantage. But while this method of sleeping may be found practicable on a sponger in a smooth sea, it would scarcely meet with favor on a vessel employed in any of the offshore fisheries, for the simple reason that in rough water the occupants of one side of the cabin might at any time find themselves suddenly wakened, if nothing worse happened, by being pitched to the other side, whenever the vessel took a lurch. Iron ballast is generally used, and as a cargo of sponges has little weight enough ballast is carried to bring the vessels down to their load line. The quantity, of course, varies with the size of the craft, but, being so wide and shallow, they require much less ballast than vessels of a heavier draught. They are seldom coppered, but, to protect them from attacks of the toredo or boring worm, their bottoms are kept well coated with metallic paint.

The vessels built at Key West are said to be much more durable than those obtained from other sources. Their frame is "maderia," a sort of red wood indigenous to Florida, and which is reputed to be exceedingly durable; the planking is yellow pine; while the fastening is chiefly

copper, at least under water, and galvanized iron, the latter being used for the upper works. The spars are made of hard pine, spruce, or white pine, most commonly of the former.

The following details of the clipper schooner Lillie, of Key West, one reputed to be a very swift sailer, will give a fair idea of the characteristic features of the best class of sponge vessels. She is a wide, center-board, two-masted schooner, with medium sheer, flush deck, "log gunwale," long cut-water; sharp bow, slightly concave water lines forward; moderate rise to the floor; long, finely-shaped run; wide, square stern; and moderate rake to stem and stern post. Her spars are made of hard pine, and she is ballasted with iron.

The following are her principal dimensions: Tonnage, 43 tons; length, over all, 69 feet; on keel, 60 feet; beam, 19 feet; depth of hold, 6 feet; depth of keel, 1 foot; height of log gunwale, 18 inches; draught, with center-board up, 5 feet; the center-board is 16 feet long and 7 feet deep. Spars: Mainmast, 61 feet, foremast, 60 feet; bowsprit, outside, 19 feet; main topmast, 24 feet; main boom, 45 feet; distance, center to center of masts, 22 feet. A vessel of this size and class costs, if built at Key West, about $9,000 to $9,500. We were told by builders that the usual price for constructing the hull and spars is $120 per register ton. The owner of a small schooner, of about 10 tons register, said that he paid at the rate of $125 per register ton for building his boat, and he also furnished all the wood for the frame. She cost him $1,900.

The smaller class of sponge vessels are generally wider in proportion than those like the Lillie. For instance, the schooner General Hancock, with a length of 44 feet, over all, and 40 feet keel, is 15 feet wide—so I was told by the builder—and her masts are, respectively, 42 and 43 feet in length.

The following are the details of the sloop-boat Terror, of Key West, which is employed in the sponge fishery, and is a fair representative of the smaller class of craft engaged in this industry.* In general appearance the Terror resembles the small sloop yachts which are so common along the Atlantic coast of the United States, particularly at New York and northwards.† She is a wide, shallow, center-board, carvel-built boat, with a moderate sheer; a long sharp bow, the greatest beam being about 2 feet aft of amidships; a rising floor; long run (with a skag); and raking, square stern, which rises considerably at the sides and is somewhat narrower than the midship section. She is decked, with the exception of a steersman's cockpit aft of the large trunk cabin. The latter is oval in shape, and occupies the greater part of the deck

*Mr. Lawrence Higgs, of Key West, the builder of the Terror, has presented the working (or half) model of the boat to the National Museum. I am also indebted to him for details of construction, &c.

†In this connection it may be remarked that, in point of lines, rig, or speed, many of these sponge boats would bear favorable comparison with the finest yachts of their size on the coast.

amidships, being 11 feet long by 7 feet wide; it is used for the double purpose of sleeping and stowing sponges and apparatus. The mast stands well forward, being only a little over 4 feet aft of the stem, and the boat may be easily handled under her mainsail alone. A large boom-and-gaff mainsail and a jib are carried, but no light sails. The wood used in the construction of the Terror is the same as that of which the larger vessels are built. Copper is used for fastening the outside plank, and galvanized and black iron for the frame and deck.

The following are the principal dimensions of the Terror: Tonnage, 6 tons; length, over all, 24 feet; keel, 21 feet; beam, 10 feet; width of stern, 6 feet 8 inches; depth (molded, gunwale to garboard), 3 feet; depth of keel, 4 inches. Spars: Mast, 30 feet; topmast, 12 feet; bowsprit, outside, 8 feet; boom, 26 feet; gaff, 9 feet.

A boat of this description carries from 2 to 5 men, while the larger vessels, like the Lillie, have 13 men on board.

Mr. Rathbun says that "the crews number from 5 to 15 men each," but I was assured by several parties that at present the number of men on a vessel rarely, if ever, exceeds 13, and it is also stated that many of the boats are manned by only 2 or 3 persons.

For gathering the sponges small open boats of the Whitehall type are used, these being locally called dinghies. Many of these boats are built by the fishermen themselves, and are light, strong, and durable. We were told, however, that a considerable number of the boats used in the business are second-hand craft, brought from northern ports. They can be bought cheap, and, with such repairs as the fishermen can make, they serve a very good purpose for a comparatively limited time.

The typical dinghy is a carvel-built, keel boat, with a sharp bow—the greatest beam being about amidships—straight stem above water, curved below; a round easy bilge; good run (with skag); and heart-shaped, vertical, square stern. It varies from 12 to 15 feet in length, and is generally about one-third as wide as long, while the depth ranges from 16 to 18 inches. It has considerable sheer, and comparatively low free board, the object being to have a boat sit rather low in the water amidships in order that the "hooker"—the man who watches for and hooks the sponges from the bottom—may the more easily use his water-glass without bending too much over the boat's side. Each boat is provided with a stern and bow seat, and three thwarts, the middle one, on which the sponge fisher always sits, being adjustable. Two men go in a boat, as a rule, and while one watches for and hooks the sponges from the bottom the other slowly sculls the dinghy over the ground. A few of the boats have scull-holes cut in their sterns, but the majority have a piece of hard wood board about a foot long and half as wide, with a notch for the oar at the upper end, inserted between two guiding strips, which are firmly secured in a vertical position to the inside of the stern. This contrivance greatly facilitates the operation of sculling, and enables the man at the oar to stand more

erect and at ease than he otherwise could. It is placed on one side of the stern, and, being adjustable, may be easily removed when not needed.

Mulberry, oak, and horse-flesh are used for frames, and juniper and yellow pine for plank, while galvanized iron nails are most commonly used for fastening.

The Key West dinghies are "built by the eye," no model or lines being used. The builder having decided on how large he is going to make his boat, gets out his keel, stem, stern post, and stern board, fastens them together, and sets them up. He then puts up the two midship frames, which are secured to the keel, after which ribbands are run from the stem to the stern, outside the frames, to give the boat the proper shape. This having been done the other frames are made to fit the ribbands, and after they are all up the planking begins.

A dinghy which I saw a negro building at Key West was constructed in this manner. The following are the details of its construction, &c.:

The keel, stern board, risings, thwarts, seats, and plank were hard or yellow pine, the stem and timbers horse-flesh, and the keelson piece and ribbands cypress "footlings." She had eleven frames, seven strakes of plank on a side, two fixed and one adjustable thwart, a wide stern seat, two rowlocks on a side, two narrow ribbands running fore and aft in the bilge and nailed to the inside of the timbers. There was a beaded gunwale outside that was 1¼ inches wide, and a ribband inside the timber heads that was 1½ inches wide, and like the gunwale one-half inch thick. There was no covering over the timber heads as on most northern-built boats. Her greatest beam was a little aft of amidships. In other respects the general description previously given will apply to this boat, of which the following are the dimensions: Length, over all, 13 feet 6 inches; keel, 13 feet; beam, 4 feet 6 inches; width of stern, 3 feet 3 inches; depth, 17 inches; depth of keel (outside of garboard), 1¾ inches; depth of stern (above skag), 16 inches; width of thwarts, 1 foot; width (fore and aft) of stern seat, 15 inches.

The same style of boats are used to some extent by the market fishermen for going to and from their little sloops, though these are generally somewhat smaller than those which have been described.

It may be added that the number of dinghies carried by a vessel employed in the sponge fishery depends on how large a crew she may have. Generally, the vessels take one boat for every two men, exclusive of the cook, who, while the others are out fishing, takes care of the vessel, and sails her about wherever it seems necessary to go. The small craft, which carry 2 or 3 men each, and which often prosecute their work about the shallow reefs, sometimes take a dinghy for each man of the crew, and in fine weather the larger boat is anchored and the men leave her alone and go off singly to seek sponges.

3. APPARATUS.

The apparatus used in the sponge fishery is simple in its nature, and consists of only a limited number of articles.

The sponge-hook is a three-pronged iron claw, with a socket at its upper end, into which is fastened a wooden handle. The length of the latter is various, and is adapted to the depth of water in which sponges are sought. Formerly it was seldom that any one used a sponge-hook pole longer than 18 feet, but now, when fishing is often pursued in 35 to upwards of 40 feet of water, the poles must be lengthened out to correspond.

The water glass is constructed by simply inserting a pane of glass into the bottom of a box or common bucket, and making it water-tight. By thrusting the bottom of this contrivance into the water and looking through the glass a sponge hunter is able to clearly distinguish objects on the bottom of the sea, even when the ocean is agitated by a fresh breeze that would otherwise make it impossible to see anything. In the early days of the fishery, when sponges were sought in shallower depths, it was customary to throw oil on the water to smoothen it, when its surface was rippled by a breeze. But, while this method answered the purpose very well, under the conditions then existing, it was found inadequate when fishing in deeper water was attempted. As a result, the water glass was introduced about 1870 and has been used ever since.

The "bruiser" is a short, stout club, which is used for pounding sponges.

4. THE METHODS OF FISHING.

When the vessel has reached the locality where operations are to begin, the boats are got into the water and two men go in each, as has already been stated. The dinghies scatter about over the ground, or work close to each other, as circumstances may dictate, the movements of the boats being governed, of course, by the abundance in which sponges are found.

One man sculls the dinghy along slowly (using a single oar over the stern) while the other, who is termed the "hooker," sits on the midship thwart, or kneels with his breast across the gunwale,* intently watching the bottom through the water-glass which he holds in his left hand, while the sponge-hook lays ready within his grasp, extended across the boat. Trained by long experience, his keen eyes quickly observe every object on the bottom, and he instantly detects the presence of a sponge when one comes within the field of his vision. No sooner does he discover the prize for which he is seeking than he signals, by a motion of his hand, for his companion to stop the boat, which is deftly done by turning her around with the oar in such a way that her center still remains over the sponge. In an instant the long-handled hook is thrust into the water, and down it goes to the bottom, many

*A large sponge is fastened on the fisherman's breast to serve as a cushion, otherwise he could not endure to lie hour after hour across a boat's gunwale, and, even with this protection, serious consequences sometimes result from persons continuing to follow a business in which they must assume such unnatural positions.

feet below, where it unerringly fastens on to the sponge, which is quickly torn from its ocean bed and brought to the surface, when the man at the oar reaches over, detaches it from the hook and throws it in the boat's bottom.

The dexterity with which one of these fishermen will manage the long unwieldly sponge-hook, and grappie the objects which he seeks so many feet below the water's surface is said to be very remarkable. Fishing goes on all day, if the weather is suitable, with the exception of the time spent at dinner. About noon and at evening the boats return to the vessel, when the men eat their meals and spread their catches on the deck, where the sponges are put to die and to allow them to drain off the slime which runs freely from them.

While the crew is engaged in fishing the cook takes charge of the vessel, which is kept under sail, and allowed to jog back and forth over the ground. He also prepares the meals, and when the proper time arrives steers the vessel alongside of the boats to pick them up.

The time of closing the week's work is varied somewhat by the condition of the weather. If bad weather prevails it may close any day, since the vessels cannot work; but, ordinarily, if the weather is fine, the vessels stand inshore on Saturday night, and anchor in localities where they each have one or more so-called "crawls"—inclosures for soaking and cleaning their catch, each 8 or 10 feet square, and situated in 2 or 3 feet of water. The week's catch is landed and deposited in the crawls to soak; the time of doing this being Monday, if the vessel comes in Saturday night; but if she arrives on Friday night then the catch is landed on Saturday. The landing having been made, the previous week's product is subjected to the cleaning process, the sponges being beaten with the "bruiser" and squeezed by hand to remove any dirt, sand, or other extraneous substances that they may contain. They are then strung on rope yarns and hung about the vessel's rigging to dry. When sufficiently dried they are landed again, and spread on the shore, and a man is detailed whose duty it is to watch all the sponges under his charge, both in the crawls and on the beach; this precaution being necessary to prevent the depredations of thieves, who, if the property was left unprotected, might swoop down on a station during the absence of the vessels, and carry off the catch of a whole trip. When the vessel is ready to return to Key West all her sponges are taken on board and stowed in the hold.

The method of fishing adopted by many of the men who go on the small sail boats, those from 18 feet long to 5 or 6 tons, differs sometimes from that which has been described. The crews on these boats are always few in number, and, of course, if one man should stay on board to look out for the vessel it would make a material difference in the working power of the crew. The boats are, therefore, anchored, and all of the crew go out to fish. On special occasions, as has been previously mentioned, when the work is being done in shallow water, and

the sea is calm, these boat fishermen go singly in the dinghes, and thus increase their chances for securing a good catch. This is called "off-handed sponging."

The larger vessels make trips ranging from six to eight weeks, and, in some instances, it was said that they had been absent from Key West as long as three months. The smaller craft do not generally stay out on their cruises longer than from two to four weeks.

5. DISPOSITION OF THE CATCH.

When the vessels reach port the sponges are discharged on a wharf and sorted into piles according to their several grades. This having been done the cargo is sold at auction—at least it is called an auction at Key West, though the conditions of the sale differ materially from those which are generally meant by the term auction, and are substantially as follows: The sponges having been arranged in proper order, the dealers assemble on the wharf during the forenoon to examine the several lots of which the cargo is composed. No person but one known to be an agent of a house engaged in the business is allowed to make a bid, and even these are not permitted to make more than one proposal for the sponges. At 3 p. m. of the same day on which the examination takes place, the buyers again assemble and submit written bids, the sponges, of course, being sold to him who makes the highest offer. The sponges are not weighed nor counted, but the different grades are bought in a lump, the buyers, from long experience, being able to estimate pretty closely the amount in any pile of goods.

After the sale, the sponges are loaded on carts and hauled to the warehouses, which are generally large and airy, a good circulation of air being secured through numerous large open windows on the sides of the buildings. These establishments have a large number of bins or pens, built along the sides, and into these the sponges are thrown after they have been cleaned, bleached, and culled into the various grades known to the trade. To prepare them for shipment they are thoroughly washed and spread in a large yard to dry or bleach.* After the sponges are well dried, the sand is pounded out of them, they are trimmed, culled, and packed in bales measuring about 18 by 18 by 30 inches. Screws worked by hand or hydraulic power are used to compress the sponges, the former method being adopted in the establishment we visited. The sponges are shipped to New York, where are several houses engaged in the trade, and which control the entire Florida catch.

* Rathbun tells us that "the process of bleaching or liming sponges has been extensively in vogue at Key West, but 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." I noticed, however, that bleaching in this manner is still practiced to a considerable extent, though not, perhaps, as much as formerly.

6. FINANCIAL PROFITS OF THE SPONGE FISHERY.

The average annual gross stock of a first-class vessel of 30 to 40 tons, with a crew of 13 men, is variously estimated at from $5,000 to $6,000, while those most familiar with the business say that a stock exceeding $9,000 is seldom made.

The "lay" is very much like that obtaining most generally on New England fishing vessels, particularly those of Gloucester, the vessel furnishing food and equipment, and the crew receiving one-half of the proceeds of the sales, which is divided between them, the cook sharing like the others. A man who earns $300 to $400 a year is considered fortunate, while the average is estimated to be not exceeding $250.

B.—THE SMACK FISHERY.

The smack fishery of Key West has always, we were told, depended principally, if not wholly, on Havana for a market. Therefore, anything which affects the fish trade at that port seriously influences the prosperity of this particular fishery. Until within a few years past the duties levied on American-caught fish in Cuba were comparatively light, and the smack fishermen at Key West were prosperous. But when the present duty was put on it was almost prohibitory, and practically destroyed this branch of the fishery, or at the best caused it to be pursued under the most discouraging conditions. All who could do so without too great a sacrifice, sold their vessels, most of them going to Spanish parties at Havana. Those which remain, some ten sail, ranging from 29 to 46 tons, it is said are run at a loss, and we were assured that they can be bought at a very low figure. Several of them lay in Key West, temporarily unemployed, one was engaged in carrying kingfish (caught by boats) to Havana, and another had been employed in the fruit trade. Some of these were remarkably fine vessels of their class, well modeled and rigged, and constructed of the most durable material. But they are poorly adapted for anything besides what they were built for; therefore, when fishing is unprofitable, it is as difficult to sell them as to find paying employment.

THE FISHING GROUNDS.

The fishing grounds most generally resorted to by the smack fishermen are off the west coast of Florida, in from 2 to about 7 fathoms of water (and rarely so deep as 15 fathoms), the region lying between Charlotte Harbor and Anclote Keys, being, perhaps, the most favorite locality. Here, on the shore soundings, they fish for red snappers, groupers, and other species which are in favor in the Cuban markets. Prof. Felipe Poey gives the following list of the food-fishes carried from Key West to the markets of Havana, which, in this connection, seems of especial interest. Writing to Professor Jordan, from Havana, under date of March 9, 1882, he says: "I have received from an old fisherman (now dealing

in fishes in the Havana market) the following list of fishes which are received in Havana from Key West, either living or preserved in ice:

"1. CHERNA = *Epinephelus morio* (C. & V.)

"2. PARGO GAUCHINANGO = *Lutjanus campechianus* Poey.

"3. PEZ PERRO = *Lachnolæmus suillus* C. & V.

"4. AGUAJI. The name of Aguaji is given to two species, both of which grow to a large size, viz, *Trisotropis brunneus* Poey and *Trisotropis aguaji* Poey. The species here meant I believe to be the former.

"5. JALLAO = *Hæmulon album* C. & V.

"6. BAJONADO = *Calamus bajonado* (Bloch).

"7. RABIRRUBA = *Ocyurus chrysurus* (Bloch).

"8. BIAJAIBA = *Lutjanus synagris* L. (*uninotatus* C. & V.)

"9. CABALLEROTE = *Lutjanus cabellerote* Poey. (Vide Poey, Enumeratio, in Anal. Soc. Esp. de Hist. Nat., IV, 100.)

"10. CABRILLA. The name of *Cabra* (*Cabra mora*) is given to *Epinephelus punctatus* Bloch (syn. *maculatus, atlanticus, nigriculus, pixanga, impetiginosus* (vide Poey Anal. Soc. Esp. Hist. Nat., IV, 91). There is also a *Cabrilla* (diminutive of *Cabra*), *Epinephelus lunulatus* (syn. *catus* Val.). I do not know which of these two may be meant.

"11. SIERRA = *Cybium caballa* C. & V.

"12. SARGO. There are several Sargos. I believe that the one here intended is *Sargus caribæus* Poey. Besides these I have myself observed the following:

"13. *Promicrops guasa* Poey.

"14. *Trisotropis falcatus* Poey.

"15. *Trisotropis petrosus* Poey."*

The object of fishing in such shallow water is to catch the so-called "hardy" groupers and other fishes that will live in a well very much better than if they were caught in deeper water. It is a fact fully established, I believe, that fish taken from considerable depths and brought to the surface, where the pressure is less, and other conditions somewhat different, will die much quicker in a smack's well than those caught in shallower water. At the best, great care must be exercised to prevent the fish from dying, since, if the vessel lays perfectly still where there is no tide way, the circulation of water in the well is often practically stopped, and consequently the fish are exposed to the danger of being suffocated. This is more liable to happen when flat fish, like halibut, for instance, are in the well, since these lay on the bottom of the vessel and cover up the holes through which the water enters. Of course, in a sea way, when the vessel is in motion, ample circulation is obtained. To secure this in calm weather, the New England smack fishermen, particularly those from Gloucester, when engaged in the halibut fishery forty years ago, generally "bailed out the well," as it was called; that is, the crew kept busy dipping water from the well in buck-

*Translation of a portion of a letter from Professor Poey, by Prof. D. S. Jordan, Vol. 2, Bulletin of the United States Fish Commission, page 118.

ets, and, of course, water from the sea ran into the well through the holes in the bottom, and thus a good circulation was secured. The English fishermen prevent halibut from interfering with the circulation by suspending them by their tails. The Key West fishermen usually adopt another method, and one that is feasible when a vessel is in smoooth water. Mr. Stearns, who is familiar with the fishery, tells me that each vessel has a live car on board, and when there is danger of the fish being injured by a lack of circulation in the well, they are put in the live car, and this is towed about until the desired results are obtained. The Key West fishermen also "bail out" the wells of their smacks.

2 VESSELS.

The smacks first used in the Key West fisheries were mostly, if not wholly, from ports on Long Island Sound, of which the New London vessels (sloops and schooners) may be taken as a type. These smacks, so far as their model, rig, arrangement of the well, and some other minor details are concerned, were admirably well adapted for work in this region, and as a consequence a considerable number of the Northern-built vessels were purchased by Key West parties. It was found, however, that the material used in the construction of the Northern vessels was not so durable as the native woods of Florida, and as the business developed and called for an increase in the fleet the demand led to the building of smacks at Key West. These, with few exceptions, are schooners, and they are modeled and rigged precisely like the smacks from New London, which they also resemble in the minor details of the arrangement of the well, ice pens, and cabin accommodations.* In a few cases, as has already been mentioned in discussing the sponge vessels, the cabins are built without berth-boards, a style that obtains very generally on other types of Key West fishing craft.

The following description of the schooner-smack Emma L. Lowe, one of the largest and finest of the Key West fleet, built in 1875, will give a fair idea of the leading characteristics of this class of vessels.† She is a carvel built, keel craft, with a good sheer, broad beam, and a reasonable amount of depth. She has a sharp bow, flaring somewhat above water; a recurved, slightly raking stem; long, projecting cutwater; high rising floor (the floor timbers of the midship section being nearly straight from the garboard to the turn of the bilge); rather quick turn to the bilge; a long, lean, concaved run; slightly overhanging counters; and a deep, square stern, the latter being somewhat thinner at the sides than in the center. The stern-post has only a moderate rake, and the vessel

* There is at present only one sloop smack owned at Key West, we were told, and she was built in New England.

† The builder's model of this smack has been presented to the National Museum, at Washington, by Mr. William J. Albury, who built her, and to whom I am indebted for many of the details of her construction, as well as for particulars of the sponge-schooner Lillie.

has less drag than the average fishing schooner of New England. The center of buoyancy is about midships, and the lines are well calculated to produce a fair sailing vessel, as well as one that would be eminently seaworthy in heavy weather; qualities that are in the highest degree desirable in a fishing schooner, and which this smack is reputed to possess in a high degree. She has a flush deck, a roughly-finished underdeck forecastle, where the cooking is done and part of the crew sleep; a trunk-cabin aft, the latter being large in proportion to the size of the vessel, while the finish is precisely the same as the prevailing style on the New London smacks, or, what is practically the same thing, those of the Gloucester schooners. The well, for the preservation of live fish, occupies the midship section of the vessel; it has heavy strong bulkheads at either end, and another in the middle, the former rising to within about a foot of the load-water line. On top of these bulkheads is laid the well deck, made of thick plank, the outside one of which generally goes through, flush with the outer planking, this style of construction being technically known as building the wells with "primings out." The entrance to the well is through the "curb" or "funnel," an aperture 3 or 4 feet long by 2 or 3 feet wide at the deck, but much longer below, and which is inclosed in strong planks extending from the well deck to the main deck, and securely fastened. There is no ceiling in the well, and, as a rule, only half the number of frames that are put in the same length in other sections of the vessel, the bulkheads supplying the place of timbers for obtaining the necessary strength and rigidity. The outside planking are perforated with the requisite number of holes to secure a proper circulation of water for keeping alive the fish that may be put in the well. The foregoing description of a smack's well applies generally to all vessels of this class and not to any one in particular.

The Lowe is rigged as a two-masted schooner, with a long fixed bowsprit and a single topmast. She carries no flying-jibboom. Her masts are each supported by two shrouds on a side. She sets five sails, namely, jib, foresail, mainsail, main-staysail, and gaff-topsail. The arrangement of the sails, as well as their cut, is the same as that on the New England fishing schooners of the same class, and is so generally understood that a detailed description seems unnecessary. The ballast is chiefly iron. The following material was used in the construction: Timbers of maderia; beams, outside planking, ceiling, and spars of yellow or hard pine; deck of white pine; fastenings, chiefly copper. She is 46.46 tons register, and cost to build and fit for sea $10,000. The following are the principal dimensions: Length, over all, 66 feet; on keel, 58 feet; extreme beam, 20 feet; width of stern, 15 feet; depth of hold, 8 feet; depth of keel, 15 inches; draught, aft, 8 feet, forward, 6 feet; height of bulwarks, 20 inches; length of trunk-cabin, 12 feet; width of same, forward end, 10 feet, after end, 9 feet. Spars: Bowsprit, outside, 19 feet; foremast, 60 feet; mainmast, 61 feet; main topmast, 25 feet; main boom, 42 feet,

3. METHODS OF FISHING.

Working as they do in shallow water, fishing can be carried on by the smacks only in fine weather. When the wind blows hard enough to get up a choppy sea, the vessels run into harbor or take shelter under a lee. As a result, much time is lost, and it often takes them five or six weeks to catch a fare of 10,000 pounds of fish. This, Mr. Stearns tells me, is about a maximum fare. The vessels generally fish at a drift, the men using hand-lines over the smack's weather rail. The gear differs somewhat from that used by the Pensacola red-snapper fishermen. A sinker is made fast to the end of the line, and at some distance above this are the snoods, with hooks at their ends, bent to the line, one over the other, like hooks on a trawl. In fishing, the lead or sinker is allowed to rest on the bottom, while the hooks trail out, one over the other, at a little distance above the ground.

Salt mullet are used for bait. Each smack generally has a small seine, and the crew catch their bait while in harbor and salt what they need for use.

The fish are crimped—pierced with a sharp-pointed cylindrical tube behind the pectoral fin, to let the air out of the swim bladder—as soon as they are caught, and they are then thrown into the well. As a rule, the well must be "swept" each morning, and the dead fish removed, the latter being salted or preserved in ice.

C.—THE MARKET FISHERY.

The market fishery at Key West is an important industry of the port, employing some 40 or 50 sail boats, half of this number being large and able crafts, which not only supply the city of Key West with fish for local consumption, but take quantities that are shipped to Cuban markets. Some of the boats confine their operations chiefly to the grounds situated at or near Key West, going out in the morning and returning to the market wharf in the afternoon to sell their catch, or to make any necessary arrangement for the next day's fishing.

1. THE FISHING GROUNDS.

There are two distinct fisheries carried on by the market boats. One of these has the kingfish (several species) for its object, while the other is for the capture of grunts, yellow-tails, and many other varieties of ground-feeding species. The most favorite ground for the kingfish is in the vicinity of Sombrero Key, but more particularly, we were told, on the south side of the key, over a stretch of 10 to 15 miles in the direction of Key West, and generally outside of the range of the coast line, over the bottom that slopes toward the Gulf Stream, and sometimes even in the inside waters of the latter. In this region kingfish are usually very abundant from November to April, therefore the locality has become somewhat celebrated as a valuable fishing ground, and is

resorted to by the fishermen in preference to the waters nearer Key West, where the same species occur, but are not so plentiful.

The smaller species of food-fishes, with which the Key West market is well supplied, occur in greater or less numbers in the immediate vicinity of the harbor, about the adjacent keys, and on numerous coral patches known to the fishermen and which abound in the channel between the islands, within a radius of 10 or 12 miles, beyond which distance they are rarely sought, though occasionally boats go farther off. Indeed, so far as our observation extended, the boats seldom go, in winter, more than 2 or 3 miles from the market wharf, and we often saw them fishing within a short distance of a little mangrove key that is, perhaps, not more than a mile and a half from the market, and in many cases they were certainly not more than half that distance off. Many varieties of these fishes feed about patches of bottom in the channels, on which there is a coral growth, and we often observed them in great numbers immediately beneath the roots of the mangroves, on a little islet near the harbor, that was of coral formation, and about some parts of which the water was quite deep. Favored here with unlimited means of escape from their enemies by darting about among the mangrove roots, or hiding beneath the projecting points of the coral shore, it seemed to be a spot well suited to the habits of such species as could here find sufficient food either on the bottom or among the schools of tiny fishes that inhabited the same locality. The sudden approach of a boat invariably caused a general stampede among the larger species that have their haunts about the keys, and if one depended on first impressions he would invariably decide that the place was destitute of fish life, except, of course, he might see some of the little minnows scurrying away among the mangroves. But hold your boat perfectly still, and in a short time you will be both surprised and pleased by the numbers and varieties of fish that show themselves in the clear translucent waters beneath you, coming from you know not where, and vanishing as mysteriously at the slightest noise or unusual movement.

But this digression has been made more for the purpose of giving some idea of the habits of the fish than to define the fishing grounds, for the boats seldom go alongside the shores, at least not nearer than to anchor just outside the shallow reefs that generally surround the islets, where the depth drops suddenly from a few feet to several fathoms, and where is often a favorite locality for many kinds of food-fish.

There are some red-snapper grounds that are resorted to occasionally by the Key West fishermen. But these banks are not to be compared in importance to those off the west coast of Florida, if we may judge by the account given by those who have visited the former. One of these grounds is near the entrance of the ship channel to Key West Harbor, another is 2 miles east of American Shoal, one about 1 mile southeast of Pelican Shoal, and a fourth 2 miles east of Sombrero Key. These spots are small in area, with depths of 18 to 25 fathoms.

2. KEY WEST MARKET BOATS.

The Key West market boats are locally known as "smackees," a name applied, both here and in the Bahamas, to small vessels or boats provided with wells for keeping fish alive, the term literally meaning a small smack. Two classes of these boats are recognized, one being large enough to make trips to the fishing grounds, 25 to 35 miles away, and stay several days, while the other and perhaps less numerous class, locally designated as "single-day boats," are smaller and intended only for fishing near Key West Harbor, going out in the morning and returning to market on the afternoon of each day. The larger boats are invariably sloop rigged, but some of the smaller class carry no jib.

Although the majority of these market boats are purely Bahamian or Bermudian in type, having in some cases been brought from Bermuda on the decks of trading vessels or sailed across from the Bahamas, and this model, as well as the rig, has been most generally copied by the people of Key West, it is nevertheless noticeable that the builders at the latter place have shown a tendency, in some instances, at least, to produce a craft more nearly resembling, in the shape of its hull, the deeper class of keeled fishing boats used along the New England coast. A few of the smackees have been improvised from the yawl boats of vessels stranded in the vicinity, by simply adding a top strake, building a well in them, and making such other changes as were required. These last may be considered as only accidental forms, and therefore to be omitted from any discussion of the typical smackee.

The most common form, or perhaps it might be called the Bahamian type of market boat, is carvel-built, wide and deep, with comparatively little sheer, a moderately sharp bow (the greatest beam about amidships), high rising floor, round easy bilge, moderately long, concaved run, a deep, heart-shaped, square stern, but no overhang, the rudder head being outside and the tiller working through a narrow long slot or hole cut in the upper part of the stern. They have small gammon-knee heads, deep keel, a curved stem and straight stern post, but there is much difference in the rake of the stem and stern post in different boats, some being nearly vertical while others are placed at a considerable angle, so that the craft may be many feet shorter on the keel than over all. The variations from the above, found in some of the Key West built craft, are that the latter have some overhang to the counter and more or less rake to the stern, so that the rudder head goes through the counter instead of working outside; a few of this type are also built with a skag aft; they generally have a more symmetrical sheer on top; are not quite so deep in proportion as the others, and, while superior sailers in ordinary weather, are conceded to be far less able and seaworthy in strong winds and rough water than the heavy-draught boat of the Bahamian model, which has a high reputation. It is asserted that the latter will often go out on a fishing trip and will work to wind-

ward in weather so bad as to drive the local pilot boats into harbor to seek shelter.

All of the smackees are decked with the exception of a cockpit aft, where the crew stand to fish or to sail the boat. The interior is divided into three nearly equal compartments. Forward is the little cabin or cuddy where the fishermen sleep, keep dry clothing, and spare gear. This is entered through a small hatch or companion slide aft of the mast. It is not provided with berths, so far as we could observe, an old sail more or less carelessly spread on the floor being used for a bed. Aft of the cabin is the well wherein the fish are kept alive, except when a boat may engage in the capture of kingfish, when, as will be detailed elsewhere, the fish are killed before being put into the well, where it is, nevertheless, found expedient to place them, as they will, when put in water, keep in good condition for about twenty-four hours. The well is somewhat peculiar in shape, being much larger at the botton than at the top, the sides and ends having a strong rake. An average-sized well is about 3 feet 6 inches long by 2 feet wide, on top, while at the bottom it is 6 feet long and 4 to 5 feet wide according to the size of the boat. It will thus be understood that it is both easy to select and take from the well any fish that may be in it which a customer may wish for. Many of these wells have a coaming about the top which flares outwards. There is also a coaming, about 4 inches in height, around the cockpit.

The material employed in the construction of these boats is the same as that of which the larger craft are built at Key West, maderia wood being used for frames and yellow pine for planking, while the fastening is chiefly galvanized iron. Copper paint is used on the bottoms and inside the wells, and a new coat is put on about three times a year.

Although some attempts have been made to modify the hull of the Key West smackee, so that it will conform more nearly with other boats used in the United States, little has been done towards introducing any other than the "Mudian rig," which seems to be universally popular with the fishermen. It is true that a very few of the boats have a boom and *gaff* mainsail, but it is apparent that this innovation is of the most limited kind, for the gaff rarely much exceeds in length the half-moon-shaped club attached to the mainsail head on other boats.

As has already been said, these smackees are sloop rigged, with few exceptions. The long tapering mast is stepped well forward, so that the boat will be perfectly manageable with a very diminutive jib, and when it blows strong the latter is reduced in size to a mere rag by being "bobbed;" its only use at such times is to pay the boat off when she tacks, and to prevent her from griping too much on her helm.

A large leg-of-mutton (or triangular) mainsail is carried, this being laced to the mast by a rope; while the foot, which is cut roaching and hangs loose, its middle curving downwards, is extended by a long boom, made of tough wood, that projects far over the stern. The foot of the

sail is attached only at the clew and tack, and it appears that the prejudice in favor of loose-footed sails is as great here as it is among the fishermen of Great Britain. The head of the mainsail is sewed to a piece of board about the shape of half of a barrel head and approximately about the same size, though some of these clubs are larger. The bowsprit is fixed and is always short. The rigging is very simple. A single shroud, at the most, on each side, supports the mast, if necessary, though these are generally slack, while the jib-stay from the mast-head passes through the bowsprit end and sets up at the stem. The manner of reefing the jib, when it is used in strong winds, is called the "Mudian tie," and consists in tying up the head with a piece of small rope so as to materially reduce the size of the sail.

The mainsail is large, but is generally baggy, and in the latter respect would suffer by comparison with the flat-setting sails generally seen on Northern fishing boats.

With the exception of one or two boats of the smaller class that only one man goes in, the smackees have crews of two men each. The boats are provided with oars (13 to 15 feet in length) which may be used whenever required, though with such a large sail area as they have a very light air of wind pushes them along at a rate which makes it unnecessary to row.

The average size of the larger class of smackees is 18 feet on the keel, 21 to 28 feet over all, 6½ to 8 feet beam, and 4 to 4½ feet deep, with a draught equal to their depth. The mast would average in length 28 feet above deck, the boom is usually 2 or 3 feet longer than the boat, while the bowsprit is about 3 to 4 feet outside. The "one-day boats" average 14 to 16 feet over all, 4 to 6 feet beam, and 3 to 3½ feet deep. The boat Jimmy, of this class, one of the cat-rigged type, is 12 feet 6 inches long on the keel, 16 feet over all, and carries a mast 23 feet long, and a boom of 18 feet. The smackee Jeff Brown, built by William H. Pierce,* is a fair example of the type of the larger boats of this class now made at Key West. She was launched in 1883, and has the following dimensions: Length, over all, 24 feet; keel, 21 feet; beam, extreme, 9 feet 6 inches; width of stern, 5 feet 5 inches; depth, molded, 3 feet; draught, aft, 3 feet; keel, 8 inches deep amidships, 4 inches deep forward and 6 inches aft. Mast, 31 feet long; boom, 23 feet; bowsprit, 6 feet outside.

Dinghies are used in connection with the smackees, some of which differ only in size from those carried by the sponge vessels, while others are small skiffs of the sharpy pattern that seldom exceed 10 feet in length. Ordinarily these are not required, but they are sometimes useful for going to and from the land when the larger boat is anchored off at a distance from shore.

The following are the details of construction, &c., of a sharpy-skiff: She has a sharp, wedge-shaped bow, straight vertical stem, flat bottom,

*Mr. Pierce has presented the builder's model of this boat to the National Museum.

curving up in the after section, a long deep skag, square stern, and stern post outside of skag and stern. There are two thwarts, the ends of which rest against pieces of board (of the same width as the thwarts), that are fastened, in a vertical position, on the boat's sides. Four wooden row-lock cleats, each with a single hole, are nailed to the gunwale. The boat is built of yellow pine, and fastened with galvanized iron nails. The sides are each made of a single piece of board, and they are fastened at the ends to the stem and stern, while the bottom boards, which are each 3 or 4 inches wide, are placed transversely and nailed outside the lower edges of the sides, thus protecting the latter from chafe when the skiff takes the ground in beaching. The dimensions are as follows: Length, over all, 9 feet 9 inches; extreme beam (amidships), 3 feet 2 inches; width of bottom, extreme, 2 feet; width of stern, 2 feet; height of sides, amidships, 1 foot 1½ inches; of bow, 1 foot 4½ inches; at stern, 1 foot 5 inches, including skag. The latter was 8 inches deep aft, tapering to a point forward, its length being 3 feet 10 inches, and thickness 1 inch.

3. APPARATUS AND METHODS OF FISHING.

Kingfish drails.—The boats engaged in the pursuit of kingfish are each provided with four drail-lines. Each of these lines is about 13 fathoms long, being one-half of an ordinary 26-fathom white cotton line of a size that would weigh 10 or 12 pounds to the package of a dozen skeins. To one end of each line is attached a stout, round-bowed, black-steel, flat-eyed hook. Two sizes of hooks are used, these being practically the same in size as the hooks used on halibut trawls from New England, and would correspond pretty nearly with Nos. 11 and 12 of the central-draught pattern. The largest hooks are used when there is a brisk breeze and the boats are going through the water at a good speed; while the others, which are only a trifle smaller, are preferred when the wind is light.

The hooks are ganged with brass wire, since the sharp teeth of the kingfish would quickly cut off a cotton line. The method of ganging is peculiar. A piece of stout brass wire (one-sixteenth inch in diameter) is bent into the form of a loop 2 or 3 inches in length, the two parts of the wire being brought together about three-quarters of an inch from the bend, from which they are parallel to their ends; the latter are turned back about half an inch in a sort of a compressed hook-like shape. This device is firmly lashed to the front side of the hook's shank by fine brass wire wound round and round, and when secured there is a loop projecting about three-fourths of an inch at the top, while all possibility of its being pulled out is prevented by the bent lower ends. Into this loop is now fastened a piece of wire one-sixteenth inch in thickness and 9 or 10 inches long, its upper end being twisted so as to form a bight or loop for the fishing line to bend into. Such a ganging is very

strong and durable and will last a long time unless, of course, a hook may be lost by the parting of a line.

Hand-lines for ground fish.—The hand-lines used by the boat fishermen who catch the smaller species of market fishes are exceedingly primitive in their character. The line is essentially the same as the largest kind of mackerel lines, made of white cotton and usually about 10 to 12 fathoms long. To one end is attached a small kirby-bend hook (about the size of a No. 16 central-draught hook), the method of ganging being simply one or two clove-hitches taken with the end of the line around the shank of the hook. Some 2 or 3 feet above the hook the sinker is bent on, this being a piece of lead without any special shape and weighing a half pound or more, with one end flattened and a hole bored in it to admit a short becket, the other end of which is bent to the line. Each man generally uses only one of these lines.

Bruiser.—Clubs for killing the larger species of fish are carried, these implements being locally known by the name of "bruisers." Their shape and function are essentially the same as that of the "killers" used by the New England cod and halibut fishermen.

Bait.—The method of baiting the hooks for kingfish is peculiar, and admirably adapted to this fishery. It may first be said that when a boat reaches the ground a piece of pork rind, or a cotton rag—anything in fact that looks white in the water—is put on the hooks until some fish are caught, and it occasionally happens that such a lure may answer the purpose tolerably well. The devices sometimes resorted to for providing a lure, when a boat first reaches the fishing ground, were rather graphically set forth by a boatman of whom I asked the question, "What bait do you use before you catch any fish?" "Oh, anything we happen to have," he replied; "sometimes pork rind, a white rag, or something else that looks white. This trip I took his stockings" (pointing to his shipmate, a lad of seventeen or eighteen years), "and first rate bait they made, too. The fish bit fast, and we caught nearly thirty before we had a chance to put on any other bait."

The bait commonly used after fishing has begun is the skin of the kingfish, one or more of which are flayed during a trip to furnish a supply.

It is cut from the side of a fish in transverse triangular sections, each bait being 6 or 7 inches long and 3 or 4 inches wide at its broadest end. Two slits are cut in each bait, one near the apex of the triangle and the other nearly in the middle. The hook is then passed through the hole nearest the end and out of the other—the upper slit is pushed up the shank and over the eye of the hook—in such a manner that when being towed the bait folds together, showing only the silvery iridescent hues of the outside surface of the skin, and resembling in appearance some small fish as it goes skipping along at the surface.

The bait most generally preferred by the "single-day" fishermen, who catch the small bottom-feeding species, is cray fish. Next to this

minnows—locally called "sardines"—are deemed the most attractive, while conchs are used when more desirable material is not obtainable.

Methods of fishing.—When a boat engaged in kingfishing reaches the locality where operations are to begin, she is sailed back and forth in various directions, towing two lines which trail behind, the baited hooks skipping along on or near the water's surface. The inner ends of these lines are fastened on the boat's quarter, nearly abreast of the middle of the cockpit, where they are convenient to the hand of the fishermen. Two other drails, baited and ready to be thrown out, are kept in the boat, and the moment that a fish is pulled in one of these "relief lines" (as it may be called for want of a better name) is thrown out, so that two lines are always kept towing. If it were practicable to use a larger number of drails, perhaps many more fish might be taken; but for various reasons this cannot be done. The kingfish is exceedingly active, and when hooked will dart about like a flash in various directions, unless he is immediately hauled in. Thus, if fish should strike several lines that could not be pulled in at the moment, the result would be their almost inextricable entanglement, a consequent waste of time, and the possible loss of the fish and gear. Another reason why a larger number of lines cannot be used is that when a school of kingfish are found they bite very fast and with extreme voracity, and at such times all the boats in the vicinity collect together and sail side by side, at very short distances from each other. One untended line might foul the gear of several other boats in this case, and the whole fleet might be thrown into confusion. Whenever kingfish are found in abundance a boat stands along, and the men keep themselves busily engaged in pulling in the large, vigorous, and gamy fish, until the latter cease biting, when the smackee is tacked and returns along the same track she has just passed over. And thus she continues to work in nearly the same locality until the fish are exhausted or cease biting.

It sometimes happens that a good fare, 200 to 250 fish, may be taken in a single day, and the catch is often large, but it is not unusual for the boats to be absent several days, and in some cases as long as a week. It will, however, be readily understood that other causes besides the abundance of fish may materially influence the time of a boat's absence from port. For instance, with calm weather, or with a heavy head wind it may occasionally take a long time to reach the fishing ground off Sombrero Key, and the success of the operations after arriving there is very much dependent on the wind and weather, as well as on the strength of the current and condition of the water, whether clear or not. Again, the kingfish is reputed to be very capricious about biting, and though it generally takes the hook with the greatest eagerness, there are times when it will not bite for several days; at least it cannot be caught in sufficient numbers to make it profitable to fish for it.

After spending the day in fishing, the boat heads for Key West to market its catch, or runs in at night and anchors under the shelter of

one of the numerous keys that fringe the coast. Not unfrequently a fleet of a dozen smackees may be seen riding side by side, often lashed together, while their crews pass away the evening in recounting their experiences of the day, or gossiping about affairs at home, and perhaps some one who is musically inclined adds to the entertainment by playing on some instrument that he carries in his boat for such occasions.

As has been indicated, the kingfish are often found in abundance, and as it generally takes a hook very readily the fishermen frequently have the liveliest kind of a time in tending their lines. To haul in kingfish, with an occasional amber fish, hour after hour, many of the specimens weighing 20 to 30 pounds each, requires not only skill but a large amount of endurance, and it is safe to predict that a novice in the business would soon find himself suffering with blistered hands, even if the exceedingly vigorous exercise failed to fatigue him.

As the fish are brought on board they are hit on the head with the "bruiser," to stun them, after which they are unhooked and thrown into the well, where they remain until the day's fishing is completed. If enough have been caught to go to market, the fish are taken from the well and eviscerated as the boat runs on her course, after which they are thrown back again and remain in the well until port is reached. If the catch is not sufficient to go to market, the fish are generally split and salted, unless it is expected to go next day.

The fishermen say that kingfish will not live fifteen minutes in a boat's well, therefore it is necessary to handle them in the manner described. The methods of fishing adopted by those engaged in the capture of the small species, of which there are many varieties, are as follows: The boat is anchored on the ground, the lines baited and lowered to the bottom, each man using one line, which is all he can tend. As fast as the fish are pulled in they are carefully unhooked and thrown into the well. The boats usually start out in the early morning and return to the market wharf about 3 to 4 p. m.

There are certain species, like the angel-fish, for instance, that cannot be easily caught with a hook. These are captured by striking them with small grains. As a matter of course, the method of capture kills them, and they must be sold within a limited time, before they become unfit for food. Depending only on the local demand, it naturally follows that a fisherman may often be compelled to throw away fish that he has worked hard to catch but cannot sell.

As has been indicated, the capture of kingfish is prosecuted only from November to about the last of March. In April it is said the fish leave the coast, presumably to spawn. The fishermen think the fish go off in the Gulf Stream to spawn, after which it is believed they go in what is termed "The Bay," where they are supposed to stay until their return in the fall.

During the summer the larger boats that have been employed in winter catching kingfish turn their attention to anything that offers a chance

for making money. Some of them fish for snappers, groupers, or anything that they can catch, and which will sell in the market, while others go for turtle for a few weeks or months, as the case may be.

4. DISPOSITION OF THE CATCH.

As a rule, the great bulk of the kingfish taken by the Key West fleet is sold and eaten in a fresh condition, but occasionally some fish are salted on the boats and a greater quantity are split and salted after they are landed, the surplus being disposed of in this manner. These salted fish are often dried, and to facilitate this and insure the more thorough drying of the fiber, the thick part of the fish is cut transversely, nearly to the skin, at distances of about an inch apart. There is no systematic method of drying, as one sees in curing cod, but the fish are hung across rails, spread on wood-piles, or disposed of in any other manner where they may have a chance to dry, a favorite method being to suspend them by the tail. Cured in this way they make tolerably good food, but it is altogether probable that a much finer article of food might be obtained by smoking the fish. Its texture, and the oil contained in its flesh, would no doubt make the kingfish excellently well adapted for curing in this manner, and it is certainly possible that when so prepared it might rival the halibut and meet with as great favor in our markets as some other kinds of smoked fishes that now command a high price and a ready sale. The fact that it is seemingly abundant and can be bought at a comparatively low figure—the average wholesale price not exceeding 2 cents per pound for fresh fish—favors its introduction as an additional article of smoked food. Experiments can be made in this direction without great expense, and if found satisfactory there is reason to expect that capital and experience will unite to utilize the product of this fishery in such a manner that it may reach a wider field than at present, create a greater demand for the kingfish, relieve the fishermen from their present dependence on the Cuban markets, and also open the way for the employment of a larger fleet and a greater number of men.*

The kingfish sold to the smack that runs to Havana, or by the fare to local dealers, had a fixed price (winter of 1884–'85) of $22 per 100 fish, the buyer taking his chance as to the size. In winter it is said that the average weight is about 12 pounds, and in spring about 8 pounds, though individuals are frequently taken that weigh as much as 30 to 40 pounds each. The fish retail at various prices. For in-

*Being fully impressed with the importance of this matter, I assumed the responsibility of calling Professor Baird's attention to the subject. In response thereto he directed me to purchase a lot of kingfish when the ship returned to Key West on her way north, so that an experiment can be made in smoking them. The fish were obtained, but have not yet been smoked; therefore the result of the experiment must be given at a future date.

stance, one may be sold for a lump sum, his weight being guessed at, while a certain price, as high sometimes as 8 cents per pound, is charged in other cases.

The market building is constructed in a peculiar manner, with a view to keeping the fish fresh as long as possible without ice. It is made of narrow boards separated from each other about 1½ to 2 inches, so that a free circulation of air can be obtained. When a fresh breeze is blowing the wind draws through quite briskly, enough so to assist in cooling the fish, which are either spread out on a long wooden table or bench or suspended by their tails from the rafters. The latter method is always adopted when the fish are not going to be sold right away, since the wind circulates more freely among them and keeps them cooler than when they are lying on the table. It is said that fish will keep perfectly fresh for twenty-four hours, when hung up by the tail, if there is a strong norther blowing.

A considerable percentage of the kingfish go to Cuban markets, and at the time of our visit the smack Aaron Kingsland was employed in carrying cargoes from Key West to Havana, making a trip in an average of about one week.

Just before the arrival of the smack at Key West, of which the fishermen are duly notified from Havana, as well as of the day she intends to sail for Cuba, the fleet of boats start out for the kingfish grounds, arranging their departure so that a good fare can be secured in time for them to return on the day that the smack takes in her cargo. We were fortunate in having the opportunity to witness the interesting and instructive operation of a smack loading with kingfish for Havana.*

The vessel lay under the lee of a long wharf that reaches out into the harbor, and hovering around her, from stem to stern, and several tiers deep, boats outside of boats, lay the fleet of little smackees, like a flock of sea birds, resting on the waves. They were just in from the fishing ground, and the fares of those nearest the vessel were being rapidly transferred to the smack's hold, where they were carefully packed in pens, tier upon tier, each layer being covered with fine ice. The method of icing the fish differs in no essential particular from that in vogue among the New England fishermen. The ice was hauled down on horse-carts and dumped on the wharf alongside the smack, whence it was transferred to her deck. Taken altogether the scene was an interesting and animated one. The fishermen gathered in squads on the vessel's deck discussing the various incidents of their trip, or speculating on the general phases of the fishery; the shouts passing between those on the boats, as each tried to learn what "luck" his compeers had met with; the monotonous repetition of the "tally" as the fish were taken

* A few days later I went on board the same smack lying at anchor in Havana. The captain told me that it usually took about a week to dispose of a cargo, the fish being generally sold at retail.

from the smackees; the swarthy faces of the Cuban crew* peering up from the dim light of the ice-house in the vessel's hold; the many remarkable ejaculations in Cuban Spanish, negro patois, and the peculiar dialect of the native white fishermen, made up a combination liable to impress even the most casual observer. The bustle attending the departure of boats that had discharged their fares, or the advent of new arrivals that came dashing in by the pier-head, under a press of sail, which, a moment later, fell in graceful folds on deck, added to the spirit of the scene, while the manner in which the little craft were handled gave one a fine impression of the boatmen's skill.

The smaller species of fish are always marketed alive, with few exceptions. A quantity of these fish are kept in the boat's well, but in addition each crew has a live car—in the shape of a cube, and about 4 feet on each side—built of boards, in which more or less fish are kept, the amount seemingly being limited only by the capacity of the receptacle. These fish are sold at retail by the boatmen, who take them from the car or boat's well, as the case may be. The car is kept fastened to the wharf, and to show the fish to customers one-half of the cover is turned back, and any fish that may be selected from the numerous varieties is dipped out with a scoop-net.

The following are some of the common names of the different species of food fish usually sold in the Key West market: Moonfish, pompano, yellow jack, grunt, yellow tail, red grouper, black grouper or gag, mutton-fish, red snapper, gray snapper, laying snapper, spotted hind, angelfish, porgie, blue tang, chub, Jew-fish or guasa, Spanish hogfish, amberfish, marget-fish, runner, parrot-fish, turbot, pug, jack-fish, bone-fish, sailor's choice, barracouda, bluefish, Spanish mackerel (?), kingfish, rock shell fish, horn-fish, tarpum, drum, redfish, mullet, sheepshead, scamp, glass-eyed snapper, squirrel-fish, permit, old wife, dog snapper, French grunt, whiting, bream, goat-fish, nigger-fish, four-eyed fish, shad, moray, gar-fish, ballahou, schoolmaster, flounder.

D.—THE TURTLE FISHERY.

Although the turtle fishery of Key West is comparatively of less importance than some other branches of the fisheries pursued from the port, of which mention has already been made, it is nevertheless a well-recognized industry, employing some five or six sloops and schooners, of six to ten tons each, these vessels being of the same class as those engaged in sponging. Besides these vessels other boats engage in turtle-fishing to some extent at irregular intervals, but they cannot

*Although this smack belongs to Key West, she is manned entirely by a crew who are natives of Cuba: though residents of Key West, some of them were unable to converse in English. It is a fact perhaps not generally known, that a large percentage—estimated by some as high as 30 per cent.—of the population of Key West, came from Cuba, many of them being political refugees, and one hears Spanish spoken in the streets as frequently as English.

be included in the list of turtle hunters. Five men usually constitute a crew.

The turtles are sought for in the channels between the keys that are their favorite haunts. It is the habit of the turtle to feed in these channels, moving in and out with the flow of the tides. The localities frequented by turtles are called "turtle sets," and it is said that the hunters become exceedingly expert in finding these, as well as in capturing the animals they are in pursuit of. But the greatest skill is often of no avail, for so extremely uncertain are the returns, that it is asserted that a vessel may sometimes be a month absent from port without taking a single turtle, while another may be "lucky" enough to secure two dozen or thereabouts in three or four days.

The turtles are taken in nets similar to an ordinary gill-net, which are put out at night across the turtle sets so as to intercept the animals as they move in and out through the channels. The turtles get their heads and flippers entangled in the meshes, and in their struggles soon become so wound up in the twine that it is impossible for them to escape. The nets are made of coarse, strong twine; they are each 50 to 75 fathoms long, 5 to 7 fathoms deep, and have a mesh varying from 14 to 18 inches. The nets are hung to ropes in the ordinary manner of hanging gill-nets; wooden floats are strung along the upper edge, and lead sinkers are most commonly used. Turtle pegs are also sometimes used; but we were told that the Key West men depend chiefly on nets as a means of capture.

There is much variation in the size of the turtles, their weight ranging all the way from 6 pounds to 200 pounds or upwards. The smaller turtles, those ranging from 6 to 16 pounds in weight, are utilized to supply the local demand, and the price for these is about 10 cents per pound. The larger animals, those between 16 and 200 pounds in weight, are shipped to New York; but it does not pay to send any larger ones North. After being brought to Key West the turtles are put in large pens built underneath the piers—sometimes called "turtle crawls"—where they are kept pending their shipment. Those sold to New York parties average a price of 6 to 8 cents per pound. The largest turtles, those too big to ship, are, like the small ones, used to supply the local market. They are worth about 3 cents per pound before being butchered, but sell for about 15 cents in the market.

The returns from this business are very uncertain, as has already been indicated, but on the whole the men engaged in it are said to do fairly well, though we were unable to get any estimate of their earnings.

E.—The shore seine fishery.

A limited fishery is carried on by the Key West fishermen, for a few weeks or months of each year, with drag seines that they throw around schools of fish near the shore and pull them to the land. Of course,

when using such apparatus the operations are limited to such localities as have clean beaches, which are not numerous in this region, at least so far as our observation extended.

Flat-bottomed seine boats, of the sharpy pattern, are used. One of these that I saw on the beach in Key West was 20 feet long over all, 6 feet 3 inches wide amidships—its broadest part—4 feet wide on the bottom, and 20 inches deep. It had one stationary thwart, 3 feet from the stem, in which was a mast-hole, an adjustable thwart amidships, and another stationary one about 8 feet from the stern. At the stern was a platform, on which the seine is stowed, 5 feet 4 inches long, fore and aft, and placed 2½ inches below the gunwale. The boat had 11 sets of 1½-inch-thick timbers, and a small skag aft. The methods of seining in vogue on the Florida coast will be more fully discussed in another place.

According to Mr. Stearns there are about six seine gangs from Key West, averaging thirty men to a gang, employed in the fall mullet fishery from the beginning of September to the 20th or 25th of December. The fishermen and their boats are taken to the west coast of Florida in vessels which are also employed to transport the catch to Cuba.

The principal seining stations frequented by these fishermen are Charlotte Harbor, Sarasota, and Tampa Bay.

III.—NOTES ON THE FISHERIES OF WESTERN FLORIDA.

The fisheries of the west coast of Florida, particularly those which center at Pensacola, are specially interesting because of the marked improvement that has been made in their importance within a few years past. So notable has been the advancement in the fishery for the red snapper (*Lutjanus blackfordii*, Goode & Bean), for instance, that data collected and compiled for the census year of 1880 no longer convey any adequate idea of the present condition of the business.

For many months of the year the waters of Western Florida are said to swarm with various kinds of edible fish, some of which are the most delicious and highly prized of the ocean species. Some of these are migratory, and can be taken only during certain seasons, when they appear on the coast, while other species are non-migratory and are caught throughout the year.

The present favorable condition of the fisheries is largely due to the enterprise of a few firms, who have entered into the business with as much zeal as seems prudent in a new industry, and who, by obtaining concessions from the express companies and other transportation agencies, have made it possible to send fish to distant markets in good condition and at prices that are reasonable. Of course, it may be supposed that with the growth of the fisheries and the consequent increase in the amount of material to be transported, still more favorable arrangements may be made which may tend to the development and improvement of

these industries, as well as to the advantage of the railroads that carry the fish. At the best, however, the fisheries of this section must labor under the disadvantage of being remote from large centers of population; and as a great proportion of the catch must be marketed in a fresh condition, and consequently be carried by fast freight, the cost of transportation will always be large. As an offset to this is the abundance of fish, certain varieties of which can be taken with less expense than in many other places, and it seems to me only a question of time when the demand will be such as to call for a very much greater quantity than is now taken, the result of which will be an enhancement of prices, the employment of more men and capital, and the consequent material improvement of the coast and offshore sea fisheries. But while we may reasonably assume that the fisheries of the Gulf may attain much greater proportions than they now have, it is not probable that they will ever reach an importance at all comparable with such fisheries as those of New England, simply because there are not the enormous resources to draw from for a large supply of material, and also because these southern species are not likely to fill so important a place in cured food as do the staple productions of our northern seas.

Such are some of the conclusions that have been arrived at, from a brief study of the fishing industries of this region, and it has been deemed best to present them here as prefatory remarks, bearing, in a general way, on the more specific notes which follow.

It is also proper to state that the notes presented here are based on such data as I was able to gather in a few hasty interviews with people who are familiar with the fisheries of Western Florida, as well as on my own personal observations. The chief aim has been to get an idea of the methods of fishing, and the vessels and apparatus used, thinking it might, at least, be possible to offer some suggestions for their improvement. At the same time a general idea has been gained of some other details pertaining to the various fisheries discussed. Such facts as have been gathered are combined in the following pages. That they will come far short of a complete discussion of the whole subject, even in the localities mentioned, I am fully aware, and therefore they are given for what they are worth, since the object aimed at is not to make a comprehensive report, but simply to give such salient points as will enable the reader to obtain an idea of the leading features of the industries referred to. Necessarily, too, the information gathered is chiefly concerning the Pensacola fisheries and those of the nearest points to it, since these were the only ones we had a chance to study, not having visited any other place on the west coast of Florida but the above-mentioned city, except Tampa, where I saw no one.

A.—THE RED-SNAPPER FISHERY.

The red-snapper fishery is specially interesting, because of its comparatively recent origin, as well as for the advancement it has made within the past few years, so that it may now be considered as

being in the front rank of the fisheries of the Gulf coast. Its headquarters are at Pensacola, which now controls this industry, since the nearness of this port to the fishing grounds, combined with its railroad facilities, make it the most available market, and give it many advantages over New Orleans and Mobile, which cities have a few vessels employed in the business. With the exception of two vessels owned at Mobile, and which market their catch at that port, the entire fleet take their fish to Pensacola, where they are sold, or, in a few cases, shipped to consignees at New Orleans.

At the present time (1885) there are employed in the red-snapper fishery of the Gulf seventeen schooners and four sloops, with a total tonnage of 709.21 tons, and manned by one hundred and forty men, approximately. The total amount of fish taken by this fleet we were unable to obtain, but judging by such statistical data as are at hand, it cannot fall far short of 2,000,000 pounds.

In addition to the vessels, there is a more or less numerous fleet of sail boats, of various sizes, up to six tons, that find employment during the summer in fishing for snappers, and the aggregate taken by these is considerable.

1. THE FISHING GROUNDS.

In the early days of the snapper fishery the inshore grounds, where the water is comparatively shallow—10 to 15 fathoms deep—were most generally resorted to, and even at the present time, in spring and summer, fish are found in these localities, but not, however, in the same abundance as formerly. The most important fishing grounds now are those lying off shore, where the snapper can be found most abundant in winter, the season when the fishery for it is at its height. Previous to 1882 the chief part of the snapper fishing was done between Perdido Bay and Cape San Blas, in from 10 to 22 fathoms. Along this stretch of ground there is said to be, here and there, patches of hard limestone bottom, on which live corals and other forms of invertebrate life occur. These places are often, says Stearns, depressions or gullies, seemingly scooped out of the surrounding sand, and having a somewhat greater depth of water than the adjacent bottom. Patches of ground of this character are the favorite haunts of the red snapper.

Many of these spots have names, given them by the fishermen, to distinguish them from each other, though some of the grounds have not received the same consideration.

The *Trysail Bank*, a narrow gully, not more than 500 yards wide and about a mile long, east and west, bears south-southwest from Pensacola Bar, from which it is distant 23 miles. It has a depth of 19 fathoms.

Dutch Bank, with a depth of 13 fathoms, is a small patch that lies off Perdido Inlet, and can be found only by ranges.

Southwest Ground is a small spot bearing southwest from Pensacola light-house, from which it is 5 miles distant.

Middle Ground, on which many small boats from the navy-yard fish in summer, is 3 miles east of Pensacola Bar buoy. Like the others, its area is small.

Charles Henry Ground embraces a series of seven small patches lying between the bearings of south-southeast from Pensacola Bar and south by west from Santa Rosa Inlet, in 19 to 22 fathoms.

East Pass Grounds are several small patches of coral bottom, about 15 miles from land, with a depth of 19 fathoms, bearing south by east from the East Pass of Santa Rosa Island.

Besides those already mentioned, there is a series of small patches of ground lying between East Pass of Santa Rosa Island and Saint Andrew's Bay, in 12 to 22 fathoms of water. These have been important fishing grounds for several years, and are still much resorted to during the warm season.

The grounds which are now most generally visited in winter, and consequently of the greatest importance, are embraced in a somewhat narrow belt along what is termed the outer edge of the shore soundings, between the meridians of 85° and 88° west longitude. Along this stretch of sea bottom, which is more or less crescent shaped, are various patches of considerable extent, with depths varying from about 20 to 47 fathoms, where the red snapper occurs in greater abundance during the winter season than elsewhere so far as is known. The species is found to the southward and eastward of this, even so far as the Tortugas, and sometimes the fish are plentiful and bite freely, though, according to Stearns, there is this difference between the grounds east of the 85th meridian and those west of it: On the former, groupers are far more abundant than red snappers, outnumbering them at least two to one, while on the western grounds the case is reversed, for there the snappers are found in large schools, and average about twice as many in number as other species. The success of the Pensacola snapper fishery is unquestionably due, in a great measure, to the fact that this species has been found in such large schools on the western grounds and within easy reach of a market.*

The grounds lying between Cape San Blas and the Tortugas have been worked over, we are told, but mostly inshore, in from 5 to 15 fathoms, which region has been thoroughly fished by the Key West smackmen. Outside of the fifteen-fathom line, south of Tampa Bay, it is altogether probable that little fishing has been done, and here, as well as farther northwest, the red snapper may probably be found in abundance. As a rule, the Pensacola smacks do not go farther to the southeast than on a small ground that bears southeast ½ east from Cape San Blas, and

* The researches made by the Albatross between Tampa Bay and Tortugas (see report of the cruise) apparently proved that red snappers were even more abundant in this region, in 25 to 27 fathoms, than they are farther to the northwest. And while the grouper appeared to outnumber the snapper north of Tampa, or between it and Cape San Blas, the reverse was the case on the more southern grounds.

the center of which is in lat. 28° 43′ N. and long. 84° 27′ W. This, and the adjacent bottom, has been worked on about three years. As a matter of fact it is thought that it would scarcely be profitable at present for them to go farther from Pensacola, since it would take too long to reach market with a fare of fish if a vessel encountered head winds on her passage. Stearns says: "We have occasionally had some of our vessels go as far to the eastward as to be off Tampa, where, in summer, they have found patches of good ground, and a fair catch of snappers, all along the edge of the so-called deep water, in a depth of about 22 fathoms. In the summer of 1884 the schooner Sarah L. Harding went there to fish for groupers, which she was going to carry to Galveston. But where in former years groupers had been abundant a good school of snappers was found, a fare was obtained, and the vessel took her cargo to Pensacola."

Although it is now deemed impracticable to go farther from Pensacola than the vessels have been in the habit of fishing, there is no doubt but that the men would extend their cruises were they sure of fair returns on distant grounds, whenever the supply of fish on those now visited grows less. As the case now stands, a smack will generally strike fish before getting far beyond Cape San Blas, at the farthest, and though the catch may not be all that one might desire, still it would not be deemed wise to leave a certainty to search for better grounds farther off, which no one has yet any definite knowledge of. The fact, too, that on these eastern grounds there is said to be an abundance of groupers, a fish that has little value in the Pensacola market, would naturally deter the fishermen from making extended cruises which otherwise they might venture on.

One of the oldest offshore snapper grounds lies off Mobile, and is about 15 miles long northeast and southwest, and its width is, approximately, 2 to 5 miles; it has a depth of 37 to 42 fathoms, with a rough bottom, chiefly of limestone and coral. It bears south-southwest from Pensacola, from which it is about 65 miles distant. This ground has been worked out, so that at present fish are not very abundant in the first of the winter, but they are generally more plentiful in March, April, and May. It is said that in this locality more West Indian species of fish and deep-water surface swimmers are found than elsewhere on the northern side of the Gulf.

The *Old Cape Ground* is another bank that, for several years, has been accounted one of the most prolific regions visited by the snapper fishermen. Even at the present time it is one of the most important grounds along the coast. The center of this bears about southwest from Cape San Blas. The depths usually fished in, in winter, vary from 27 to 31 fathoms. There are no definite limits to the ground, but, according to what we were able to learn of it, its length is about 20 to 25 miles along the edge of soundings southeast and northwest, and its width from 3 to 7 miles. Farther to the southeast, and separated from the Old Cape

Ground by a stretch of barren bottom that lays about south from Cape San Blas, is the *New Cape Ground.* This bears from south-southeast to southeast from the cape, and has about the same extent as the old bank, while the depths do not differ materially from those of the other ground. The character of the bottom is much the same on all these banks, according to the fishermen, at least on the spots where snappers are found, and they say that where the arming of their leads will bring up black sand, or sand with black specks, coarse gravel, and live corals or bryozoa, they consider it good ground for fish.

It may not be out of place to say that quite extended researches have been made west of the Mississippi in search of snapper banks, the demand for fish in the Galveston and New Orleans markets, and the consequent high prices often paid being, no doubt, an inducement toward making these investigations. As early as the fall of 1880 two smacks, from Noank, Conn., which were fishing in the Gulf, made a cruise off Galveston in search of fishing grounds, but found no bottom suitable for red snappers to live on. Mr. Sewall C. Cobb also tells us that he spent the entire month of July, in 1883, seeking for red snappers, and sounding along the coast, from the southwest pass of the Mississippi to a point off the center of Padre Island, Texas, a distance of about 450 miles. The bottom, over all this extent of ground, was mostly mud and broken shells, and totally devoid of any fish life, so far as he was able to tell. He succeeded, however, in finding a small area, in 10 or 12 fathoms, bearing about east-southeast from Galveston, some 45 or 50 miles distant, where there were some outcropping coral rocks on the bottom; and here some red snappers were taken. It appears that two schools of fish were found, but in each case the individuals were of small size and they were not very abundant. The first lot taken averaged about 3 pounds apiece, while the fish caught from the other school weighed an average of 7 pounds each.*

In the summer of 1884 the Pensacola Ice Company sent another schooner off Galveston for red snappers, but the voyage was a failure, the vessel not getting fish enough to pay her provision bill.

Captains of merchant vessels who visit Pensacola have reported that red snappers are abundant off the coast of Mexico, particularly in the immediate vicinity of Vera Cruz. Mr. Stearns, who has inquired pretty closely into this matter, is of the opinion that these reports are exaggerated. He says there are some small spots in sight of the city of Vera Cruz where boat-fishermen take a few snappers, but he does not believe there are grounds extensive enough to support anything like an important vessel fishery.

The banks frequented by the red snapper having been discussed in a general way, it seems desirable that certain peculiar characteristics

* Mr. Cobb showed me a large piece of coral rock that was pulled up on a fishing line, at this place, and which he brought home and still keeps as a souvenir of the trip. This rock would probably weigh 30 or 40 pounds.

that distinguished them from other fishing grounds, should be considered.

The red snapper has a habit of congregating in schools of limited extent, something like the mackerel and menhaden, instead of spreading over the bottom as do the cod, haddock, and many other species of ground feeders. It is therefore difficult to define precisely the limits of the areas that it inhabits. The best that can be done is to give a general idea of the locality and extent of the banks on which are small patches of ground where the snapper is found in abundance. It is not, however, known, even to the fishermen, whether or not the fish remain on a particular spot for a considerable length of time. It is only known that the fish cover a very limited area, and it is believed that they cannot be induced to leave the locality where they are found. A vessel will rarely stop in one position more than a day, and frequently only a few hours, before the school of snappers she is fishing on is broken up, or the fish become gorged with bait so that they will not bite fast enough to make it profitable to stay longer. Consequently, the vessel gets under way and goes to port or "tries around" to find another school. This being the case, it is, of course, quite impossible for anyone to say positively that snappers remain in one locality for days or weeks at a time. It may, perhaps, be safe to infer that when they have located in a place where the conditions are well suited to their existence, they remain there until the instinct of reproduction or other cause may induce them to change their position. This seems all the more reasonable, because it is only on certain kinds of bottom that the fish are found, the peculiarities of which have already been alluded to.

The character of the snapper grounds, so far as relates to the abundance of fish on them, and, of course, their consequent importance, has changed very materially, it is said, within the past three or four years. It is claimed that this change is still going on, and that localities that were remarkable for the abundance of fish on them only a year or two ago are now of comparatively little importance. The best evidence that can be adduced in support of this theory is the fact that the vessels are continually obliged to extend their cruises further off in order to meet with success, and at present we are told that it would be of little use to attempt to catch fish on grounds where they could be taken in great numbers in the early days of the business. Whether this decrease in the abundance of the species will go on until it is no longer profitable to prosecute the fishery is a vital question. While this seems probable, one could scarcely be so dogmatic as to make such a prediction, unless, indeed, he had special opportunities for studying the fishery during a number of years. There are several reasons, however, which might lead one to anticipate a serious depletion in the numbers of the red snapper which do not obtain in the majority of food-fishes. First, it is local in its habits, and, unlike most of the migratory species, is taken at all seasons of the year; second, the region inhabited by the

snapper (from a point about south from Mobile to the Tortugas) is a narrow belt, rarely exceeding more than 3 to 6 miles in width, and its total area is of comparatively small proportions; third, it must be borne in mind that certainly not more than one-half of this ground can be taken into account at present, since it is not fished on for snappers; fourth, it must also be considered that, even on this so-called snapper bank, fish are found only on small areas, that are more or less widely separated, and which, combined, constitute only a very small percentage of the whole ground; indeed, the localities inhabited by schools of snappers are not so numerous but that much trouble is oftentimes experienced in finding them, and not unfrequently one or two days are spent on the best grounds without good fishing being obtained; fifth, the great voracity of the snapper, and its readiness to take the hook, makes it possible to capture a large percentage of the individuals in a school, and it is fair to infer that in most cases their numbers will have suffered a very marked diminution before they cease biting. In many instances it is probable that nearly all the fish in a school are caught. It will be apparent that this is the case when it is understood that one or two thousand fish are sometimes taken in a few hours, the total weight of which would approximate 10,000 to 20,000 pounds.

In regard to its food, which unquestionably exercises a great influence on its movements, and the abundance of which perhaps confines it to certain localities, there are various statements based on observation. Stearns thinks that while groupers feed chiefly on crustacea and other material that may be picked off the bottom, the red snapper preys on fish, which is his favorite and principal food.

Cobb says "The snapper feeds upon the best in the sea, calico crab, blue crab, squid, polyp, and shrimp being his favorite diet."

I have myself taken a small bivalve from the stomach of a snapper. But those caught on the Albatross seldom had anything besides fish in their stomachs, though in a few instances small crabs were noticed. Fish were also often found in the stomachs of groupers.

2. THE FISHERMEN.

The fact that for many years the vessel fishery for red snappers was carried on exclusively by "Yankee fishermen," who came here in winter from New England, has naturally led to more or less eastern men being at present employed in the business. In the winter of 1884–'85 there were three New England vessels engaged in the snapper fishery from Pensacola, and certainly one schooner belonging to that port, which carried a captain and crew from the same section. In some other cases the skippers were from New England. Some of them spend the winter here, and go north in summer.

Mixed with these northern-born fishermen are many natives of the South, as well as a more or less liberal sprinkling of foreigners—Ital-

ians, Scandinavians, Minorcans, French, Spanish, &c.—some of whom come here in ships which they leave to engage in fishing. The average crew for a snapper-catcher is about seven men, and the total number of fishermen employed in this business is probably not far from one hundred and forty.

3. VESSELS AND BOATS.

The vessels employed in the red snapper fishery are for the most part of northern build, and are about equally divided in type between the tight-bottom schooners in common use north of Cape Cod, and the welled smacks of southern New England. They are mostly of small size, compared with the larger class of sea-going fishing schooners now employed from Maine and Massachusetts, and, as a rule, are quite old. Some of them were formerly employed in the Gloucester fisheries, and others from ports on Long Island Sound, or on the coast of Maine. A few—generally those of the smallest class—have been built in Gulf ports. Coming from so many sources, there is a marked diversity in these vessels, and no one of them could be described as characteristic of this special fishery. Those which came from northern New England are, as a rule, sharp, schooner-rigged, keel craft, and have the characteristic features of the clipper fishing schooners of the region where they were built. The principal change that has been made in them is in the substitution of a large, long-clewed, balloon main-stay sail instead of the rather short-clewed sail used in New England. None of them carry a flying-jib in winter, and only one or two have a foretop-mast and jib-topsail. The schooner Henrietta Frances, of Boston, did attempt to carry a flying-jib the present winter, but she soon lost her jib-boom, having broken it off in the short sea of the Gulf.

Although tight-bottomed vessels are now found as well or better adapted for the fishery than welled smacks, the latter were at first in favor, therefore smacks, both sloops and schooners, were then purchased for the trade. Comparatively little use is now made of the wells, since it has generally been found more satisfactory to ice the fish than to keep them alive. The northern-built smacks differ in no essential particular from those of the locality from whence they came. Those from ports on Long Island Sound are generally deeper, and somewhat fuller than the vessels from north of Cape Cod, but are precisely the same as one may see at Noank, New London, or at Fulton Dock, New York, where smacks 20 to 25 years old are still in use.

Some of these old smacks are said to be very seaworthy, and, though they are small, they are considered well adapted to the fishery in which they are engaged, and which, at present, is not sufficiently remunerative to warrant the employment of large and costly vessels. So far, it has not been found profitable to employ vessels much larger than 50 or 60 tons, and it is probable that this will always be a safe limit, since nothing can be gained by additional tonnage. This is due to the fact that

the fishery must seemingly always be carried on with hand-lines from the vessel's side, or in dories, and in this case 8 or 9 men, at the most, will catch nearly as many fish as a much larger number. Therefore, any increase in the size of the vessels, above a certain limit, and addition to the number of men carried, must result in greater expense without a corresponding augmentation of receipts.

The following is a list of the vessels engaged in the red snapper fishery, from Gulf ports, in the winter of 1884–'85:

VESSELS MARKETING THEIR CATCH AT PENSACOLA.

OWNED OR CHARTERED BY THE PENSACOLA ICE COMPANY.

Schooner smack Niantic, of Pensacola, 45.87 tons; built in Connecticut.
Schooner smack J. W. Wherrin, of Pensacola, 25.59 tons; built in Massachusetts.
Schooner smack Ripple, of Pensacola, 28.82 tons; built in Connecticut.
Schooner Ada, of Pensacola, 16.46 tons.
Steamer Millie Wales, chartered; burned in December, 1884.
Schooner smack Comet, of Stonington, Conn., 27.52 tons; lands her fish at wharf of Pensacola Ice Company.
Schooner smack Mary Potter, of Stonington, Conn., 36.23 tons; lands her fish at the same wharf as above.

OWNED OR CHARTERED BY MESSRS. WARREN & CO.

Sloop smack Maria Antonia, of Pensacola, 15.89 tons; built at New Orleans, La.
Schooner Clarence Barclay (tight bottom), of Pensacola, 25.03 tons; built at Salem, Mass.
Schooner Sarah L. Harding (tight bottom), of Pensacola, 31.31 tons; built in Maine.
Schooner John Pew (tight bottom), of Pensacola, 42.36 tons; built at Essex, Mass.
Schooner H. S. Rowe (tight bottom), of Pensacola, 56.50 tons; built at Essex, Mass.
Sloop Hope, of Pensacola, 5.46 tons; built at Pensacola.
Schooner Henrietta Frances (tight bottom), of Boston, Mass., 73.84 tons; built in Maine. Chartered.

OWNED BY MESSRS. E. E. SAUNDERS & CO.

Schooner smack Estella, of Pensacola, 38.57 tons; built in Connecticut.
Schooner smack Caro Piper, of Pensacola, 29.64 tons; built in Maine.

CHARTERED BY THE SANTA ROSA FISH COMPANY.

Schooner John Di Lustro, of Pensacola, about 21 tons; built at Pensacola, 1884.

VESSELS OWNED AT NEW ORLEANS AND MOBILE, BUT WHICH LAND THEIR FISH AT PENSACOLA.

Schooner smack Albert Hayley, of New Orleans, La., 47.95 tons; built in Connecticut.
Schooner smack Emma B., of New Orleans, La., about 31 tons; built in Mississippi.
Schooner smack Frances Ellen, of New Orleans, La., lost at sea by being capsized, January, 1885.

* The wells on these smacks are used when practicable, but generally it is found more satisfactory to ice the fish, as has previously been stated.

Sloop smack Challenge, of Mobile, Ala., 29.24 tons; built in Connecticut; chartered by New Orleans parties.
Sloop smack Charles Henry, of New Orleans, 21.30 tons; chartered by New Orleans parties.

VESSELS LANDING THEIR FISH AT MOBILE, BUT OCCASIONALLY AT PENSACOLA.

Schooner smack Laurel, of Mobile, Ala., 33.07 tons; built in Maine.
Schooner smack Leonora, of Mobile, Ala., 32.02 tons.

From the foregoing it will be seen that, exclusive of the steamer destroyed by fire and the schooner capsized, there were twenty-one vessels, with a total tonnage of 709.21 tons, employed in the snapper fishery of the Gulf in the winter of 1884–'85.

In summer a number of sail-boats are employed, more or less regularly, in the red-snapper fishery. These are mostly of the class usually engaged in the oyster fishery in winter, and vary from 4 to 6 tons.

Among the sail-boats that are employed in the Pensacola red-snapper fishery, in summer, is one that deserves special mention, since in its rig as well as in some other peculiarities it is very distinctive in type.

It is a carvel-built, center-board boat, entirely open; with long, sharp bow; round bilge, fine run, and vertical, heart-shaped, square stern, the latter being rather light and very symmetrical. The rudder hangs outside, and is managed by a yoke, the yoke lines reaching forward of the mizzen-mast. This craft is rigged as a three-masted schooner, without jib, and carries three sprit sails, the mizzen only having a boom. The masts are adjustable and the smaller spars and sails can be substituted for the larger instead of reefing. So far as we know, this is the only three-masted open boat used in the fisheries of the United States, and we are not aware that on any other does the European custom prevail of substituting small sails for large ones when the wind increases. I am indebted to Mr. Stearns for the following interesting account of these boats, which, he says, are used by the negro fishermen of Warrington to go to the nearest snapper grounds during the summer.

They are owned chiefly by pilots and stevedores, who, having used them in their own trade during the winter, let them out in summer to reliable negroes for fishing, taking one share of the catch for payment.

Formerly, this type of boats was used almost exclusively by the pilots of Pensacola to board vessels at sea. The pilots would go from the shore at 2 or 3 o'clock a. m., and sail in various directions until sunrise, when the course was laid for home. A lookout was always kept from elevated stations on shore during the remainder of the day, and the sighting of a large vessel resulted in a general race between the whole fleet of boats.

Sometimes the morning run would take the most of the fleet 20 miles from land, and often very heavy winds and seas were encountered while out there.

At a later period, say eight or ten years ago, the stevedores were very actively competing with one another, and it became the custom to board vessels at sea to solicit the job of loading them. Various kinds of boats were tried for this purpose and the "pilot rig," as it is here called, was universally adopted as being the best. Whenever a vessel came in sight, there would be a dozen or more stevedores, and probably as many pilots, engaging in an exciting race for her; all using all sail and oar power. As the gains of success were large it became no object to spare money in perfecting the boats.

In 1878 and 1879 there was greater interest in the "pilot rig" boat than in almost anything else about Pensacola Bay. There were regattas in rapid succession, and the entries would range as large as 30 in number. In the day of the finest specimens they could and did outsail anything of equal size that could be found.

They have mostly been built by Robert Langford, who spent his whole time, with assistants, for ten years, exclusively in making these boats. The original model was the Whitehall pattern, but this has been greatly improved to meet the requirements of the trade in which they were employed.

Langford's boats are built with the greatest care, and are very expensive, but such is the excellence of their construction that, even with the rough usage which they receive they are durable, and prove a good investment in the end. Boats of similar rig and proportions were built at New Orleans and taken to Pensacola to compete with Langford's productions, but the former were all very badly outsailed.

Since large pilot schooners have come into use at Pensacola, and the stevedores have abandoned the custom of boarding vessels at sea, these boats have fallen into the hands of the fishermen. There are 12 or 15 of them now at Warrington that make a business of fishing about 8 months in the year. From four to seven men go in a boat, working for a share each. They leave Warrington at daylight, or before, and go from five to fifteen miles from the bar to small patches of fishing ground, and leave the grounds in time to carry their catch to Pensacola before the fish-houses are closed; or in cool weather, remain longer, and send the catch to market by one boat the following morning. Their daily catch ranges from 100 to 1,000 pounds of fish per boat, averaging probably about 400 pounds. The fishing gear is rigged similar to that used on the smacks, but is generally lighter. Ice is never used. These boats often sail 40 miles a day, going and returning, besides spending a large portion of the day on the fishing grounds.

Boats of this type are about 3½ beams to length, and their depth is practically the same in proportion as that of an ordinary Whitehall boat. They vary in size from 16 to 21 feet in length. The keel is shallow and quite wide in the middle for the center-board case. The centerboard is iron, and it is placed a little forward of amidships. A boat will have 3 or 4 thwarts according to its size. The stern is decked,

flush with the rail, for a length of 2 or 3 feet, and under this is a locker for food, &c.

The following are the materials used in constructing these boats. Timbers of mulberry or "tighteys," which are very strong and light; stem, keel, stern-post, and stern, of oak; plank of white cedar; gunwales of yellow pine, and thwarts of yellow pine or oak. The fastening and fittings are either copper or brass.

All have three sails, but the mainsail (or middle sail) is not carried except in light winds or when a boat is being driven hard.

The area of sail on these boats, says Mr. Stearns, is so large that they can be kept up in fresh winds, only by having a large amount of "live ballast." From three to seven men constitute a crew, and if a boat is racing all of these must be experts, and understand how to place themselves so that they may improve the stability and sailing qualities of the craft. Even with small sails and a moderate-sized crew, these boats will work to windward very rapidly, when most small craft will not "look" that way.

"I once came from Warrington in one during a gale," says Mr. Stearns, "when a 24-foot keel cabin sloop could not make any headway to windward. In ordinary winds and seas they will make a 3½ point course on a wind."*

The larger boats of this class cost $450, and the smaller ones from $250 to $300.

Each of the vessels carries from one to three dories of the pattern built in New England, from whence they are obtained. These are usually 14 to 15 feet long on the bottom.

4. APPARATUS AND METHODS OF FISHING.

Fishing-lines.—The hand-lines used in the snapper fishery are rigged in a very primitive manner, little attention being paid to elaboration and refinement of details, such as is common with codfish gear. But this lack of care in rigging the gear is because it would be superfluous, since the snapper usually bites so greedily that no refinement in the apparatus is required to entice it to take the hook, and also because the snoods and hooks are frequently carried off by sharks and jew-fish. Therefore, a fisherman who would spend hours in rigging a hand-line for cod-fishing, not neglecting the smallest detail that could add to its fineness and supposed attractiveness, will soon learn that all this care is not required in preparing snapper gear, and consequently will rig it as others do.

The lines are usually 50 fathoms long, of steam-tarred cotton, of a size weighing from 16 to 18 pounds to the dozen lines of 25 fathoms each. A lead sinker weighing 2½ to 3 pounds is fastened to the end of the

*I understand Mr. Stearns to mean that they will, when sailing close hauled, lay within 3½ points of the direction from which the wind may be blowing.

line.. Two moderately long-shanked, round-bowed, eyed hooks are bent to the ends of a snood of smaller line (about 12 pounds to the dozen) of 10 or 11 feet in length, and this is fastened to the main line above the sinker by doubling the snood and passing the ends, with the hooks attached, through the bight and hauling it taut. One end of the snood is left to hang below the other about a foot. No swivels are used. The method of ganging is to pass the end of a snood through the eye of a hook, then around the shank and back underneath the standing part to form a hitch. The end, which is usually 6 or 8 inches long, is sometimes laid up on, and bent to, the standing part. More frequently, however, the end is simply cut off, or carried up and bent in a bowline to the standing part, no trouble being taken to lay the line together. The line is, in most cases, doubled above the hook to prevent its being bitten off.

Sounding-line.—Each vessel is provided with a sounding-line, which is also a fishing-line. The line itself does not differ from those previously described. The sounding-lead weighs about 8 or 9 pounds, and has a cavity in its lower end to receive the arming, which is generally wax. A snood, about 3 feet long, with a hook attached to its end, is bent to the line some 2 to 4 feet above the lead. When the line is being used for sounding this hook is baited. Attached to the line, at a suitable distance above the lead, is a wooden toggle placed at right angles to the line, so that it can be grasped in the hand to throw the lead.

Trawl-lines.—It seems desirable to mention the fact that attempts have been made to utilize trawl-lines for the capture of the red snapper, this apparatus being precisely the same as that used in the cod and haddock fisheries from New England ports. For various reasons, however, trawls have not been found well adapted to this fishery. More fish can be caught on hand-lines than on trawls, for the following reasons: (1) the red snapper, as has already been stated, is found in schools of such limited extent that only a small part of a trawl could be set where the fish were, consequently the rest of the line would be put out to no purpose; (2) this being the case, the catch must necessarily be small, even if a fish was taken on every hook that crossed the school; (3) the snapper is so active and persistent in its efforts to escape that it frequently tears itself clear of a trawl-hook, especially if the latter is not well fastened; (4) the presence of sharks and large jewfish on the grounds in considerable numbers is a decided drawback to the use of trawls, even if other conditions favored it, for not only are fish liable to be torn from the lines or mutilated by these pests, but the apparatus is also exposed to the risk of being injured; (5) the snapper bites so freely at a hand-line that more can be taken by this form of apparatus in a given time than by any other means that has been tried.

With the above objections to the use of trawls, and the additional one that they are far more expensive than hand-lines, there seems no reason to suppose that they will ever be profitably employed in this fishery.

Crimping tools.—The welled smacks, on which fish are kept alive, are

provided with crimping-awls, sharp-pointed hollow tubes, of brass, set in handles so as to leave the handle-ends uncovered. These are used for crimping the fish, to let the air out of their swim bladders so that they can live in the well. Red snappers that are to be iced are also crimped to let the air out, but the tool used is generally a pitchfork or a pew—in fact, any sharp-pointed instrument that chances to be at hand—and less care is exercised than when the fish are to be kept alive.

Hand-haulers.—As a rule, the snapper fishermen use nothing to protect their hands, or to enable them to grasp the line more firmly. The extreme activity of the red snapper, when hooked, and the rapidity with which its bites, renders it impracticable to use woolen nippers similar to those worn by cod-fishermen on the banks. But a sort of hand-hauler is used by some of the Northern fishermen who come here, which is something like that which the boat fishermen of New England wear to protect their hands. This is much broader than the nipper, covering most of the hand; is double, and generally has a piece of woolen cloth between the two parts of knitted work.

Palmetto bindings.—Some of the New Orleans smacks, who ship their fish from Pensacola to the home port, carry quantities of palmetto leaves, which are used for binding or tying "bunches" of red snappers.

Other apparatus.—The pitchforks, fish-pews, gaffs, gob-sticks, &c., carried by the vessels employed in this fishery are essentially the same as those in use elsewhere, and need no special description.

Bait.—A vessel engaged in the snapper fishery usually carries from 300 to 400 pounds of salt bait on each trip. This is generally lady fish, bluefish, or skipjacks, though the common mackerel (*Scomber scombrus*) and the Gulf menhaden (*Brevoortia patronus*) are sometimes used. Salt bait is put on the hooks when the vessel first arrives on the ground, but after fishing has begun fresh bait is chiefly used, the hooks being "pointed" with pieces of the salted article which is considered the most attractive. Jewfish, groupers, porgies, leather-jackets, and sharks are used for bait; in fact, almost any fish that are caught on the lines, even to red snappers, though, of course, the latter are not taken for this purpose when fish of less value can be obtained, which is generally the case. The fresh bait has the advantage of being very much tougher, as a rule, than that which is salted, and therefore cannot so easily be torn from the hooks. Porgies are said to be more attractive bait than most of the other varieties used fresh, and we had an opportunity for noting that the red snapper prefer it to the grouper, both of which we tried on our hooks.

It is said that after the 1st of March the snapper is far more dainty than during the winter, and then choice varieties of fresh bait are required; lady-fish and bluefish are preferred.

There is nothing peculiar in the manner of baiting the hooks. The bait is cut into irregularly shaped pieces, about 2 inches in diameter,

and of varying thicknesses. Two or three pieces are put on each hook, and sometimes more are used if the bait is thin.

Methods of fishing.—The methods adopted for finding and catching the red snapper are peculiar, and, so far as we are aware, differ from those of any other fishery, either in America or Europe. As has already been stated, a remarkable habit of this species is to collect in schools of limited extent on bottom generally composed of black sand, live coral, small rocks, and coarse gravel. As a result of this peculiarity, a vessel may be within a stone's throw of a fine school of fish, and not a single sign of their near presence be manifest to the fishermen, so far as getting a bite is concerned. The natural inference to one unacquainted with the business would be that no fish were near, but experience has taught that such a decision is liable to be erroneous. When, therefore, a vessel has reached the ground, and the depth and the material brought up on the lead are both indicative of the possible presence of snappers, the mate of the vessel begins throwing the sounding lead at short intervals, the hook on the line being baited before the sounding begins. So ready is the snapper to take the bait that it is confidently expected that one will be caught on the sounding line almost the instant it reaches bottom, should the lead strike the ground where there is a school of fish. This being the case, the vessel is not hove to at all. If the wind is light, she stands back and forth—usually by the wind—with a good full, but if there is a fresh breeze she must be luffed into the wind, to deaden her way, so that the lead will reach bottom. In either case the mate stands on the rail, grasping the main-rigging with one hand, and heaves the lead far ahead of the vessel, every few minutes; and such dexterity is acquired in this operation that it is currently reported that some individuals can throw a lead over 20 fathoms before it strikes the water. One who falls far short of proficiency in this part of the work is not accounted a good mate for a snapper catcher.

The sounding goes on continuously until a fish is caught, the vessel standing off and on, constantly crossing from one edge to the other of the fishing ground. As soon as a snapper is taken the main boom is guyed out, the jib hauled down, and the vessel hove to. While this is being done a buoy with anchor and line attached is thrown over to mark the spot, or else a dory is hoisted out and a man springs into her with his line, throws out his anchor to hold on, and immediately begins fishing. As soon as possible, all hands on board the smack get out their lines and begin to pull in the snappers as rapidly as they can. In a short time, however, the vessel drifts off the fish and not a single bite can be felt. It is now that the wisdom of putting a mark on the ground is apparent, for there is no difficulty in finding it, and the uncertainties of guessing are eliminated. Then, too, trials can be made on all sides of the first position, if deemed desirable, and the precise locality where fish are most abundant can be fully established. This point having been settled to the satisfaction of the skipper, the anchor is generally

let go, so that the vessel, when a "scope" is paid out, may be as nearly over the center of the school as possible. Now the work of fishing begins in good earnest, and if the snappers bite well, which is usually the case, they are pulled in with a rapidity that is surprising. We are assured by the most reliable authority that the numbers taken in a limited time are very much greater than would be believed possible by one unacquainted with the fishery. Mr. Stearns tells me that smacks have taken as many as 1,700 to 1,800 fish in a single day, and on one occasion a fisherman who sailed in one of his vessels caught 400 fish as the result of one day's work.

When fishing begins, the snappers are usually caught within 6 or 8 feet of the bottom, but if the school is large and the fish hungry, they soon follow the lines up in the water, and in a little while can be taken by pairs only a few fathoms from the surface. At such times the energy and dexterity of the fisherman is fully tested, and he who is quickest at pulling in his line, unhooking his fish, rebaiting his hooks, &c., catches the greatest number of fish, and correspondingly becomes more valuable to his employer.

When the fish are to be kept alive in the well of a smack, much more than ordinary care must be taken of them, and consequently some of the rush is dispensed with and fewer fish are taken. As the snappers are pulled in they are carefully unhooked, and the crimping awl is quickly inserted under the fourth scale, behind the sharp, angular projection of the gill-cover, which is a distinguishing feature of their heads. This lets out the air with which they are almost always inflated, after which they are put into the well.

Fishing usually continues without cessation until the snappers cease biting. If darkness puts a stop to the fishing the vessel generally lays at anchor until the next morning, when she may get a second "spurt." It more commonly happens, however, that the fish cease to bite while there is yet daylight, the inference generally being that the school is very much broken up, though in some instances it is evident that the fish are still very abundant, since they can be felt knocking against the gear and occasionally nibbling at the hooks. But it is difficult to catch one. They take such a dainty hold of the bait at such times that it is only now and then that one is hooked firmly enough to bring him to the surface. It is probable that the fish are gorged with bait, since there is no other plausible reason that can be given for their change from remarkable voracity to almost total indifference to food. The common mackerel has a similar habit.

As soon as the fish cease biting, if there is still enough of the day left to "try around," the vessel gets under way and the process of sounding for a new school is begun and continued in the same manner as has been described, while the rest of the crew proceed to take care of the fish, if they are to be iced.

It occasionally happens that one, two, or even more days may some-

times be spent in searching for fish without finding a good school, and in winter fishing is often very much interfered with by continued rough weather. In strong winds the sea is short and nasty in this part of the Gulf, and it goes without saying that "sounding out a berth" cannot be successfully continued in heavy weather. If, however, a vessel is anchored on fish, they can be caught in pretty bad weather.

Although the men fish from the deck, as a rule, when the vessel is at anchor, it should be stated that sometimes in fine weather a portion of the crew go out in dories at various distances from the smack. Hand-lining in dories for codfish is very much more profitable than fishing from the deck of a vessel, but in the snapper fishery the conditions are so different that the same advantageous result is not always obtained, though occasionally the boats are able to find better fishing than can be got on the vessel.

Some of the snapper-catchers do not anchor, unless in exceptional cases, but prefer to fish at a drift and work back to windward whenever they have lost good fishing.

5. CARE OF THE FISH.

The method of caring for the fish that are kept alive has already been indicated, in part, at least. It remains to be said that much care must be exercised to prevent them from dying in the well from suffocation, in case of calms, when the vessel lies motionless. It is then necessary to get up an artificial circulation of water by "bailing the well," or adopting some other means to effect the same object. It is also necessary to sweep the well with a dip-net at intervals, and remove any fish that are dead. These are iced.

Those vessels which ice the whole of their catch carry about five or six tons of ice each trip, in winter. These are provided with a series of pens built in the hold, in which the ice is stowed and the fish packed.

The snappers are not eviscerated, but are carefully washed before being iced. They are then thrown into the hold and packed in the pens. A layer of broken ice, 8 or 10 inches thick, is first put on the floor of the pen, and on this is laid a tier of fish. Just here there is some variation in the methods adopted by different men. Some skippers are very particular about having the fish packed carefully in the pens by hand, and always laid on their sides in regular order in the tiers. But others simply pitch the fish in helter-skelter, and pay no regard to the order in which they are placed.

After a tier of fish is put in the pen it is covered with pounded ice (the latter, however, not being very fine), then follows another tier of fish and more ice, until the compartment is nearly filled, a covering of ice several inches thick being put on top of all.

Groupers (red and black), scamp, and other marketable kinds of fish that are sometimes taken with the snappers, are iced in the same pens

and in the manner above described. The groupers are little valued at Pensacola, and no one thinks of catching them in quantities as they do snappers, though a few are sometimes taken.

6. RUNNING FOR MARKET.

When a fare is obtained it is desirable for the snapper-catchers to make port at the earliest possible moment, because their cargo is a perishable one, and the sooner they can reach a market the better will be the condition of their fish. Therefore, as soon as it is decided to run in, all sail that the vessel will carry is piled on, and she is driven to her utmost. This is particularly the case if there is a possible chance of reaching Pensacola Bar before day closes, since, to avoid laying off the harbor all night, the vessel is crowded as much as she will bear, if there is wind enough. If, however, she cannot reach the bar before nightfall less sail is carried, for unfortunately, owing to a lack of suitable range-lights, it is not safe to attempt to cross the bar at night, particularly in bad weather. Occasionally this is done by the fishermen, but the risk of running aground is too great to warrant the attempt.

7. LANDING OF THE CARGOES AND DISPOSITION OF THE FISH.

When a vessel reaches the wharf the fish are hoisted from her hold in tubs to the storehouse, where they are weighed and packed for transportation. The method of packing varies somewhat, though it may be stated in general terms that all the iced fish, except those sent to New Orleans, are eviscerated before being packed for shipment. At New Orleans, fish that have been eviscerated do not sell well, we were told, though it seems strange that such a prejudice should exist.

I had the opportunity of seeing a fare of snappers packed at the storehouse of the Pensacola Ice Company. After being weighed, the fish were ripped down the belly with a knife, beheaded with a hatchet or ax, eviscerated, and packed with ice in barrels, without being washed.

Warren & Co. make a small slit near the vent of the fish instead of ripping it open; the intestine is cut near its posterior extremity, the head is then cut off and the viscera pulled out. Fish treated this way, and washed clean, look much more attractive than if ripped open. The snappers shipped by this firm to E. G. Blackford, New York, are not beheaded. The gills are taken out and the viscera removed in the manner described.

The red snapper is remarkable for the length of time it will keep in excellent condition in ice. Packed in barrels or boxes, in the way we have mentioned, it is sent all over the country, more particularly to the large cities; going as far as Boston in the Northeast, Chicago in the Northwest, Denver in the far West, New Orleans in the Southwest, and Jacksonville in the Southeast. Incidentally, the fish may reach a greater distance. Thus, they sometimes go to Galveston, and it is claimed that Minneapolis is supplied with them. Some of the cities inside these

limits, such, for instance, as Saint Louis and New York, are among the best markets for the red snapper.

There are certain peculiarities about the method of shipping fish to New Orleans from Pensacola that are worthy of being noted. As has been stated elsewhere, there are a number of New Orleans smacks engaged in the snapper fishery that ship their catch from Pensacola to the home port. Arrangements are therefore made with the railroad managers to insure a box-car being placed at the disposal of the captain of a smack whenever he chances to need it, and he takes the responsibility of packing his fish in the car for transmission to his agent or the owner of his vessel at New Orleans.

On one occasion I saw the smack Albert Hayley discharging a cargo of fish at Pensacola and packing them for shipment to New Orleans. The greater part of the fish lay on deck tied up in "bunches" (with palmetto leaves), roughly estimated to weigh 25 pounds to the bunch. We were told that it is customary to ship this way to the New Orleans market and that a certain price per bunch is paid for the fish, the amount in this instance being $1 per bunch.

Part of these fish had been taken alive from the smack's well, and the rest had been iced; none were eviscerated. The fish were packed with fine ice in a box-car, the bunches being stowed so that the heads were up.

All of the fish shipped from Pensacola go by rail, except those sent to New York; these are generally shipped via the Savannah Steamship Company's line.

8. LAY.

As a rule, the captain of a vessel is the only person on her who receives a share of the proceeds, or, to put it in technical language, the only one who goes on shares. The rest of the crew are hired. The average wages for a mate, who must be a first-class fisherman and a man of considerable experience and judgment, is $40 per month. The other members of the crew are paid an average of $25 per month to each man. Boys are seldom carried, and the wages of the men are governed somewhat by their efficiency, a good fisherman, who is reliable and steady, commanding higher pay than one who is deficient in these qualities.

The settlement between the owners and captain is effected in the following way: All of the fitting expenses, including such articles as provisions, fishing gear, bait, ice, &c., and the wages of the crew, with the exception of the mate and the next highest-priced man, are deducted from the gross stock, the remainder being termed the net stock. The skipper receives one-fifth of this net stock as his "share," and 8 per cent. on two-fifths of the net stock as captain's commission. From her four-fifths of the net stock the vessel pays the wages of the two highest-priced men (one of whom is the mate) and the captain's commission; also, of course, her expenses for insurance, wear and tear of sails, rigging, and hull.

9. FINANCIAL PROFITS OF THE SNAPPER FISHERY.

The scale of prices paid by the Pensacola dealers is as follows: 3½ cents per pound for red snappers of 8 pounds' weight and less. Fish weighing more than 8 pounds bring 25 cents each. As the average of the latter is about 12 to 13 pounds, the price is, approximately, 2 cents per pound. The average price is, therefore, about 3 cents per pound. Taking this as a basis, we are able to get some idea of the business from the following notes on the amount of fish taken by several vessels belonging to the fleet of Messrs. Warren & Co.:

The schooner Sarah L. Harding, in ten months during the year 1884, caught 155,000 pounds of red snappers with a crew of six men. In December of the same year, with a crew of nine men, she landed 30,000 pounds of these fish.

The schooner John Pew in three and a half months, ending December 31, 1884, landed 110,000 pounds of snappers.

The schooner Clarence Barclay in six and a half months' fishing, in 1884, landed 110,000 pounds.

If a vessel gets 1,500 fish, weighing 7,500 to 10,000 pounds, each trip, it is considered a good fare. This is often exceeded, however, by the larger vessels now employed. While we were at Pensacola in the Albatross we learned of the arrival of two schooners, one of which had 3,500 snappers, and the other about 2,500.

The trips vary a great deal in length. A vessel may be fortunate enough to get a good fare and return to port after an absence of no more than two or three days. At another time she may be prevented from fishing by rough weather for a week after sailing, and other things may cause her to stay out two weeks. Even then she may be unfortunate enough not to find fish abundant, and may return to port with a half fare.

The three last months of the year—October, November, and December—are the best for this fishery, since at this season a greater catch is made than at any other time, and the demand is usually good. From the middle of March to the middle of June comparatively little is done. The fish can be caught in considerable quantities, but the demand drops off a good deal after Lent. It is more than probable that the demand for the red snapper is greatly influenced at this season by the many kinds and enormous quantities of other fish, from sea, lake, and river, that fill the markets of all the principal cities. Owing to this lack of demand for fish, as well as to the difficulties attending their preservation in hot weather, the vessels generally haul up for two or three months in summer.

10. HISTORY OF THE RED-SNAPPER FISHERY.

The fishery for red snappers began more than thirty years ago, according to Mr. Bartholomew, a veteran fish-dealer of New Orleans, but the date is not exactly known, because for many years after its incep-

tion it was so limited, and carried on in such a desultory and primitive manner, that little importance was attached to it as a fishery. Indeed, it may fairly be said that the catching of snappers did not attain proportions to entitle it to the distinction of a separate fishery until about 1870.

In regard to the discovery of the habitat of the species, the same authority says that the snapper grounds were found in a somewhat accidental manner. Sometimes, in going along the coast, the shore-seine fishermen would find themselves becalmed in their sail-boats, and not unfrequently they would drift several miles from the land. At such times they would put out hand-lines to catch barracouda, kingfish, and other varieties that are found near the land, in this region, during spring and summer. But occasionally the boat would drift over a school of red snappers, which would bite eagerly, so that sometimes considerable quantities were caught. At first the excitement and sport attending the capture of the fish was probably more of an incentive for the fishermen to take them than anything else, for it is said that comparatively little was then known, even by the coast population, of the food qualities of the snapper, and a small quantity sufficed to supply the demand. But the merits of the species came to be gradually known in the Gulf States, where it steadily grew in favor, and the demand increased proportionately, though it necessarily could not be large in a sparsely settled region. Notwithstanding, however, that the red snapper came to be highly prized in Southern markets, little or nothing was known of it as a food-fish in the North and Northwest until after 1870. It is a somewhat significant fact, as illustrating this point, that several years later the snapper was described by Messrs. Goode & Bean as a species new to science.

"In the year 1869 Maj. John C. Ruse and S. C. Cobb, who had bought out the stockholders of the citizens in the 'Ice Company,' proceded to add to that business the catching and selling of the Gulf deep-water fish. They bought the smack Gladiator, of 22 tons burden, and began in a small and irregular way the sale of that famous fish, the red snapper. Upon the death of Major Ruse, his interest was purchased by A. F. Warren, and so little was the business [of snapper fishing] valued, owing to the rates of express to various points, that the ice company added a coal business in order to keep their men and teams employed the year round. Little by little concessions were obtained from the express company until 1876, when L. H. Sellers became an active stockholder. In the mean time the fish business grew so as to require the catch of several Yankee smacks, who came into the Gulf during the winter, and returned North in May."*

The formation in 1871 of the Pensacola Ice Company, which included the above-named parties, is an event worthy of note, since this firm continued the fish business begun two years previously. For some

* Extract from article by S. C. Cobb, in Pensacola Commercial, December 10, 1884.

time, however, the supply of snappers was furnished chiefly by the "Yankee smacks," for the company owned no tonnage. The schooner J. W. Wherrin, the first smack bought at Pensacola expressly for the snapper fishery, was purchased by the Pensacola Ice Company in 1879. The next year the smack Ripple was bought, and in 1881 the schooner Niantic and steamer Millie Wales were added to the fleet controlled by the company. With the exception of the Millie Wales, that was recently burned, the company still owns the above-named vessels, besides which two smacks from Stonington, Conn., are chartered by the firm.

In the mean time, in 1880, Messrs. A. F. Warren and Silas Stearns, who for many years had been associated with the Pensacola Ice Company, withdrew from it and organized a fishing firm under the name of Warren & Co. This firm soon after began to purchase vessels, of which it now owns five and charters one—the largest fishing fleet controlled by any company at this port.

According to Cobb, "Messrs. Vesta and Mathews began in 1880, and the Santa Rosa Fish Company in 1882." The last of these has one vessel, while the firm of E. E. Sanders & Co., which engaged in the business in January, 1885, employs two smacks. Vesta and Mathews have no tonnage, but buy fish from vessels or boats as they have opportunity.

The present status of the red-snapper fishery at Pensacola, so far as the number of vessels and men employed, the catch and distribution of fish, &c., is given elsewhere, and certainly shows a growth that is gratifying, and which would seem to indicate a material increase in the future, when it may be reasonably supposed that the demand will have become much greater for this species than it now is. In regard to the general fisheries of Pensacola—of which that for the snapper forms the chief part—Cobb says there are employed "constantly from one to two hundred men; the product of their labor supports 1,000 of the city's population, with a probability that it will equal in value the entire lumber trade of the port in less than ten years." While this anticipation may be criticised as too ambitious, it nevertheless shows what those interested in the business have reason to hope for.

11. GENERAL CONSIDERATIONS.

In view of the fact that it is claimed by those who have had the best opportunities for observations that the red snapper is rapidly becoming scarcer on the grounds where it is now taken, it seems eminently desirable that the means for preventing this depletion should receive consideration. For, if it is true that a marked diminution has already taken place, there is then reason to expect that it will continue with an ever-increasing ratio until the species is so much reduced that there will no longer be any profit in fishing for it. That such an event will happen we cannot say, but it is safe to assert that it would be a great misfortune if it did, for not only would an industry be broken up, but the coun-

by at large would be the loser in being deprived of one of the finest of our edible fishes. What then can be done to prevent this? Only two ways of preventing it occur to me now: first, the discovery of new fishing grounds that may be worked while the old ones are recuperating; and, second, the application of such aid as may be given by fish-culture.

It is a matter of congratulation that the recent researches of the *Albatross* have demonstrated the important fact that there is a large area of ground yet unworked off Tampa, and south of it, where the snapper is seemingly more abundant than where it has formerly been sought. This opens up a new field for work, and if it is entered on before the old grounds are too much exhausted the latter may regain their former richness; but if this is not done in time, there will be little chance for them to recover. Of course, to go to these more distant grounds requires more or less "change of base." Either the fish must be landed at Tampa, or else swift-sailing vessels, of 45 to 50 tons, will have to be employed, if the catch is to be taken to Pensacola. And in the latter case it will probably be necessary to eviscerate the fish on board the vessels before they are iced, which would no doubt make a great difference in the time they could be kept in good condition. It is also possible that some improvements might be made in the ice-houses on board the smacks, though experience has proved that comparatively little can be done here.

As to the artificial propagation of the red snapper, it must be confessed that so very little is known of its breeding habits at present that it is impossible to say what may be done in this direction. We do not yet even know the number of eggs it contains or whether they float in the water or adhere to the bottom, though we might expect that the former is the more probable.

It does seem highly desirable, in view of existing circumstances, that some capable person should have the opportunity of studying the breeding habits of this species, since data could thus be obtained that would be of the greatest importance should an emergency ever arise when it may be necessary to propagate the snapper by artificial means.

B.—PENSACOLA INSHORE FISHERIES.

In Pensacola Bay, and on the outside beaches in its vicinity, a fishery is carried on with open boats and seines for the species that can be taken near the shores and in the bayous and lagoons, while there is an oyster fishery in the bay, the product of which is marketed at the city.

1. THE MARKET SEINE FISHERY.

The seine fishery of Pensacola supplies the chief part of the fish used in the city for a considerable portion of the year, besides producing quantities that are shipped to other markets. Ten boats and fifty men find employment in this fishery in winter, but double that number engage in it from spring to fall.*

*I am indebted to Mr. Rudolph Hernandez, who has followed the market fishery for twenty years, for many facts concerning this industry.

The fishing grounds.

Pensacola Bay, as well as the shore bordering the Gulf in its vicinity, is remarkable for the extent of sand beaches that may be utilized for seine hauls. It would be useless to attempt to particularize concerning these, since there are such long stretches of good ground, that, perhaps, it may be said that there are comparatively few places where fishing may not be prosecuted. Besides the beaches that border on the bay and face the sea, there are good grounds for seining in the lagoons or bayous, several of which extend inland from the bay. The largest of these is the bayou that has its entrance near the ruins of Fort McRae, on the western side of the harbor's mouth, and this is considered a favorite fishing ground. As a rule the water is shallow for a considerable distance from the beaches, and, therefore, the seines are made to correspond, and are never deep, since the fish are hauled on the shore. From April to October is the best season on the sea-beach, where pompano, bluefish, Spanish mackerel, sheep's-head, sea trout, lady fish (the latter for bait for the red-snapper fishermen) are caught, besides several other kinds that are not marketable. Some of the latter are edible, though not in demand. During the same season fishing is carried on in the bay, chiefly for mullet, trout, croakers, chopers or spot, and pigfish, which are taken with several other varieties. In the spring and fall, when the fish are migrating along the coast, the best fishing is found on the Gulf shore. In winter, seining is carried on in the lagoons, where more or less fish are found at this season, and on the shores of the bay. Most of the species caught in summer, in the bay, are also taken in the winter, though many kinds are less plentiful.

Apparatus.

Boats.—The seine-boats of Pensacola average about 20 feet long, 7 feet beam, and 2 to 2½ feet deep. They are carvel built, open boats, with shallow keel, center-board, sharp bow, round bilge, long, low, rather flat floor, short run (with skag), and deep, heart-shaped, vertical, square stern, similar to the stern of an ordinary ship's yawl. At the bow, some 5 or 6 inches below the gunwale, is a sort of half deck or platform, 3 feet long, and there is another crossing the stern about 18 inches long, fore and aft. On the latter the skipper of the boat stands to throw out the seine, and also to "pole the boat," as the process of guiding her with a pole is called. This method of controlling the movements of the boat is preferable to any other in the shallow waters where seining is done.

The frame is usually oak, the plank of juniper or cypress, and galvanized iron is used for fastening.

The majority of the boats are cat-rigged, carrying a single large sprit-sail, but a few have two sprit-sails. A boat costs about $125.

Some of the boats, more particularly those used in winter, are ship's

yawls, that have been bought at a low price. They are rigged like the others.

Each boat has a crew of five men who work on shares, the proceeds being divided into 6½ parts (if the skipper owns her), one share going to each man, one to the seine, and one-half a share to the boat. If the skipper does not own the boat, he gets one and a quarter shares, the extra one-quarter share being given to him to keep the seine in repair, and also for his care of the boat.

Seines.—The seines used at Pensacola are 75 fathoms long, when hung, and 85 meshes deep, the size of the mesh being 2½ inches, stretch measure. Two sizes of twine are used in their construction—Nos. 12 and 16—the smaller size in the wings and the larger in the bunt. Each seine has a large bunt bag 350 meshes in circumference at its mouth, and tapering to a point, its general shape being that of a cone. The cork rope and lead (or foot) line, to which the net is hung, are ⅞-inch Russia hemp bolt rope. The floats are "home-made," of white cedar or juniper root. The leads on the foot line weigh 2 ounces each. Three of these are on the foot line at the mouth of the bunt bag, and elsewhere they are put 15 to 16 feet apart. A pole—locally called a "staff"—is bent to each end of the seine, so as to keep the ends vertical in the water and the foot line close to the bottom. The lower end of each of these is weighted with 6 or 7 pounds of lead, to make it keep upright and "hug the ground."

The average seine will "fish" in 11 feet of water; that is, when set in that depth its lower edge will sweep the bottom so that fish cannot escape beneath it. Some of the seines taper at the wings, but others are uniform in depth. Two hauling lines are used with the seine, one 16 and the other 26 fathoms long. In setting the seine the short line goes out first, its end being left on shore when the boat shoves off, and the longer, or "boat line," is bent to the other end of the seine, to run to land after the net is out.

Nets.—It may be mentioned here that a few trammel nets are used, chiefly by Spaniards, for the capture of various species in the lagoons.

Methods of fishing.

There is no regular time for fishing. Some gangs work all night and go to market in the morning, while others begin at daylight and leave the beach for Pensacola about 2 or 3 o'clock in the afternoon.

The fish are generally seen before the seine is shot, and they are usually moving along the shore, particularly when migrating. A boat goes along until a school is seen, when the net is put out to inclose them in a half circle. If they are some distance from the shore the seine lines are used, but otherwise it is set without them. In the latter case one man jumps over, near the beach, with the end of the seine, which he drags far enough in to intercept the progress of the approaching fish. In the mean time the boat shoots rapidly

away, circling around the school, the skipper throwing over the seine, the last end of which is soon landed. If this does not reach the shore, some line may be run out, but, more commonly, the men jump overboard into the shallow water and drag it in, part of them going to the other end. One man is left in the boat, which he quickly shoves aground, and then runs to join his companions and assist them in landing the seine. All this work is performed in the most rapid manner, for these Southern fish are exceedingly quick in their movements, and no sooner do they find themselves obstructed in their onward course than they dart about, seeking some opening to escape from, and oftentimes they jump the cork-rope and regain their liberty. The mullet is celebrated for the ease with which it will go over a cork-rope, as well as for its general habit of jumping, which has earned for it the appellation of "jumping mullet." The large bunt-pocket, which is a characteristic of the seines used here, is very useful for preventing the loss of fish, for, when frightened, they usually rush into this, as it seemingly offers a chance to escape, and before they can correct their mistake they are drawn to the shore. The catch is usually landed on the beach; such fish as are marketable are put in the boat, and the rest are left to die or are thrown in the water.

Disposition of the catch.

The fish taken by the Pensacola market boats are all sold fresh, sometimes by wholesale to dealers, who ship them to distant cities, and at other times they are hawked about the streets. Formerly, there was a police regulation by which the fishermen were prevented from hawking their fish until after 7 a. m. Those arriving before that hour usually engaged a stall at the market, where they exposed their fish for sale.

Prices, depending on supply and demand, fluctuate a great deal, and there is even a greater diversity in the daily earnings, which vary from a few cents to $5 per day for each man. The average year's work for a man in this fishery is estimated at $250.

2. SPRING AND FALL FISHERY AT THE EAST PASS.

At the East Pass of Santa Rosa Island a seine fishery is carried on in spring and fall that may justly be included with the market fisheries of Pensacola, since the catch goes to that city.

Capt. A. Destin was the pioneer of this fishery, which he began shortly after the close of the war (1861–'65). At first he salted his catch, and this was continued until 1876, since which time the greater part of the fish have been disposed of fresh to the dealers at Pensacola. The originator of this industry is now dead, but the business is still carried on by his family, who employ two or three boats and make an average yearly stock of about $3,000.

Messrs. Warren & Co. have established a camp at the Pass, and dur-

ing the "run" of fish in spring and fall have one boat and a seine gang employed here.

Fishing is done wholly with drag-seines, in the manner already described, with the single exception that a man goes along the beach to watch for approaching schools of fish, whose presence he signals to his companions in the boat. This enables the fishermen to be prepared in time, and, if desirable, they can lay out the shore-end of their seine so that they have only about one-half of it to shoot after the fish come within its radius.

The fall fishing continues from October 1 to January 1, and the spring fishery from March 1 to June 1. At the latter date the weather gets too warm to keep the fish in good condition Years ago the fishery for pompano was discontinued in April, as soon as the fish had spawned, but now they are in high demand at a much later date, and, as a matter of fact, are said to bring higher prices than in the fall. The fish caught at the East Pass that are most valued for food are the pompano, Spanish mackerel, bluefish and sheepshead. Many other kinds, of less value, are also taken.

3. POUND FISHING.

Although the attempts to use fish pounds at Pensacola have so far resulted only in failure, it is worthy of note that this form of apparatus has been tried in these waters.

In 1881 Mr. Stearns built a pound at Pensacola Bay, but it proved unsuccessful, owing to the great numbers of large predaceous fish which destroyed the netting. Another pound was tried in 1884, at Grassy Cove, Santa Rosa Island, but met with a similar fate, being torn to pieces by tarpum.

4. OYSTER FISHERY.

The Pensacola oyster fishery is not a specially important industry. A few boats find employment in tonging oysters in winter, and in summer some of them engage in the red-snapper fishery, taking one or two tons of ice and going to the grounds nearest the land.

Some of the boats, Mr. Warren tells me, are of a nondescript form, having been improvised from ship's yawls, while a few are small decked sloops and schooners ranging in size from three to five tons. Both of these types, which we have mentioned, are round bottomed, square sterned, keel craft, but they vary a good deal in form and general appearance.

The typical oyster-boat is, however, of a very different kind. It is made on the sharpie pattern, is flat bottomed, wide and shallow, carvel built, with sharp bow, wide, square stern, and carries a center-board. It is roughly built, has considerable camber to the bottom, especially aft, and is provided with a skag and stern-post. It has a half deck forward, and a deck 3 to 4 feet long at the stern, while wash-boards extend along the sides. It is generally built wholly of yellow pine, but red-

cedar frames are sometimes used. According to Stearns, both the cat-rig and and sloop-rig is in vogue, in either case a boom and gaff mainsail being carried. The size ranges from 24 to 26 feet in length, and 7 to 8 feet in width. Two men constitute a crew. They usually content themselves with making one trip each week, and consider five to twelve barrels of oysters a fair take.

C.—Fisheries of Saint Andrew's and Saint Joseph.

The shore seine fishery is the only one prosecuted from these harbors. There has not yet been any hook-and-line fishing, and the abundance of sharks, saw-fish, and tarpum, or silver-fish, would make it difficult, if not impossible, to profitably employ gill-nets or pounds.

The seine fishery is prosecuted chiefly in the spring and fall, when various kinds of fish are migrating along the coast. At this time, for a few weeks or months, as the case may be, the business reaches quite important proportions, 25 boats and 150 men being employed from Saint Andrew's, and 3 boats and 18 men from Saint Joseph. A few of these men may, perhaps, do more or less fishing throughout the year, depending on it chiefly for a livelihood, but nearly all are farmers, whose principal dependence is on agricultural pursuits, but who thus utilize the time, in autumn, that cannot be turned to profitable account on their farms. Having harvested their crops, they leave their homes, which are often some distance inland, and go to the coast to gather the harvest of the seas. The majority of the scattered coast population are also farmers, to a greater or less extent, though many of these fish in spring as well as fall, and probably derive the chief part of their income from the sea.

1. Fishing grounds.

The sandy beaches which stretch along the Gulf coast, and are numerous in the harbors and bays of this region, afford abundant opportunity for hauling seines, and these constitute the fishing grounds.

Mr. N. W. Pitts, of Saint Joseph, tells me that pompano, Spanish mackerel, bluefish, sheepshead, mullet, sea trout, redfish, and a few other less important species are taken on these grounds. There are also many kinds that are not marketable taken in the seines, these being called "sorry fish" or "waste fish."

Pompano are caught in the greatest numbers in May and June. Sometimes they are fairly abundant in April, and occasionally a few are taken in March.

Spanish mackerel and bluefish are caught in spring from April 1 to June 1, and in fall from October 1 to December 1. Sometimes the Spanish mackerel are caught in schools by themselves, but more frequently they are mixed with other species.

Sheepshead are also taken in the spring and fall, but are seldom seen schooling by themselves. Mr. Pitts says "they are a fish that run with others."

Mullet are caught from October 1 to December. At this season they go in schools along the shore, and are seldom fished for in a greater depth than 6 feet.

Sea trout are taken with other fish, in spring and fall.

Redfish are also caught in limited numbers, mixed in with other kinds. They are in little demand, and are never fished for as a specialty.

It may be stated that the capture of mullet is the principal fishery in the fall, and the other species taken at that time are usually caught with the mullet. It would appear from the statements of the fishermen, and from my own observations, that the food-fish on this coast have a habit of "running" together that is seldom seen in Northern waters; therefore, not only may the same locality be a fishing ground where many species can be taken, but a dozen kinds may be caught in one haul of the seine.

2. APPARATUS AND METHODS OF FISHING.

Boats.—The boats used for seining at Saint Joseph are of the sharpy type, and locally called "skiffs." According to Mr. Pitts, they are long, narrow, and deeper in proportion than this style of flat-bottomed craft is usually made, being 24 to 25 feet long, 3 to 5 feet wide, and 18 to 20 inches deep. They have a rather narrow stern, across which, on top of the gunwale, is a platform, 5 feet square, for the seine to lay on. There are four thwarts for the rowers to sit on. Sails are seldom used. The boats are rather roughly built, by the fishermen themselves, red cedar being used for frames, yellow pine for plank, and galvanized iron nails for fastening. Six men constitute a crew for one of these boats, and they are called a seine gang.

Seines.—The average length of a seine is 115 fathoms. For one-half its length, in the center or bunt, it has a uniform depth of 11 feet, when hung, but from this it tapers to 4 feet at the extreme end of the wings. The bunt-pocket is 26 feet long, its mouth made square, each side having 100 meshes, which is the depth of the seine in its bunt. The mesh is 2½ inches, stretch measure. Cork floats and lead sinkers are used on these seines.

Methods of fishing.—The methods of seining are essentially the same at Saint Andrew's and Saint Joseph as at Pensacola, the only difference being that no end ropes are used at the former places, the men always jumping into the water to drag ashore the wings of the seine if they do not reach the land.

3. CARE OF THE FISH.

The early-caught fish are often marketed fresh, but with this exception they are salted, and packed in "Boston barrels," that are obtained from Pensacola, to which port they are shipped from the North. About a bushel of salt is required for a barrel of fish.

The above applies more particularly to the fish taken at Saint Joseph. Many of those caught at Saint Andrew's, as stated elsewhere, are disposed of to the local country trade.

4. DISPOSITION OF THE CATCH.

Mr. Pitt says that the fish taken at Saint Joseph, both fresh and salt, are sold chiefly to Pensacola parties, and he gives the following list of prices, per barrel, of 200 pounds of salt fish: Mullet, $5; Spanish mackerel, $8; pompano, $10; sheepshead, $5; redfish, $3. The above are the prices paid on the spot where the fish are taken, by the firms, who usually send a schooner down along the coast to purchase the catch of the seiners. Bluefish are not salted, and redfish are in very little demand when cured in this way. Mr. Pitt says he "sold a few of the latter on one occasion, but that it was a mighty sorry sale."

Mullet are most highly esteemed when they are filled with roe, but they are often so abundant along the coast that the supply far exceeds the demand. And when they are in this condition they can be caught more easily than at other times, for they cannot jump over a cork rope and escape so readily as they generally do.

With an increasing population in the country the demand for these coast fish must necessarily grow to large proportions. And there seems reason to believe that the fishery may be extended and increased to meet this demand until it becomes a very important industry.

Many of the farmer-fishermen improve the opportunity they have in the fall to supply themselves with fish to last for many months, if not for the year, while a considerable percentage of the fish they sell are disposed of to the country trade; probably, in most cases, to their immediate friends and neighbors.

5. FINANCIAL PROFITS AND LAY.

An average stock for a seine gang for three months in the fall is estimated at $300. Some of the crews are hired, receiving $12 to $20 per month and their board. Others go on shares; the proceeds of the sales are divided into seven equal parts, of which the boat and seine together take one, and each man one.