

15.—REPORT UPON AN INVESTIGATION OF THE FISHING GROUNDS OFF THE WEST COAST OF FLORIDA.

BY A. C. ADAMS AND W. C. KENDALL.

(With Plate CXI and one text figure.)

INTRODUCTION.

The Fish Commission schooner *Grampus*, Capt. A. C. Adams, commanding, left Wood's Holl, Massachusetts, January 14, 1889, for the Gulf of Mexico, under instructions to investigate the physical and biological characteristics of the red snapper and grouper grounds off the west coast of Florida, and the shore fishes and fisheries between Biscayne Bay and Cedar Keys. Dr. James A. Henshall, secretary of the Cincinnati Society of Natural History, and Mr. W. C. Kendall were assigned to the *Grampus* as naturalists, the former to conduct the coast inquiries, the latter to remain with the schooner on the offshore work.

The instructions for the offshore explorations were essentially as follows: The area marked out for examination was comprised between the depths of about 15 and 50 fathoms, beginning about 20 miles north of the Tortugas Islands, and extending to within 20 or 30 miles of Cape San Blas. The work was to be begun at the south and carried northward to such extent as the time and weather would permit. The bottom varies considerably in different parts of this region, being rich and affording good fishing in some places, while in others it is poor and devoid of much life. The object of the cruise was, if possible, to determine the precise localities to which red snappers and groupers resort in greatest abundance. The investigation was to be conducted in the following manner: Lines of dredging and fishing stations were to be run across the plateau in an east and west direction, or practically parallel with the lines of latitude, at intervals of about 10 miles. Continuous trials for fish, by the methods employed by the red-snapper fishermen, were to be made along these lines, and the bottom was to be examined by means of the dredge at regular stations located about 10 miles apart. Temperature and other physical and meteorological observations were also to be recorded.

In the coast work Dr. Henshall was instructed to collect and study the fishes along the region above defined, and also the marine invertebrates with special reference to the useful species of crustaceans, sponges, etc. With respect to the fishes, he

was to pay particular attention to the abundance, distribution, and habits of those species which might be of economic importance as food, bait, or otherwise. He was also to observe the methods and collect the statistics of the fisheries between Biscayne Bay and Charlotte Harbor.

The *Grampus* reached Key West on January 27, and a short delay ensued in making the necessary preparations for the work. Dr. Henshall arrived February 5, and on the 9th the *Grampus* proceeded to convey him as near as possible to Biscayne Bay, where he was to begin his collecting trip along the coast. February 11 Dr. Henshall left the *Grampus* off Indian Key, to make his way eastward along the Florida reefs and by the first safe passage into Biscayne Bay. He was provided with the large seine boat belonging to the schooner, a dory, and the necessary fishing appliances, camping utensils, and provisions; his party consisted, besides himself, of a competent pilot, and of a seaman and the cabin boy from the *Grampus*. It was arranged that he should meet the *Grampus* about March 4, at Charlotte Harbor.

The *Grampus* returned to Key West from Indian Key on the 12th, and was there joined by Mr. Kendall on the same day. She began her investigations February 14, and continued them until March 27; but the season proved too short to carry them farther northward than about 100 miles, especially as much stormy weather was encountered. The average width of the region gone over was about 70 miles, making the total area examined about 7,000 square miles.

On the following pages the work is described under the several east and west lines of observing stations, which are ten in number and are designated by the letters A to J, inclusive. These lines and the dredging stations are represented on the accompanying chart (Pl. CXXI). The seventy-five dredging stations made are numbered from 5050 to 5124, inclusive. Of the animals obtained, only the fishes, brachyuran crustaceans, and mollusks have so far been identified and can be referred to specifically. Tables are given of the dredging stations, of the snappers and groupers caught, and of the meteorological observations. The report upon the shore fishes is being prepared by Dr. Henshall and Dr. D. S. Jordan, and will be published separately.

During the night of February 19, after completing line B, and while at anchor, a strong breeze sprang up, parting the anchor cable and obliging the schooner to return to Key West for a new shackle. A week was lost by this accident, as the schooner did not get back to her grounds until February 26, being detained by stormy weather. The schooner generally anchored on the ground during the night, so that she could take up her work again the next morning without loss of time.

On March 3, after completing line D, the schooner proceeded to Charlotte Harbor, in accordance with the agreement made with Dr. Henshall, meeting him there on the 4th. Supplies were obtained and plans laid to again meet Dr. Henshall at Port Tampa, and after a short delay, occasioned by sickness on board and calm weather, the *Grampus* reached line E about noon of the 10th. Work was carried on continuously from that time until March 27, and the *Grampus* made Port Tampa on March 29, Dr. Henshall also arriving on the same day. Mail was received at that place instructing the *Grampus* to proceed to New York, and further operations in this region were therefore suspended for the season.

The *Grampus* left Port Tampa April 4. Head winds detained her two days at the Tortugas, where shore collections of fishes were made. Departure was taken from Key West April 15, and New York was reached on the 25th of that month.

DETAILED ACCOUNT OF THE INVESTIGATION.

LINE A.—FEBRUARY 15 TO 17; DREDGING STATIONS 5050 TO 5058.

Dredgings.—Line A was carried nearly due west from shoal water, the latitude varying only from 25° 01' N. to 25° 02' 49" N. The first station, No. 5050, was made at 8.30 a. m., February 15, in a depth of 15½ fathoms. The dredge was dragged for half a mile but brought up only white mud with no apparent life. The surface net was also towed at the same place, securing an abundance of copepods, salpæ, and fish eggs. Station 5051 was in 18 fathoms, and covered a distance of one-quarter of a mile. The contents of the dredge consisted chiefly of broken shells, with one large shrimp and several other small crustaceans. At station 5052, 21 fathoms, distance traversed one-eighth of a mile, the bottom consisted of white mud and broken shells. Copepods, salpæ, and fish eggs were obtained in the surface net near the same place. Station 5053 was made at 7.40 a. m., February 16, depth 25 fathoms, distance traversed one-quarter of a mile, bottom consisting of a light-colored, fine sandy mud, with broken shells, dead corals, sponges, and bryozoans. A small crab (*Lambrus agonus*) was also taken in the dredge. Station 5054 was in 29 fathoms, distance traversed one-quarter of a mile. Only a few broken shells and a crab (*Neptunus spinicarpus*) were brought up in the dredge. Station 5055, in 32 fathoms, drift one-eighth of a mile, afforded broken shells and corals, fragments of sponge, one starfish and a few small crustaceans (*Podochela gracilipes*, *Ethusa*, sp., etc.). At station 5056, 36 fathoms, drift one-eighth of a mile, the dredge brought up only sand and broken shells, one small crab, and an annelid. The bottom was probably smooth, consisting of light-colored sand. Station 5057 was occupied at 6.15 a. m., February 18, depth 37 fathoms, drift three-quarters of a mile. The contents of the dredge consisted of sand, shells, broken coral, nullipores, two small fishes, and two crabs (*Lambrus fraterculus* and *Ethusa*, sp.). The first line (line A) was completed the same day at station 5058, 44½ fathoms, drift one-tenth of a mile, bottom composed of sand and broken shells. About 4½ miles west of the last station the water deepened to 57 fathoms.

The bottom along this line varied from mud to sand, with broken shells at most stations. The sand and mud were light-colored in all places.

Fishing.—Fishing trials were made at each of the dredging stations, and generally at intervals of five to ten minutes between the stations during the daytime. This line afforded more fish (red snappers and groupers) than any of the others farther north. Nothing was taken, however, during the morning of the first day, or until about the close of the second dredge haul (station 5051). At the first station the bottom consisted of white mud with no life, and at the second chiefly of broken shells, apparently with very few animals living upon it. While drifting, however, on this haul, about 1.15 p. m., hard bottom was struck and three fine red snappers were taken immediately by one person. Fishing was continued for about twenty-five minutes, and six lines were out during a part of the time, but only one more red snapper was caught, the vessel soon drifting to muddy bottom, where there seemed to be no fish. Judging by the number of bites that were felt, had the lines been ready in the beginning, and had the ship been supplied with better bait, more gratifying results would have been obtained.

The next fish, two red snappers, averaging $27\frac{1}{2}$ inches in length, were taken at station 5052, although the bottom at that place was soft. No bites were felt between stations 5051 and 5052. The vessel anchored on the ground at 6 p. m. on February 15, and during the evening the following were taken on hand lines: Eight or ten sailors' choice (*Lagodon rhomboides*), two small red-mouthed grunts (*Hæmulon rimator*), two squirrel fish (*Serranus formosus*), and a crab (*Calappa marmorata*).

Two trials were made on the run to station 5053, but no fish were taken, although the soundings were considered favorable. Better success was had at the latter station, however, where trial No. 3 was made while the dredge was out, the bottom containing considerable life although composed of sandy mud. Five lines were kept out about twenty-five minutes, taking thirty-one red snappers, one red grouper, and two black groupers. The former species was very abundant, and a good fare could probably have been obtained in a comparatively short time. The average length of the snappers was 24 inches; nine of them measured 29 inches each, and the three smallest $13\frac{1}{2}$ inches each. The largest grouper measured 36 inches and weighed $22\frac{1}{2}$ pounds.

No bites were obtained between stations 5053 and 5056, nor at the latter station. After leaving station 5056 two large red snappers and one large grouper were caught, at 5.30 p. m. (trial 4). The snappers measured 33 and 36 inches, respectively, and the grouper 35 inches. This trial was made just before dark, and other fish could be felt nibbling at the bait, but the vessel did not lay to long enough to secure a larger catch. Had it been earlier in the day large fish would probably have been taken in abundance. In this same locality a small shark (*Carcharhinus terra-novæ*) containing a fish (*Monacanthus hispidus*) in its stomach was captured.

No fish were taken at station 5057, but while at anchor during the evening of February 16 (trial 5) two red groupers, each measuring 21 inches, were obtained in 37 fathoms, sand, broken shells, and corals.

The next morning at 9 o'clock one black grouper, 28 inches long, was caught 3 miles west of station 5057, of the previous day; depth, 38 fathoms; sandy bottom, with broken shells and corals. Nothing was obtained at station 5058. Three flying fish were seen on February 16.

LINE B.—FEBRUARY 17 TO 19; STATIONS 5059 TO 5067.

Dredgings.—Line B was begun at the outer or deep-water end and was carried eastward along a somewhat irregular line, varying from latitude $25^{\circ} 12'$ to $25^{\circ} 17'$ N. Station 5059 was in 50 fathoms, drift one-eighth of a mile; contents of dredge, sand and broken shells. At the next station, 5060, 38 fathoms, drift three-eighths of a mile, the dredge brought up sand, broken shells and coral, and some small crustaceans. Station 5061 was in 36 fathoms, drift one-half a mile; bottom, sand and broken shells. One small fish (*Rhypticus pituitosus*) and one crab were the only signs of life taken in the dredge. Copepods, salpæ, and fish eggs were obtained in the surface net. At station 5062, $30\frac{1}{2}$ fathoms, drift one-half a mile, the bottom also consisted of sand and dead shells, of which an entire dredge-load was secured, but it seemed to be devoid of much life. At station 5063, 27 fathoms, drift one-eighth of a mile, mud, sand, and broken shells, several small crabs and lancelets (*Branchiostoma lanceolatum*) were taken in the dredge. Station 5064 was in 24 fathoms, drift, one-eighth of a mile. The bottom was composed of soft mud, sand, and broken shells; several

pieces of sponge, a few crabs, and a number of lancelets were obtained. The bottom at station 5065, $19\frac{1}{2}$ fathoms, drift one-tenth of a mile, consisted of hard sand and broken shells, a few worms being the only visible signs of life. At station 5066, 17 fathoms, gravel and broken shells, together with a few specimens of *Branchiostoma* were obtained from the bottom, while the surface net captured copepods, larval crabs, fish eggs, and young fish. The inner end of the line was reached at station 5067, depth $14\frac{1}{2}$ fathoms, the bottom being hard. Broken shells and a few small shrimps were brought up in the dredge.

Fishing.—Snappers and groupers were taken at only two places along this line (trials 7 and 8). A number of small sharks were seen alongside at station 5059 and one was captured. One flying fish was also observed. The fishing trials were unsuccessful at stations 5059 and 5060, and only one was made between those stations, as the wind was blowing strong. While at anchor on the evening of February 17, in the position of station 5061, 36 fathoms, sand and shells, one red snapper, measuring 28 inches, was caught and a number of bites were felt, but they may have been due to other fish. After leaving station 5061, trials with hand lines were made very close together, good bait (fresh snapper) being used, but without obtaining any fish, although the bottom seemed to be as favorable as on line A. Between stations 5061 and 5062 a school of six or eight porpoises (*Prodelphinus plagiodon*) played around the bow, and one male, measuring 6 feet 11 inches long, was harpooned.

In the neighborhood of station 5064 the bottom was soft and sticky, with no indications of fish, and this continued some distance toward 5065. At the latter station, $19\frac{1}{2}$ fathoms, hard sand and broken shells, groupers were plentiful, nine red and three black groupers being taken inside of fifteen minutes and also three red snappers, averaging a little over 23 inches in length. Four or five groupers at a time could be seen swimming up towards the surface. From this point to the end of line B no fish were obtained, although all the conditions seemed favorable to their existence. At station 5067 a turtle and a large shark were seen at the surface.

LINE C.—FEBRUARY 26 TO 28; STATIONS 5068 TO 5074.

February 20, about 1 a. m., the anchor cable parted, due to a heavy chop sea, and the schooner was obliged to return to Key West for a new shackle. During the afternoon of that day, while proceeding southward, a large number of frigate mackerel (*Auxis thazard*) were caught by trolling from the stern, with a piece of white rag for bait. While returning to the fishing ground on February 25, a short visit was made to Marquesas Key, where shore collections were made.

Dredgings.—Line C was in latitude $25^{\circ} 23'$ to $25^{\circ} 24' 30''$ N. and extended from a depth of 17 to one of 52 fathoms. Seven dredging stations were made, as follows: No. 5068, 17 fathoms, coarse gravel, with broken corals and shells, afforded several specimens of *Branchiostoma*, worms, a small crab, and a bivalve mollusk (*Tellina antoni*). Station 5069, 23 fathoms, soft gray sandy mud, gave a few small crustaceans and one *Bregmaceros atlanticus*. Station 5070, $26\frac{1}{2}$ fathoms, hard sandy bottom with broken shells, the dredge also securing a small sponge, a small crab, and a hermit crab protected by a fragment of coral. Station 5071, 30 fathoms, fine gray sand, with black specks and broken shells, afforded several species of crustaceans and one sea urchin. Station 5072, $33\frac{1}{2}$ fathoms, sand and broken shells, algæ, corals, sponges,

bryozoa, and small crustaceans, including three species of crabs, each represented by a single specimen, namely, *Leptopodia sagittaria*, *Arachnopsis filipes*, and *Cymopolia*, sp. At station 5073, 38 fathoms, the dredge brought up sand, broken shells and corals, fragments of sponges of several kinds, ascidians, two sea urchins, three ophiurans, and small crabs, including *Podochela gracilipes*. Station 5074, in 52 fathoms at the outer end of the line, afforded a rich hard bottom, with alcyonarian corals, small barnacles, crabs, algæ, and other forms of life.

Fishing.—Line C was begun February 26 and finished on the 28th. No snappers or groupers were taken along this line, and there were no indications of those fish, although the vessel was provided with good fresh bait. Frequent trials were made between as well as at the several dredging stations, but altogether without any success. Inside of a depth of 33 fathoms, the bottom ranged from soft to hard, with very little life upon it. At station 5072 and beyond the bottom was much richer, but the fishing trials proved equally fruitless there. At some of the inner stations specimens were taken of the frigate mackerel (*Auxis thazard*), called by the people in this region Spanish mackerel, and flying fish were numerous during the 28th. A number of porpoises were also seen on the latter day.

LINE D.—FEBRUARY 28 TO MARCH 3; STATIONS 5075 TO 5082.

Dredgings.—This line was carried eastward from deep water chiefly along the parallel of 25° 34' N. latitude, deviating in one place to 25° 38' 21" N. Eight dredging stations were made, the water shoaling from 52½ to 15½ fathoms. Station 5075 was in 52½ fathoms, the bottom consisting of gray sand, broken shells and corals. Sponges and a large pycnogonid were the principal animals obtained. At station 5076, 39 fathoms, the dredge brought up coarse gray sand with broken shells and corals, algæ, sponges, one small fish, pycnogonids, small shrimps, and small crabs (*Arachnopsis filipes*, *Lambrus agonus*, and *Calappa*, sp.). Among the shells were specimens of *Muricidea floridana*. Station 5077, 33 fathoms, coarse gray sand, broken shells and corals, afforded specimens of two gastropod mollusks (*Fusus eucosmius*, *Nassa ambigua*), small crabs, a large hermit crab, a sea urchin, and a small fish belonging to an undescribed genus. At station 5078, 30 fathoms, sand and broken shells, the dredge secured a large pycnogonid, and several species of crabs (*Podochela gracilipes*, *Arachnopsis filipes*, *Lambrus fraterculus*, and *Cymopolia*, sp.). In about this same position the surface net was towed for nearly a mile, taking fish eggs, pteropod mollusks, copepods, salpæ, and small jelly fishes. Station 5079, 27 fathoms, afforded sand (apparently a hard bottom), and three small crabs representing *Lambrus agonus* and other species. At station 5080, 25 fathoms, sand and broken shells, the dredge brought up a small eel belonging to a new species (*Sphagebranchus kendalli* Gilbert), some sponges, and small mollusks (*Liocardium levigatum*, *Corbula dietziana*, *Oliva literata*, *Nassa ambigua*, *Polynices lactea*).

Station 5081 afforded fine sand and mud, in 20 fathoms, with small crabs (*Neptunus spinicarpus*) and mollusks (*Oliva literata*). Station 5082 was at the inner end of the line, in 15½ fathoms, the bottom consisting of gray sand and broken shells, from which the dredge brought up only fragments of sponge, nullipores, and a compound ascidian containing an anomouran crustacean.

Fishing.—Only two groupers and one red snapper were taken along line D. The bait was fresh, live fish from the well being used. The bottom in several places indicated good feeding grounds. The first fish, two large black groupers, were captured at station 5076, 39 fathoms, where the bottom consisted of coarse gray sand with fine broken corals and shells, and contained an abundance of life. At station 5080, 25 fathoms, one red snapper was secured, weighing 18 pounds and measuring 30 inches in length. There was much difficulty in fishing along part of this line, owing to stormy weather, which may also have been responsible for the small number of fish captured.

A small shark (*Carcharhinus terra-novæ*) was caught at station 5075, and one frigate mackerel at the anchorage in the evening of the same day. Between stations 5081 and 5082, one crevalle was taken on the drail line.

VISIT TO BIG GASPARILLA ISLAND, ETC.

March 4, about 9:45 a. m., the *Grampus* anchored off Big Gasparilla Island, in accordance with the agreement made with Dr. Henshall, who arrived there on the same day. Supplies were obtained from Punta Gorda and some fishing was done in the vicinity of the anchorage. The small seine was hauled in a bayou and once on the outside, in the latter place securing sheepshead and catfish, and in the former pipe fish, sea horses (*Hippocampus*), silversides, cyprinodonts, young flounders, crabs, etc.

Several hauls of the large seine on Gasparilla, March 6 and 7, resulted in the capture of sheepshead, catfish, Spanish mackerel, file fish, two menhaden, drum, many halfbeaks, anchovies, herring, two mullet, one shark (*Reniceps*), squids, etc. March 7 Dr. Henshall and his party left in the seine boat. March 8 the seine was hauled on Lacosta Island, with the following results: A large number of sheepshead, halfbeaks (*Hemirhamphus*), sailors' choice (*Lagodon rhomboides*), garfish (*Tylosurus marinus*), flounders, gurnards (*Prionotus*), redfish (*Sciaena ocellata*), Milner's pagellus (*Pagellus milneri*), drum, etc. Many porpoises were also seen in the cove. Just after leaving Charlotte Harbor, on the 9th, squirrel fish (*Serranus formosus*) and whiting (*Orthopristis chrysopterus*) were caught with a small hand line. It is important to note that the water taken on board at Gasparilla caused sickness to some of the officers and crew.

LINE E.—MARCH 10 AND 11; STATIONS 5083 TO 5090.

Dredgings.—Line E, consisting of eight dredging stations, was carried chiefly along latitude 25° 44' 32" N., beginning in shallow water near the coast and ending in a depth of 53 fathoms. The results of the several dredge hauls were as follows: Station 5083, 15 fathoms, gravel, broken shells and coral, one small crab and a gastropod mollusk (*Natica canrena*). Station 5084, 19 fathoms, sand, broken shells, nullipores, a few specimens of *Branchiostoma*, small shrimp, worms, and mollusks, among the latter being *Semele cancellata* and *Turritella acropora*. Station 5085, 24 fathoms, hard fine sand, broken shells and corals, a few small crabs (*Cymopolia*, sp., etc.), and the following mollusks: *Oliva literata*, *Murex chrysostoma*, and *Ocenebra nucca*. Station 5086, 28 fathoms, mud, fine sand, and broken shells. Station 5087, 31 fathoms, fine sand and broken shells, one ophiuran and a sponge. Station 5088, 34 fathoms, fine sand and broken shells, fragments of sponge, ascidians, bryozoa, and small crabs (*Leptopodia sagittaria*, *Neptunus spinicarpus*, *Callidactylus asper*). Station 5089, 38 fathoms, sand, nullipores, one crab (*Lambrus fraterculus*), and a small fish (*Antennarius*, sp.). Station 5090, 53 fathoms, sand and broken shells, with specimens of free crinoids (*Antedon*).

Fishing.—At the first station on this line, 5083 (trial 11), exceedingly good results were obtained. The depth was 15 fathoms; bottom, black gravel, broken shells and coral, but very little life being taken in the dredge. The fish captured were thirty-two red snappers and two red groupers, the former averaging 25 inches, the latter 27 inches in length. Captain Adams considers that this locality promises good fishing. In seeking this position, and when half a mile north of it, a line was put over to ascertain the depth. One grouper was taken on it, and four or five others followed it to the surface. No fish were caught, however, beyond this station to the end of the line. The weather was rather stormy and it was difficult to fish between stations. Had it been smoother, some fish might have been taken, but the experience has been that where fish occur they bite readily and quickly, and indications of them are found as soon as fishing begins.

LINE F.—MARCH 11 TO 16; STATIONS 5091 TO 5096.

Dredgings.—This line was made chiefly in about 25° 54' N. latitude and contained six dredgings, ranging from deep to shallow water, as follows: Station 5091, 49 fathoms, fine sand and broken shells, one small crab and a specimen of *Hippa*. Station 5092, 31 fathoms, gravel, sand with black specks, and broken shells, a starfish, sea-urchin, crabs, shrimps, etc. Station 5093, 28 fathoms, sand with black specks, broken shells and coral, alcyonarians, ophiurans, shrimp, etc. The towing net at this place secured jellyfishes, salpæ, and a small fish at the surface. Station 5094, 25 fathoms, coarse gravel, broken shells, and a single specimen each of sponge, crab, and starfish. Copepods, salpæ, small fishes and fish eggs were taken abundantly in the surface tow net. Station 5095, 20½ fathoms, gray sandy mud, a shrimp, crab (*Neptunus spinicarpus*), and a small eel, apparently *Ophichthys punctifer*, but too young to be positively identified. Station 5096, 16 fathoms, gray sandy mud with black specks, two specimens of a worm and two crabs (*Munida*).

Fishing.—Line F was begun in a depth of 49 fathoms. The sea was rough, and no fish were caught, but a spotted porpoise (*Prodelphinus plagiodon*), measuring 6 feet 10 inches long, was harpooned in the vicinity of station 5091. A school of about thirty of these porpoises had been playing around the bow. The indications for red snapper, however, were not favorable.

March 12 the weather was too severe for continuing the dredging and the schooner lay at anchor in latitude 25° 52' N., longitude 83° 31' W., 40 fathoms, hard bottom. During the morning four red snappers, averaging 31½ inches in length, and two black groupers, averaging 33 inches in length, were captured, and in the afternoon two red snappers, the length and weight of which were not ascertained. The fish appeared to be very abundant and could be felt biting at the hooks, but they did not hold on well, and only those above recorded were actually taken on board. During the night the schooner drifted about 2 miles northwest, bringing up in about latitude 25° 58' N., longitude 83° 30' W., depth 48 fathoms. On the morning of March 13, one black grouper, 38 inches long, and one red snapper, 32 inches long, were captured in this position.

The next fish, three red snappers, averaging 24½ inches in length, were caught at station 5094 (trial 14), the depth being 25 fathoms, the bottom consisting of coarse

sand, broken shells and corals, and the dredge bringing up very few evidences of life. March 15, during which stations 5092 to 5095 were made, was pleasant, and the trials were carried on to good advantage, but the fish seemed to be scattered. On the morning of March 16, a short distance to the eastward of station 5095, one red grouper measuring 19 inches long was taken. This was the last capture made on Line F.

LINE G.—MARCH 17 AND 18; STATIONS 5097 TO 5104.

Dredgings.—Line G was run somewhat irregularly, deviating between latitude $26^{\circ} 04'$ and latitude $26^{\circ} 13'$ N. Eight dredging stations were made, the first in a depth of 12, the last in 51 fathoms. They may be described as follows: Station 5097, 12 fathoms, fine gray sand and broken shells, bryozoans and one shrimp. Station 5098, 18 fathoms, hard sand, broken shells, a sponge, ascidians, and the following mollusks: *Arca noæ*, *Crepidula convexa*, *Polynices lactea*. Station 5099, $21\frac{1}{2}$ fathoms, sand and broken shells; sponges, hydroids, crabs (*Leptopodia sagittaria* and *Cyclois bairdii?*), and other small crustaceans, one fish (*Ophidium*, sp.), and several species of bivalve mollusks (*Lucina crenulata*, *Chama congregata*, *Liocardium levigatum*, and *Venus pygmaea*). Station 5100, 26 fathoms, black gravel, mud, broken shells, and a few ophiurans. Station 5101, 30 fathoms, black gravel, coral sand, broken shells; worms, sea-urchins, and crabs (*Cryptopodia concava*, *Cymopolia*, sp.). Station 5102, 33 fathoms, gravel, coral sand, mud; ophiurans, worms, gastropod mollusks (*Fusus eucosmius*), and small crabs (*Podochela gracilipes*, *Lambrus agonus*, *Callidactylus asper*, young). Station 5103, 36 fathoms, fine sand; sponges, bryozoans, ophiurans, ascidians, and small crabs. Station 5104, 51 fathoms, coarse sand, broken coral; a large number of free crinoids (*Antedon*, sp.) and a few small crabs (*Arachnopsis filipes*, *Lambrus agonus*, *Lambrus fraterculus*, *Iliacantha subglobosa*, and *Carpoporos papulosus*).

Fishing.—Only three fish, all of which were red groupers, were taken along Line G. The first was at station 5098 (trial 16), 18 fathoms, hard sand, length $23\frac{1}{2}$ inches; the second at station 5099 (trial 17), $21\frac{1}{2}$ fathoms, sand, length 26 inches; and the third at station 5100 (trial 18), 26 fathoms, gravel and mud, length 26 inches. One squirrel fish (*Serranus formosus*) was obtained at station 5097, and one frigate mackerel was caught by trolling at station 5100.

LINE H.—MARCH 18 TO 22; STATIONS 5105 TO 5111.

Dredgings.—Seven dredging stations were made along this line in latitude $26^{\circ} 17' 30''$ to latitude $26^{\circ} 20'$ N., extending from a depth of 56 fathoms to one of $16\frac{1}{2}$ fathoms, as follows: At station 5105, 56 fathoms, the dredge brought up nothing, but the lead indicated sand. Station 5106, 36 fathoms, sand, a few broken shells; large quantities of nullipores, green algæ, sponges, ascidians, small crustaceans, including the following four species of crabs: *Podochela gracilipes*, *Neptunus spinicarpus*, *Ethusa*, sp., and *Cymopolia*, sp., a sea-horse (*Hippocampus hudsonius*), etc. Station 5107, 31 fathoms, sand and broken shells; sea-urchins, one small holothurian, crabs (*Neptunus spinicarpus*, *Lambrus agonus*), and two species of gastropod mollusks (*Turritella acropora*, *Turbo crenulatus*). Station 5108, 27 fathoms, sand, sponges, crabs (*Lambrus fraterculus?*, *Neptunus spinicarpus*, *Achelous*, sp., *Cymopolia*, sp.), shrimps and other crustaceans, mollusks (*Muricidea floridana*, *Turritella acropora*, *Turbo crenulatus*), and a small fish (*Gillellus semicinctus*). Copepods, salpæ, etc., were taken in the surface tow net. Station 5109,

24 fathoms, sandy mud with black specks, broken shells; two ophiurans, one small fish (*Bregmaceros atlanticus*), shrimps, one crab, and two species of mollusks (*Dentalium matara*, *Distortrix reticulata*). Station 5110, 21 fathoms, sand with black specks, broken shells; one small sponge, crab (*Pericera cornuta?*), and gastropod mollusk (*Fasciolaria tulipa*). Station 5111, 16½ fathoms, sand, mud, and broken shells; shrimp and lancelets (*Branchiostoma lanceolatum*).

Fishing.—No fish were taken until a depth of 25 fathoms had been reached. From there to the inner end of the line nine groupers and two red snappers were secured. The first fish, six groupers (three red and three black), were captured on the morning of March 21 (trial 19) while the schooner was drifting in about latitude 26° 18' N., longitude 83° 05' W.; depth 25 fathoms. They averaged 27 inches in length.

The largest fish taken during the cruise, a red grouper, weighing 31 pounds and measuring 43 inches in length, was caught at station 5109 (trial 20), 24 fathoms. Soon afterwards another red grouper, 31 inches long, was taken in a depth of 23 fathoms, while the schooner was under way. The last catch on this line was at the innermost station, No. 5111 (trial 22), depth 16½ fathoms, where the following were secured, namely: Two red snappers, averaging 31½ inches in length, and one red grouper, 29 inches long.

The trials on this line were made with great thoroughness and with the usual fresh bait, but the fish seemed to be scarce, although good spots might be found by working around over the ground in all directions. As a rule, more fish were found on the inshore ends of the line as the *Grampus* worked northward. Two small sharks (*Carcharhinus*) were taken at station 5107, and one half-dead sailors' choice (*Lagodon rhomboides*) was caught in a dip-net while at anchor during March 19.

LINE I.—MARCH 22 AND 23; STATIONS 5112 TO 5118.

Dredgings.—Line I was carried from shallow to deep water along a nearly straight course in 26° 28' to 26° 31' 50'' N. latitude. Seven dredgings were made, as follows: Station 5112, 16½ fathoms, fine white sand with black specks, gravel, one small fish (*Gillellus semicinctus*), annelids, and the following mollusks: *Crassatella floridana*, *Tellina antoni*, *Semele reticulata*, *Cavolina uncinata*, *Koonsia obesa*. Station 5113, 21 fathoms, gray sand, gravel, broken shells, shrimps and small crabs (*Neptunus spinicarpus*). Copepods, ctenophores and salpæ were taken in the surface net. Station 5114, 24 fathoms, coarse black sand, broken shells, one small starfish, crab, annelid, and sponge. Station 5115, 27½ fathoms, gray sand with black specks, broken shells, one eel (*Letharchus velifer*), and three species of crabs (*Lambrus agonus*, *Cryptopodia concava*, *Carpoporos papulosus*). Station 5116, 33 fathoms, gray sand and broken shells, sponges, and small crabs (*Podochela gracilipes*, *Lambrus agonus*). Station 5117, 37½ fathoms, hard gray sand, algæ, ascidians, shrimp, crabs (*Podochela gracilipes*, *Arachnopsis filipes*), and two small fishes (*Synodus fætens*, *Aphoristia plagiusa*). Station 5118, 59 fathoms, hard fine sand and broken shells, three small shrimp, one crab, coral, and free crinoids (*Antedon*).

Fishing.—Only two successful trials were had on this line, although the weather was fine, and everything favorable for fishing. The first fish, a black grouper measuring 31½ inches long, was taken at 3 p. m., March 22, in 22 fathoms, sandy bottom. The second lot was secured about 6 p. m. of the same day, at station 5114 (trial 24) in

a depth of 24 fathoms. It consisted of two red snappers and fourteen groupers (four red and ten black), the former averaging 29, the latter 34 inches in length. The fish were very gamy and caught at the leads as well as at the baited hooks as soon as they touched bottom. Fishing was continued here about thirty minutes. No bites were felt along the remainder of the line.

LINE J.—MARCH 23 TO 27; STATIONS 5119 TO 5124.

Dredgings.—Six dredgings were made along an irregular line in latitude $26^{\circ} 37'$ to latitude $26^{\circ} 45'$ N., extending from deep water to shallow water, as follows: Station 5119, 45 fathoms, coral, sand, and broken shells, algæ, crinoids (*Antedon*), small crabs (*Carpoporus papulosus*), ascidians, mollusks (*Cardium peramabilis*, *Dentalium laqueatum*), and one small fish. Station 5120, 36 fathoms, fine sand, gravel, and broken shells, one ophiuran and two crabs (*Platylambrus serratus*). Station 5121, 31 fathoms, coarse sand and corals. Station 5122, 28 fathoms, sand with black specks, broken shells, one small crab, and a starfish. The surface net was towed in the same vicinity, securing copepods, medusæ, fish eggs, etc. Station 5123, $25\frac{1}{2}$ fathoms, gray sandy mud, broken shells. Station 5124, 19 fathoms, fine gray sand with black specks, and a single small crab.

Fishing.—No success attended the trials for fish along this line and no traces were found of either red snappers or groupers. At 2:45 p. m., on March 27, however, while on the way from the last station of the line, No. 5124, to Tampa, Florida, in about latitude $26^{\circ} 52'$ N., depth 18 fathoms, both red snappers and groupers were observed in abundance.

Near station 5119, a female spotted porpoise (*Prodelphinus plagiodon*) was harpooned from a school of six that was playing about the vessel. She measured 7 feet in length and 3 feet 7 inches in circumference behind the pectorals: Her udders were full of milk, and she was accompanied by one young individual about half the size of the mother. Fragments of squids were found in her stomach. The skin and skeleton were prepared and sent to Washington. Two sharp-nosed skates were also taken at station 5122.

VISIT TO TAMPA BAY AND RETURN TO KEY WEST.

During March 28 the *Grampus* was under way bound to Tampa. In the morning many large schools of young herring were seen, pursued by about a dozen porpoises. One kingfish (*Scomberomorus*) was caught in the afternoon, and at night the schooner made Egmont light. She entered Tampa Bay the next day, and anchored off Gadsden's Point, about 5 miles below Port Tampa, where she was joined by Dr. Henshall.

April 3, the seine was hauled on Gadsden's Point and the following fish were obtained: Angel fish (*Chaetodipterus faber*), mullet (*Mugil curema*), including the young about an inch long, gar fish (*Tylosurus marinus*), sailors' choice (*Lagodon rhomboides*), half beaks (*Hemirhamphus unifasciatus*), cyprinodonts, etc.

April 4, the *Grampus* returned to Egmont Key, where a large number of small herring and a few other fish were seined on the shore. In leaving Tampa Bay, two large devil-fish (*Manta birostris*) and two flying fish were observed. The Tortugas were reached on the 7th and the schooner remained there until the 9th, during which time the seine was hauled several times on Garden Key and Bird Key. At the former

place the following material was obtained: Barracudas (*Sphyræna picuda*), bone fish (*Albula vulpes*), cock-eyed pilot (*Glyphidodon saxatilis*), striped grunts (*Hæmulon elegans*), and several species of small fish belonging mostly to the Serranidæ. The catch at Bird Key comprised a trunk fish (*Ostracion trigonum*), several small fish, crabs, annelids, ophiurans, sea urchins, shrimp, and specimens of octopus. Jelly fishes, tunicates, holothurians, and aplysia were taken in the moat.

The *Grampus* arrived at Key West April 10, and left there for New York on the 15th.

SUMMARY OF THE WORK.

The information that we possessed respecting the red-snapper and grouper fishing grounds of the Gulf of Mexico prior to the investigation of the schooner *Grampus* has been summarized in a report by Capt. J. W. Collins,* from which we take the following extracts:

The grounds which are now 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 [Northwestern Florida]. 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 eighty-fifth 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 numbers 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 15-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. * * * Although it is now [1885] 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."

The region examined by the *Grampus* is the one described by Captain Collins as being most distant from Pensacola and the least known, but at the same time it is nearest Key West. It comprises the southern part of the submerged continental plateau off the western coast of Florida, between the depths of 15 and 50 fathoms. The plateau has there an average width of about 150 miles inside of the 100-fathom curve, from which line the depths increase rapidly toward the west. The area surveyed lies about

* 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. Report U. S. Commissioner of Fish and Fisheries for 1885 (1887), pp. 217-305.

† The researches made by the *Albatross* between Tampa Bay and Tortugas [in 1885] 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.

midway between the coast and the 100-fathom curve, and has an average width of about 70 miles, nearly one-half that of the plateau itself.

The present survey can only be regarded as preliminary in its nature and results, indicating the principal resources of the new fishing grounds and proving their great value from an economical standpoint. Owing to the shortness of the season, the *Grampus* was obliged to work along straight courses, not deviating to one side or the other, even when it was apparent that the fishing spots encountered would yield suitable returns if carefully followed out. Good fishing was found in a number of places, but it is probable that had the fishing trials been continued longer, and the weather been more suitable at all times, the location of many additional fishing spots could have been definitely determined.

The total number of fish of each of the principal kinds taken was as follows: Red snappers, eighty-eight; red groupers, twenty-eight; black groupers, twenty-five; or about one and three-fifths times as many red snappers as groupers, indicating that the grounds are richest in the first-mentioned species, which is also the most highly prized for food. The red snappers were found in all depths from 15 to 48 fathoms, but the largest catches, one of thirty-one, the other of thirty-two fish, were made in depths of 15 and 25 fathoms. Three red snappers only were taken between 30 and 40 fathoms, and five between 40 and 48 fathoms, but this can not yet be taken as evidence that the red snapper does not occur abundantly in the deeper parts of the area examined. The range of these fish in weight was from 5 to 20 pounds.

The red grouper was found in depths of 15 to 37 fathoms, but only once in a greater depth than 26 fathoms. The largest catch, nine fish, was secured in 19½ fathoms. This species was taken at thirteen different stations, often in connection with either the red snapper or the black grouper, and sometimes with both. The black grouper was caught at only nine stations, in depths of 19½ to 48 fathoms, nineteen individuals being from between 19½ and 25 fathoms, and six from between 38 and 48 fathoms. Ten individuals, being the largest number taken at any one place, were obtained from a depth of 24 fathoms. The weight of the red groupers was from 5 to 31 pounds, and of the black groupers from 10 to 23 pounds.

The results obtained on each of the lines may be summarized as follows: *

Line A.—The bottom along this line consisted chiefly of white mud, sand, and broken shells and corals. The fish were found principally on bottoms of broken shells. The catch consisted of thirty-nine red snappers, three red groupers, three black groupers, and one grouper the species of which was not determined. All of these fish were taken in depths of 18 to 38 fathoms. At station 5053, thirty-one red snappers and three groupers were caught in about twenty-five minutes by the use of six hand lines.

Line B.—The bottom on line B, where tested, was composed mostly of broken shells, with sand, some gravel, etc., and not much life was brought up in the dredge. Fish were taken at only two places, one red snapper in 36 fathoms, and three red snappers and twelve groupers in 19½ fathoms. Concerning both this line and line A, Captain Adams is of the opinion that, had he been searching for fish only, he could have found an abundance of both red snappers and groupers in a number of places by sounding for hard bottom.

Line C.—The bottom consisted chiefly of broken shells, but there was also considera-

* See also tables of dredging stations and fishing trials, pp. 311-312.

ble gray sandy mud, fine sand, broken coral, etc. The weather was stormy and the water rough most of the time, which greatly interfered with the operations of dredging and fishing. The bottom appeared to be rich in the lower forms of life at only two dredging stations. No red snappers or groupers were taken, although the bottom appeared to be favorable to them. This may have been due in part, however, to the rapidity with which the vessel drifted before the wind, not allowing the bait to remain long in one place.

Line D.—The bottom resembled that of the previous line, but had a larger proportion of broken shells and less mud. Fishing was carried on continuously, but only one red snapper was caught, in a depth of 25 fathoms. Two black groupers were hauled up to the surface from 39 fathoms, but escaped from the hooks.

Line E.—Broken shells composed the bottom in greater part, but hard sandy bottoms and muddy bottoms were found occasionally. Fish were taken only at the inner station, in 15 fathoms, where thirty-two red snappers and two red groupers were secured. While making this line, the sea was so rough that no fishing could be done except at the dredging stations. Even a moderate wind in this region produces a heavy chop sea, which interferes with the handling of the lines while the vessel is drifting.

Line F.—The bottom consisted chiefly of broken shells, with patches of gravel, sand, and sandy mud. Very few animals were taken in the dredge. During most of the time while fishing was being carried on the wind was light and favorable. Fish were obtained at five different places, in depths of 19 to 48 fathoms, namely, ten red snappers, one red grouper, and three black groupers. In 40 fathoms the fish seemed to be abundant, but did not bite well. They could be felt striking the lead or tugging feebly at the bait.

Line G.—Broken shells predominated along most of this line, mixed with gravel, sand, and mud. A stiff breeze prevailed during the entire time, interfering more or less with the fishing trials. The only fish obtained were three groupers, one at each of three stations, in depths of 18, 21½, and 26 fathoms.

Line H.—The bottom was composed of broken shells, sand, and mud. The wind was unfavorable for fishing on the outer or deep-water end of the line, but nearly died away while the vessel was on the inner end, where all of the fish taken were secured. The total catch consisted of two red snappers, six red groupers, and three black groupers from depths of 16½ to 25 fathoms. The largest catch was of three red and three black groupers in a depth of 25 fathoms.

Line I.—The bottom consisted of broken shells and hard and soft sand, and the weather was favorable for fishing. Fish were only taken, however, in depths of 22 and 24 fathoms, as follows, namely, two red snappers, four red groupers, and eleven black groupers.

Line J.—The bottom was composed of sand, broken shells, and mud. The weather was boisterous and no fish were caught.

General distribution of the fish.—On the more southern lines the red snappers and groupers were found as far out as depths of 35 to 40 fathoms, becoming less abundant but averaging larger in size as the water deepened. As the work progressed northward, the fish were chiefly obtained on the inner parts of the lines, the red grouper also taking the place of the red snapper, which was rarely seen. In the deeper water the black groupers predominated over the red groupers, the latter becoming relatively more common as the water shoaled toward the coast.

Food of the fish.—Care was taken to examine the stomachs of all of the red snappers and groupers obtained in order to determine, if possible, from their food the character of bottom which they might be expected to resort to most frequently, but they were in the habit of ejecting their food while being hauled in, and their stomachs were generally empty. The little material that was secured from this source consisted of several varieties of fish, including the flying fish, eels, crabs (*Calappa*), and mantis shrimp (*Squilla*), all of which may be regarded as active animals that could rarely be taken in the dredge. The ovaries of the females were in no cases much developed.

LISTS OF THE BRACHYURA, MOLLUSCA, AND FISHES COLLECTED.

By W. C. KENDALL.

THE BRACHYURA.

Leptopodia sagittaria (Fabr.).

Stations 5072, 5083, 5099; 21½ to 34 fathoms; three specimens, all ♂.

Podochela gracilipes Stimpson.

Stations 5055, 5073, 5078, 5102, 5106, 5117; 32 to 38 fathoms; one to four specimens at each station.

Metoporphaphis, sp. nov. (†).

Marco, one specimen, ♀.

Arachnopsis filipes Stimpson.

Stations 5072, 5076, 5078, 5104, 5117; 30 to 51 fathoms; one specimen at each station.

Libinia dubia Milne-Edwards.

Card's Sound (2 ♀), and Little Gasparilla (1 ♂).

Libinia emarginata (Say), var. (†).

Charlotte Harbor, 1 ♀.

Epialtus dilatatus A. M.-Edwards (†).

Bird Key, 1 ♀.

Pericera cornuta (Herbst) (†).

Station 5110, 21 fathoms, 1 ♂.

Pericera, sp.

Station 5063, 27 fathoms, one specimen.

Mithrax (?), sp.

Station 5108, 27 fathoms, 1 young ♂.

Microphrys bicornutus (Latreille).

Bird Key, 3 ♂, 6 ♀.

Mithraculus sculptus (Lamarck.).

Bird Key; 13 ♂, 18 ♀.

Lambrus agonus Stimpson.

Stations 5053, 5076, 5078, 5079, 5102, 5104, 5107, 5115, 5116; 25 to 51 fathoms; one to two specimens at each station.

Lambrus fraterculus Stimpson (?).

Stations 5057, 5078, 5089, 5104, 5108; 27 to 51 fathoms; one specimen at each station.

Platylambrus serratus M.-Edwards.

Station 5122, 28 fathoms, 1 ♂.

Platylambrus (?), sp.

Stations 5098, 5109; 18 to 24 fathoms; 2 specimens.

Cryptopodia concava Stimpson.

Stations 5101, 5115; 27 to 30 fathoms; 1 ♂, 1 ♀.

Menippe mercenaria (Say).

Key West, 1 ♂.

Carpoporus papulosus Stimpson.

Stations 5104, 5115, 5119; 27½ to 51 fathoms; four specimens.

Leptodius floridanus Gibbes.

Bird Key, 2 ♂.

Panopeus herbstii Milne-Edwards.

Tampa Bay, 1 ♂.

Panopeus packardii Kingsley.

Card's Sound, 3 ♂, 2 ♀.

Neptunus gibbesii (Stimpson).

Egmont Key, Tampa Bay, 1 ♀.

Neptunus anceps (Saus.) A. M.-Edwards.

Bird Key, 1 ♂, 2 ♀.

Neptunus spinicarpus (Stimpson) A. M.-Edwards.

Stations 5054, 5081, 5088, 5095, 5106, 5107, 5108, 5113; 20 to 36 fathoms; one to two specimens at each station.

Callinectes hastatus Ordway.

Taken at the following localities on the west coast of Florida, namely: Card's Sound, Marco, Stump Pass, Little Gasparilla Pass, Big Gasparilla, Myakka River, Gordon's Pass, Cape Sable Creek, Punta Gorda.

Callinectes ornatus Ordway.

Bird Key, 1 ♂; Key West, 6 ♂, 5 ♀.

Acheloüs spinimanus (Latr.).

Key West, 3 ♂; Gordon Pass, 1 ♂.

Acheloüs depressifrons Stimpson.

Bird Key, 2 ♂, 2 ♀.

Acheloüs, sp.

Station 5108, 27 fathoms, one specimen.

Gelasimus pugilator (Bosc) Latr.

Card's Sound, Marco, Big Gasparilla, Cape Sable Creek; many specimens.

Gelasimus pugnax Smith.

Card's Sound, 3 ♂, 1 ♀.

Ocypoda arenaria (Cater by).

Key West, 1 ♂; Marquesas Key, 2 ♂; Loggerhead Key, 2 ♂; Little Gasparilla Pass, 1 ♂.

Pachygrapsus transversus Gibbes.

Bird Key, 4 ♂, 2 ♀.

Sesarma cinerea (Bosc).

Long-boat Key, 2 ♂, 1 ♀.

Sesarma angustipes Dana.

Long-boat Key, 5 ♂, 9 ♀; Little Gasparilla, 1 ♂; Big Gasparilla, 1 ♂.

Aratus pisoni Milne-Edwards.

Long-boat Key, 5 ♂, 8 ♀; Little Gasparilla Pass, 1 ♂.

Geocarcinus lateralis Guerin.

Loggerhead Key, 5 ♂, 1 ♀.

Calappa marmorata Boyd.

Three and one-half miles west of station 5052, 1 ♂.

Calappa, sp.

A male from station 5076 is too young to be identified.

Cyclois bairdii Stimpson (?)

One small crab, a male, from station 5099, 21½ fathoms, appears to agree in all particulars with Stimpson's types of *Cyclois bairdii*, from Cape St. Lucas, with which it has been carefully compared. The Florida example is slightly smaller than the smallest of Dr. Stimpson's specimens, and if any appreciable difference exists between the Gulf and the Pacific forms it can not be made out with the material at hand. In Dr. Stimpson's description (Notes on N. A. Crust., Ann. Lyc. Nat. Hist., N. Y., VII, p. 237, 1862) it is stated that the front of *Cyclois bairdii* is tridentate, but in his types, which are preserved in the National Museum, as well as in our specimen, the front is always prominently bidentate.

Iliacantha subglobosa Stimpson.

Station 5104, 51 fathoms, 1 ♂.

Iliacantha sparsa Stimpson.

Station 5077, 33 fathoms, 1 ♂.

Callidactylus asper Stimpson.

Stations 5088, 5102, 32 to 34 fathoms, 1 ♂, 1 ♀.

Prionoplax atlanticus, n. sp.

Carapax wide, nearly straight transversely, strongly convex longitudinally; lateral borders straight. Unlike *P. spinicarpus* Milne-Edwards, which has its surface finely granulated and marked by straight deep channels, the surface of our specimen is smooth, shiny, and has no channels marking off the areolations. Front lamellate, advanced, sloping and divided into two rounded lobes by a slight notch, which in *P. spinicarpus* continues behind with the mesogastric groove. Antero-lateral borders armed with three flat, sharp teeth, one of which is at the external orbital angle, instead of four as in *spinicarpus*; orbits large, directed forward. Eyestalks not inflated at base as in *P. spinicarpus*; cornea large. Antennules well developed, folded back transversely in a little groove, concealed for the most part behind the front and separated by a straight nasal lobe. The antennæ are in the notch between the front and the suborbital border, their bases small and almost cylindrical; they touch the front at the internal angle. The next segments are small and cylindrical. Epistome wide but very short, and limited behind by a very prominent labial border; from each side it continues with a channel which follows the line of the branchiostegal suture.

Chelipeds moderate, smooth; meros armed with a small tooth on the superior margin; carpus armed with one small tooth on the superior border and another external inferior tooth near the hand. The superior tooth is the largest. Hand naked, finger slightly inflected. Ambulatory legs somewhat flattened, long, slender. Penultimate pair the longest. No joints of the abdomen soldered together.

Of this species, which is believed to be new, one male was taken at station 5069, 23 fathoms.

Ethusa, sp.

Stations 5055, 5057, 5106.

Cymopolia, sp.

Stations 5072, 5078, 5085, 5101, 5106, 5108, and also at Marquesas Key.

THE MOLLUSCA.*

PELECYPODA.

Lima squamosa Lamarek.

Bird Key, Tortugas.

Arca noæ Linné.

Key West, and station 5098, 18 fathoms.

Crassatella floridana Dall.

Station 5112, 16½ fathoms.

Lucina crenulata Conrad.

Station 5099, 21½ fathoms.

Chama congregata Conrad.

Station 5099, 21½ fathoms.

Cardium peramabilis Dall.

Station 5119, 45 fathoms.

Liocardium lævigatum Linné.

Station 5080, 25 fathoms; 5099, 21½ fathoms.

Venus pygmæa Lamarek.

Station 5099, 21½ fathoms.

Tellina antoni Phil. (= *interrupta* Wood var.).

Station 5068, 17 fathoms; 5112, 16½ fathoms.

Semele cancellata Orbigny.

Station 5084, 19 fathoms.

Semele reticulata Gmelin.

Station 5112, 16½ fathoms.

Corbula dietziana C. B. Adams.

Station 5080, 25 fathoms.

Spengleria rostrata Spengler.

Bird Key, Tortugas.

SCAPHOPODA.

Dentalium matara Dall.

Station 5109, 24 fathoms.

Dentalium laqueatum Verrill.

Station 5119, 45 fathoms.

* In the identification of the Mollusca Mr. Kendall has been assisted by Mr. W. H. Dall, of the U. S. National Museum.

PTEROPODA.

Cavolina uncinata Rang.
Station 5112, surface.

GASTROPODA.

Aplysia wilcoxii Heilprin.
West coast of Florida.

Koonsia obesa Verrill.
Station 5112, 16½ fathoms.

Oliva literata Lamarck.
Stations 5080, 5081, 5085; 20 to 25 fathoms.

Fasciolaria tulipa Linné.
Station 5110, 21 fathoms; Marquesas Key, Key West.

Fusus eucosmius Dall.
Station 5077, 33 fathoms; station 5102, 32 fathoms.

Nassa ambigua Montagu.
Station 5077, 33 fathoms; 5080, 25 fathoms.

Murex chrysostoma Gray.
Station 5085, 24 fathoms.

Ocenebra nucea Mörch (= *cellulosa* Conrad).
Station 5085, 24 fathoms.

Muricoidea floridana (Conrad) Dall.
Station 5076, 39 fathoms; 5108, 27 fathoms.

Distortrix reticulata Link.
Station 5109, 24 fathoms.

Cerithium muscarum Say.
Card's Sound.

Turritella acropora Dall.
Stations 5084, 5107, 5108; 19 to 31 fathoms.

Crepidula convexa Say.
Station 5098, 18 fathoms.

Crepidula unguiformis Lamarck.
Key West.

Natica canrena Lamarck.
Station 5083, 15 fathoms; Garden Key, Tortugas.

Polynices lactea Guilding.
Station 5080, 25 fathoms; 5098, 18 fathoms.

Turbo crenulatus Gmelin.
Station 5107, 31 fathoms; 5108, 27 fathoms.

Turbo (Astraliium) imbricatum Gmelin.
Marquesas Key.

Acanthochiton astriger Reeve.
Bird Key, Tortugas.

THE FISHES.

Branchiostoma lanceolatum (Pallas).

Stations 5064, 5066, 5068, 5111; 16½ to 24 fathoms.

Carcharhinus terræ-novæ (Richardson).

Several places on the fishing grounds, surface.

Reniceps tiburo Gill.

Charlotte Harbor.

Synodus foetens (Linné).

Station 5117, 59 fathoms, one young specimen.

Ophichthys punctifer (Kaup) (?).

Station 5095, 20½ fathoms; the specimen could not be identified with certainty on account of its small size.

Letharchus velifer Goode and Bean.

Station 5115, 27½ fathoms. The single specimen obtained is small.

Sphagebranchus kendalli Gilbert, sp. nov. (see p. 310).

Station 5080, 25 fathoms.

Tylosurus marinus (Bl. Schn.).

Lacosta Island, Charlotte Harbor; Gadsden's Point, Tampa Bay.

Hemirhamphus unifasciatus (Ranzani).

Gadsden's Point, Tampa Bay.

Albula vulpes Linné.

Garden Key, Tortugas.

Exocoetus noveboracensis Mitchill (?).

At many places on the fishing grounds, at the surface.

Hippocampus hudsonius DeKay.

Station 5106, 36 fathoms.

Mugil curema C. & V.

Gadsden's Point, Tampa Bay.

Sphyræna plicuda Bl. Schn.

Garden Key, Tortugas.

Scomberomorus regalis (Bloch).

Near Egmont Key.

Auxis thazard Lac.

Several places on the red-snapper grounds.

Nomeus gronovii Gmelin.

Taken from under *Physalia* on several occasions.

Stromateus paru Linné.

Surface; swimming freely and from under *Physalia*.

Epinephelus morio C. & V.

Red Grouper. Taken on the offshore fishing grounds in depths of 15 to 37 fathoms, but only once in a greater depth than 26 fathoms. The weight of the specimens obtained ranged from 5 to 31 pounds each.

Epinephelus nigritus (Holbrook).

Black Grouper. Taken on the offshore fishing grounds in depths of 19½ to 48 fathoms; nineteen specimens were from between 19½ and 25 fathoms, and six from between 38 and 48 fathoms. They ranged in weight from 10 to 23 pounds each.

Serranus formosus Linné.

Two specimens; caught in entrance to Charlotte Harbor, March 9. Also taken at night, $3\frac{1}{2}$ miles west of station 5052, and at station 5097, 12 fathoms.

Prionodes (?) sp.

One young example from station 5119.

Rhypticus pituitosus Goode and Bean.

Station 5061, 36 fathoms.

Lutjanus blackfordi Goode and Bean.

Red-snapper. Taken on the offshore grounds in all depths from 15 to 48 fathoms. The range in weight of individuals was from 5 to 20 pounds.

Orthopristis chrysopterus Linné.

Lacosta Island, Charlotte Harbor, and in the channel from Charlotte Harbor.

Hæmulon rimator Jordan & Swain.

Taken at night $3\frac{1}{2}$ miles west of station 5052.

Hæmulon sciurus Shaw.

Garden Key, Tortugas.

Sparus pagrus Linné.

Red-snapper grounds.

Calamus milneri Goode and Bean.

Lacosta Island, Charlotte Harbor.

Lagodon rhomboides Linné.

Lacosta Island, Charlotte Harbor; Gadsden's Point, Tampa Bay; and taken at night $3\frac{1}{2}$ miles west of station 5052.

Sciæna ocellata Linné.

Lacosta Island, Charlotte Harbor.

Chætodipterus faber Broussonet.

Gadsden's Point, Tampa Bay.

Glyphidodon saxatilis Linné.

Garden Key, Tortugas.

Prionotus scitulus Jordan and Gilbert.

Lacosta Island, Charlotte Harbor.

Gillellus semicinctus Gilbert.

Station 5108, 31 fathoms; 5112, $16\frac{1}{2}$ fathoms.

Dormitator (?) sp.

Station 5057, 37 fathoms. A single specimen, $1\frac{1}{8}$ inches long.

Bregmaceros atlanticus Goode & Bean.

Station 5069, 23 fathoms; 5109, 24 fathoms.

Ophidium sp.

Station 5099, $21\frac{1}{2}$ fathoms.

Citharichthys macrops Dresel.

Lacosta Island, Charlotte Harbor.

Aphoristia plagiusa Linné.

Station 5117, $37\frac{1}{2}$ fathoms.

Antennarius, sp.

Station 5089, 38 fathoms.

Ostracion quadricornis Linné.

From stomach of black grouper on two occasions.

Ostracion trigonum Linné.

Bird Key, Tortugas.

Monacanthus hispidus Linné.

From stomach of sharp-nosed shark.

Tetrodon testudineus Linné.

Lacosta Island, Charlotte Harbor.

Gouder p. eua

rephelus

45
16
29 ✓

DESCRIPTION OF A NEW SPECIES OF EEL (SPHAGEBRANCHUS KENDALLI).

By CHARLES H. GILBERT.

Body much more elongate than in *selachops*. Snout very slender, nearly terete, projecting beyond mouth for a distance equaling two-thirds length of gape. Eye larger than usual in this genus, its diameter half length of snout, equaling inter-orbital width; its anterior margin slightly behind front of lower jaw. Gape 4 in head. Teeth in a single series in both jaws, acute, somewhat compressed, directed backwards. Teeth on head of vomer well developed, in a \wedge -shaped patch. No teeth on shaft of vomer in the single type specimen; this probably abnormal.

Anterior nostrils in a short tube, well forward on lower side of snout; posterior pair without tube, labial.

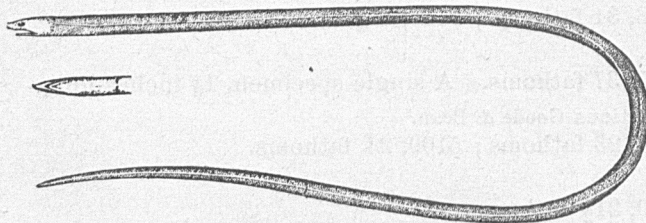
Gill openings very small, their width about equaling diameter of eye, separated by a distance equaling half their width. The slits wholly transverse in direction, not diverging posteriorly as in *selachops*.

Head much shorter than in *selachops*, the trunk somewhat longer; head $7\frac{3}{4}$ in length anterior to vent; body $1\frac{1}{2}$ in tail. (In *selachops*, head less than 5 in body; body $1\frac{1}{2}$ in tail.)

Color nearly uniform olivaceous, lighter below.

A single specimen 6.75 inches long was taken by the U. S. Fish Commission schooner *Grampus* in 25 fathoms off the coast of Florida, latitude $25^{\circ} 34' N.$, longitude $82^{\circ} 50' W.$ (station 5080).

The species is named in honor of Mr. W. C. Kendall, naturalist of the *Grampus* at the time the fish was taken.



SPHAGEBRANCHUS KENDALLI Gilbert (natural size).

Record of the fishing trials at which red snappers and groupers were obtained.

Line.	Record number.	Dredging station number.	Date.	Hour.	Position.		Depth.	Nature of bottom.	Temperature.			Kind of fish taken.	Number taken.	Average size.		Remarks.	
					Latitude N.	Longitude W.			Fath.	Air.	Surface.			Bottom.	Inches.		Pounds.
A	1		1889.														
	2	5052	Feb. 15	1:15 p. m.	25 00 31	82 32 00	18	S. brk. Sh.	73	67	67	Red snappers.	4				
	3	5053	15	4:30 p. m.	25 00 31	82 40 00	21	M. fine S.	77	67	67	do	2	27½	12		
			16	7:40 a. m.	25 00 31	82 51 40	25	Hrd. Sh. Co. Sponges.	71	68	68.5	do	31	24	9½		
	4		16	5:30 p. m.	25 02 49	83 32 00	36	S. brk. Sh.				Red snappers.	2	34½	18		
	5		16	Evening	25 02 00	83 34 00	37	S. Co. Sh.	76	76	69.5	Groupers.	1	35	20		
B	6		17	9 a. m.	25 02 00	83 37 00	38	S. Co. Sh.				Red groupers.	2	21	5½		At anchor.
	7		17	Evening	25 12 00	83 20 30	36	S. Sh.	70	70	68	Black groupers.	1	28	19		
	8	5065	19	10 a. m.	25 15 00	82 39 15	19½	Hrd. gy. S. Sh.	77	69	67	Red snappers.	1	28	15		Do.
											do	3	23½	8½			
											Groupers.	12	23½	9		9 red groupers, 5 to 10 pounds; 3 black groupers, 10 to 17 pounds.	
C																No fish were taken on line C.	
D	9	5076	Mar. 1	7:45 a. m.	25 34 00	83 28 00	39	Crs. gy. S. Co Sh.	69	68	69	Black groupers.	2				
	10	5080	2	1:30 p. m.	25 34 00	82 50 00	25	S. brk. Sh.	72	66	67	Red snappers.	1	30	18		
E	11	5083	10	1 p. m.	25 44 32	82 26 15	15	Bk. G. brk. Sh Co.	68	66	66.5	do	32	25	8½		
F	12		12	a. m.	25 52 00	83 31 00	40	Hrd	61	71		Red groupers.	2	27	9½		
				p. m.								Red snappers.	4	31½	18½		
	13		13		25 58 00	83 30 00	48	Hrd	66	68		Black groupers.	2	33	19		
												Red snappers.	2				
	14	5094	15	2:45 p. m.	25 54 00	82 58 00	25	Crs. S. brk. Sh Co.	75	65	67	do	1	32	20		
												Black groupers.	1	38	23		
												Red snappers.	3	24½	9½		
G	15		16		25 54 00	82 40 00	19	Hrd				Red groupers.	1	19	4½		
	16	5098	17	2 p. m.	26 07 00	82 38 00	18	Hrd. S. brk. Sh	71.5	65	66	do	1	23½	6		
	17	5099	17	4:40 p. m.	26 04 00	82 49 00	21½	S. brk. Sh.	65	66	66	do	1	26	7		
H	18	5100	18	5:40 a. m.	26 04 00	83 00 00	26	G. M. brk. Sh.	67	69	69	do	1	26	7½		
	19		21		26 18 00	83 05 00	25	S				Groupers.	6	27	11		3 red and 3 black groupers.
	20	5109	21	1 p. m.	26 17 00	83 00 00	24	Fne. S. M. brk. Sh.	68	71	67	Red groupers.	1	43	31		
	21		21		26 18 00	82 58 00	23	Fne. S. M. brk. Sh.				do	1	31	11		
	22	5111	22	8:50 a. m.	26 20 00	82 39 00	16½	S. M.				Red snappers.	2	31½	17½		
I	23		22		26 29 00	83 00 00	22	Gy. S.				Red groupers.	1	29	11		
	24	5114	22	6 p. m.	26 30 00	83 08 00	24	Crs. bk. S. brk. Sh.	67	65	66.5	Black groupers.	1	31½	16		
												Red snappers.	2	29	12½		
J												Groupers.	14	34	14½		4 red and 10 black groupers.
																No fish were taken on line J	

U. S. Commission of Fish and Fisheries.
M. McDonald, Commissioner.

Chart showing the
WORK OF THE U.S.F.C. SCHR. GRAMPUS
January 27th to April 10th 1887.

Investigation of the
RED SNAPPER GROUNDS OF THE GULF OF MEXICO.

*The Dots indicate the positions of the
Dredging Stations. Connecting
lines show the courses of the Vessel
along which fishing was carried on.
The numbers and letters refer to the text.*

