

X.—REPORT UPON THE OPERATIONS OF THE U. S. FISH COMMISSION SCHOONER GRAMPUS FROM JUNE 5, 1886, TO MARCH 15, 1887.

BY J. W. COLLINS.

The *Grampus* was completed by the contractor, and went into commission on the morning of June 5, 1886, previous to which time the officers (first mate, D. E. Collins; second mate, J. M. Coombs; machinist, G. W. Williams), three seamen, and the cook had joined her and were assisting in making preparations for sea. At 10.40 a. m. on the 5th of June, we left Noank, Conn., and arrived at Wood's Holl on the afternoon of June 6. On June 8 we sailed from Wood's Holl for Gloucester, where we arrived at 6.30 p. m. on the following day. Boats and fishing gear which had been made at Gloucester were taken on board at that place, and some necessary changes were made in the sails. On June 14, left Gloucester for Boston, arriving at the latter place the same afternoon. The chronometer and other instruments and apparatus were taken on board at Boston. Returned to Gloucester June 16; on June 22 sailed from Gloucester for Wood's Holl, reaching the latter place at 7 p. m. on the following day. The vessel remained at Wood's Holl until August 12, the time in the interim being spent in making the necessary preparations for a cruise.

On the morning of August 12 we left Wood's Holl on a cruise to the so-called "tilefish grounds," which lie along the northern edge of the Gulf Stream, in depths varying from 75 to 175 fathoms, between the meridians 70° and 73° west longitude.

After leaving Wood's Holl we went to Newport for bait, arriving at that place the same evening. A supply of menhaden bait was obtained on the 13th from fishing steamers off Wickford, and the next day a quantity of clam bait was purchased at Newport.

At 5.40 p. m., August 14, got under way at Newport and proceeded to sea. On the afternoon of August 15 three trawls were set in 96 fathoms, latitude $39^{\circ} 59' N.$, longitude $70^{\circ} 15' W.$

From this time until and including August 21, trials were made every day, with the exception of August 17 (when it was too rough to fish), with hand-lines and trawl-lines in depths varying from 60 to 160 fathoms, at intervals of from 5 to 20 miles apart, until a position was reached, latitude $39^{\circ} 20'$, longitude $72^{\circ} 04' 15''$, where the trawls were set

for the last time during the cruise. The results of these trials for fish were very meager. A few common hake (*Phycis chuss*) and silver hake or whiting constituted the chief part of the catch.

On the morning of the 18th, at 5.30 o'clock, I noticed a large number of small horse-mackerel (*Orcynus thynnus*) alongside, running with the vessel. We immediately put out two bluefish troll-lines and caught 10 of the fish. Such of them as were not severely wounded we put into the well, but some of them soon died. We had one of them cooked and found it very palatable, the flavor resembling somewhat that of the common mackerel. These fish were of uniform size, and, approximately, about 18 to 22 inches in length. Although they seemed to bite readily at troll-hooks when first put out, it was not long before they refused to take them, and all subsequent attempts at capturing others on hooks proved unavailing. These fish exhibited a remarkable peculiarity, and one which I have not previously noticed in similar species. While the vessel would be lying to, drifting, they would remain around her, their presence being detected by an occasional flash of white, as they turned in the water several fathoms below the surface. But as soon as the vessel was under way and sailing through the water, they would rise near the surface and follow along on both sides, seemingly taking great delight in chasing her, their movements resembling those of the common porpoise or dolphin (*Delphinus delphis*); the chief difference being that the tunny exhibited no disposition to "play" under the bow as the dolphin does, but contented itself with keeping near each quarter of the vessel. It may be remarked here (though somewhat anticipating the rest of the report) that this school of fish remained alongside of the vessel for two or three days and nights, following her with unflagging vigilance, and with seemingly increasing numbers. For most of the time when the vessel was sailing, many hundreds of these fish could be seen on each side and astern, sometimes as far off as 200 fathoms, running down the slope of a wave. Several were struck with the harpoon, but our latest efforts to catch them on a trolling-line proved abortive. Mr. Newcomb saved the gills from some of the dead specimens, parasites having been observed on them.

The object of this cruise was mainly to ascertain if any tilefish (*Lopholatilus chamaeleonticeps*) could be found on the grounds where this species had existed in such abundance prior to the great mortality which occurred to the same in the spring of 1882. No tilefish were taken on the grounds visited, and, so far as could be ascertained, by examination of the stomachs of the fishes caught, there was a decided scarcity of food suitable for the *Lopholatilus*.

The attempts to catch the tilefish having now continued for six days, and our researches having extended over a stretch of ground nearly 120 miles in length, where the *Lopholatilus* was formerly known to occur in large numbers, it seemed to me undesirable to pursue the investigation to greater length, more particularly as our bait at this time was quite

unfit to use. I think it is now safe to say that the large number of sets made with the trawl-line on this occasion, together with the trials made with hand-lines, clearly demonstrate the fact, that, if the tilefish has not become absolutely extinct in this region, it is certainly so rare that the chances of obtaining it are limited. It is possible that in other regions it may be found, or it may be taken, at some later period, in the locality visited by us, but at the present time it seems very doubtful if it exists along the northern borders of the Gulf Stream to the eastward of 73° west longitude.

It is a somewhat remarkable fact, and one seemingly worthy of notice in this place, that, with comparatively few exceptions, the fish caught had no food in their stomachs. Hake are notably voracious, and it is reasonable to infer that if food is abundant in this region there would be as good evidence of it as when, in former years, the tilefish were found gorged with crustacea, etc.

We left the tilefish ground on the evening of August 21. It was calm and foggy during the a. m. of the 23d. At this time we were off to the southward of Block Island, about 15 or 16 miles distant. Here we saw several schools of porpoises running in various directions. In the afternoon the wind increased from a light air to a moderate breeze from the southward. We headed in for Martha's Vineyard. The fog cleared for awhile, and Block Island was seen. A number of hagdous (*Puffinus major*) were seen on the previous day off Long Island, and others were noticed to-day. At 12.40 p. m. I succeeded in wounding one, which we secured alive, and brought it on board.

We arrived at Wood's Holl on the afternoon of August 24. As soon as the collections which had been obtained on the cruise were landed, together with such portion of the vessel's equipment as was not required for work in the immediate future, preparations were made for a trip to the eastern fishing banks in quest of halibut, which, it was hoped, might be brought into port alive in the vessel's well, thus affording an opportunity for experimentation in the artificial propagation of this important and valuable species.

The large iron steam windlass and the engine and boiler used on the Grampus having been found too heavy for her, the accumulation of weight forward making it difficult to keep the vessel in trim, and causing her to pitch and send heavily in a seaway, the Commissioner determined to have them removed and to substitute instead a wooden windlass, such as is ordinarily used on fishing schooners.

The boiler and steam pump were landed at Wood's Holl, and, arrangements having been made with Gloucester parties to make the necessary changes in the windlass, we left Wood's Holl on September 1, and on the following day reached Gloucester.

On the afternoon of the 2d the vessel was hauled out on the railway to have the condensing pipes taken off her bottom, and at high water the next day she was launched again and moored to the railway pier,

where she lay nearly all the time while the new windlass was being made and put on.

The construction of the vessel's deck-frame forward of the foremast, though well adapted to the requirements of a steam windlass such as had first been put on her, was not so well suited for the support of a wooden windlass. It was necessary to put in a new deck-beam for the windlass bits to rest on and fasten to, and also a new pawl-bitt. To do this the deck had to be taken up forward of the foremast, running back of the forecastle in places to break joints. New decking had also to be put in where the hole for the smoke-stack of the steam boiler had previously been cut.

The change in the windlass rendered necessary a change in the stowage of the chain cables. These had been stowed under the forecastle floor, forward of the foremast, but under the new arrangement they were placed in boxes built on the after side of the forecastle bulkhead. This carried the weight of the chains—some 6,500 pounds—about 10 feet farther aft, nearer the center of the vessel; a desirable change, since she would thus be less liable to pitch and send heavily in a seaway.

September 6 the iron windlass was landed, and the next day it was shipped to Wood's Holl. Some delay was experienced in getting the new windlass completed, owing to the fact that several days' work were expended on the stick of timber first selected before it was found to be unfit for the purpose. The work of the carpenters, calkers, painters, and plumbers was finally completed at noon of September 22.

Previous to this, at 9.40 a. m., September 15, Mr. James Carswell, expert fish-culturist, reported on board, he having been ordered on from Washington by the Commissioner to join the vessel for this cruise to the banks. Mr. R. L. Newcomb joined the vessel on the 21st to make the cruise in the capacity of naturalist.

It was thought that there was at least a probability of finding halibut with ripe eggs, which might be taken from the fish and impregnated on the ground. In this event it would be necessary to have some device to keep the eggs in, so that they would retain their vitality and go on in their development until the vessel reached Wood's Holl. Mr. Carswell devised and had made two wooden frames, each capable of holding two of Chester's glass hatching-jars. These frames were so arranged that they would float in the well, thus supporting the nearly immersed jars, their motion being regulated by upright wooden guides nailed to the side of the well, though they were not prevented from oscillating with the movement of the vessel in a seaway. Ten of the Chester jars were sent on from Wood's Holl and taken on board; also pans, dippers, etc., that were required for fish-cultural purposes were purchased.

The season was at hand when heavy weather might be expected on the banks. The foretopmast was therefore sent down and the rigging

set up taut before sailing. September 21 we took on board six tons of ice, and the next day, just before sailing, the water tanks were refilled.

As previously mentioned, the repairs on the vessel were completed at noon of September 22, and at 4.20 p. m. of the same day we sailed on a cruise to the banks under the following orders:

U. S. COMMISSION OF FISH AND FISHERIES,
Wood's Holl, Mass., September 19, 1886.

SIR: As soon as the repairs and alterations incident upon the completion of the new windlass are completed, you will proceed with the Grampus to some one of the eastern banks for the purpose of determining the possibility of bringing in cod and halibut living, in connection with the artificial propagation of these species. If you can add some living haddock or pollock or others of the gadoid fish, you will do so. Should you find any of these fish spawning, it may be well to try the experiment of stripping them on the spot, and bringing the eggs in under such conditions as you and Mr. Carswell may decide upon. The locality to be visited, and the period of your stay, are left to your discretion. The vessel will return to Wood's Holl with its cargo.

You will also obtain as good a series of the sea-fowl of the coast as you can secure, procuring as many duplicates as possible. A few specimens of each species should be brought in the flesh, to be forwarded to the National Museum.

Very respectfully,

SPENCER F. BAIRD,
Commissioner.

Capt. J. W. COLLINS,
Commanding Schooner Grampus, Gloucester.

We passed Eastern Point at 5.25 p. m., and at 11 a. m., September 23, we spoke the schooner Carrie E. Payson, of Portland, one of the gill-net herring fishing fleet, off Wood Island, Maine. From her we obtained 8 barrels of fresh herring, which we immediately iced for bait.

As soon as the bait was on board (at 11.50 a. m.) we filled away on port tack, close hauled by the wind, heading SE. $\frac{1}{2}$ S., with a moderate breeze E. The latter part of the day was rainy, with light to moderate wind from E. to SE., varied by calms; weather threatening in appearance.

We went into Portland Harbor for the night, in company with a large fleet of fishing and coasting vessels, and at 8 p. m. anchored off Fort Preble.

At 6 a. m., September 24, we got under way, and ran out of Portland with a light breeze, which varied from W. to WNW. The wind gradually increased during the p. m., and at midnight blew a moderate gale from NNE.

The wind blew stiff during the first part of the 25th, decreasing to moderate breeze at meridian.

At 12.15 p. m. sounded in 49 fathoms, hard bottom; latitude $43^{\circ} 05'$ N., longitude $65^{\circ} 15'$ W.; put out 5 hand-lines and caught 17 cod, mostly of small size, and one haddock. These were all put into the well, but 9 of the cod soon died. Their ovaries and spermaries were very small, apparently not at all advanced in development. Nothing was found in the stomachs of the fish except a few pieces of partially digested squid. Squid were seen in the water following up the fishing gear, but none could be caught on a squid-jig that was put out.

We lay to fishing one and three-quarters hours, and got under way at 2 p. m. Just previous to this a school of porpoises came alongside the vessel for a brief time, but did not "play" under the bow when we kept off.

At 2.45 p. m. spoke schooner Garibaldi,* at anchor in 82 fathoms (approximately), trawling for cod. Her captain came on board. He reported having good fishing, and said he caught a halibut that day, which was then on deck among the recently caught codfish.

Mr. Carswell and I went on board the Garibaldi to ascertain what stage of development the reproductive organs of the halibut were in. It was a male, of about 25 pounds' weight. Its spermaries, though not ripe, were in an advanced condition of development.

In the evening, as we lay becalmed, about 200 squid were caught, the majority of which were put into the well alive. They seemed to live without any difficulty, but in a few days they nearly all made their escape through the holes in the bottom of the well, which are large enough to allow a somewhat bulkier animal to pass through if he chance to hit directly in a hole.

There was a moderate breeze from SSW. on the morning of the 26th, but the wind rapidly augmented in force, blowing a stiff breeze at 3 p. m. and somewhat stronger after that, veering westerly. We ran to the eastward, along the southern border of La Have Bank, making occasional soundings and trials for fish with hand-lines, but without success. Only one of the cod put into the well yesterday remained alive to-day.

At 11 a. m., while we were lying to trying for fish, the schooner Mabel Leighton, of Gloucester, spoke us, and her captain, Charles H. Greenwood, told me that he had a large squid on board which he would give to the Fish Commission. I immediately went on board the Leighton and got the squid. It proved to be the "broad-finned squid" (*Sthenoteuthis megaptera* Verrill), of which no perfect specimen had heretofore been obtained in the United States. The only perfect specimen previously known was picked up on Cape Sable, Nova Scotia, and it is now in the Provincial Museum at Halifax.

Captain Greenwood said the squid had been caught on the previous evening by John F. McDonald, one of his crew, who was fishing with an ordinary squid-jig. The locality where it was taken was off the southern part of La Have Bank, near the meridian of 64° W., and in 82 fathoms of water.

* This vessel was destroyed by fire October 2, near Murder Island, off the west coast of Nova Scotia.

I made the following measurements of the specimen before putting it into alcohol:

	Ft.	In.
Total length (tip of tail to end of longest tentacles)	4	4
Length of longest tentacle, each	2	7
Length of body, exclusive of head	1	7½
Length of upper pair of arms, each	0	8½
Length of pair of arms next the upper ones, each	0	11
Circumference of body, 2 inches behind the junction with the head	1	3

At noon we filled away and ran to the eastward, and at 1.45 p. m. spoke the schooner *M. A. Baston*, of Gloucester, a halibut catcher, at anchor in 220 fathoms. Her position, as given by Captain Thompson, was latitude $42^{\circ} 47' N.$, longitude $63^{\circ} 12' W.$

After lowering and furling the mainsail and laying the vessel to under foresail and jib, I went on board the *Baston*, accompanied by Mr. Carswell.

On her deck were 12 to 15 halibut that had just been caught. The fish were opened and examined to ascertain the condition of the reproductive organs. These were found in various stages of development; some well advanced, but none fully ripe.

Captain Thompson reported halibut fairly plentiful, and thought we might get enough for our purposes if the weather proved favorable. I therefore concluded to lay to by his vessel and wait for an opportunity to fish.

The next day, September 27, was very unfavorable for our purpose, since we had to set under sail, or make a "flying set," as it is often called. It was raining in the early morning, with a fresh WSW. wind. At 7 a. m. the wind hauled to WNW.; the rain ceased, and was immediately followed by a thick fog, which continued till 11 a. m. Between meridian and 4 p. m. the wind hauled from NW. to NE., increasing in force, with a rough choppy sea and current setting southwesterly with considerable strength.

The crew of the *Baston* went out about noon to haul their lines, which had been previously set. Two of her dories, each having two men, were brought so far to leeward by the change of wind that they could not reach their vessel. Indeed, the men could make little or no headway against the wind, sea, and current. Anticipating a difficulty of this kind, I had run down to leeward of the *Baston*, and a lookout was kept for any of her boats that might be in that direction. The men in the first dory we picked up were considerably exhausted. They had been unable to find their gear, and had been rowing continuously for several hours; they could then scarcely hold their position against the sea and wind. After getting the boats on board we beat up to windward of the *Baston*, hove to, hoisted out her dories at 5.30 p. m., and her men returned to their vessel.

On the 28th the wind was moderate from ENE. in the morning, veering southeasterly in the evening. We set two codfish trawls, each hav-

ing 1,000 hooks, in from 90 to 110 fathoms, pebbly bottom; position (5013), lat. 42° 50' N.; long. 63° 20' W. This set was made chiefly to procure cod, hake, etc., to use as bait for catching halibut. There was also some probability of catching a few of the latter species. The total catch was as follows: 60 cod; 81 hake (*P. chuss*); 37 cusk (*Brosmius americanus*); 5 pollock (*Pollachius carbonarius*); 2 small skates; a few shells, chiefly whelks (*Buccinum*), and some sea anemones. The following birds were collected during the day: 6 common hagdons (*Puffinus major*), 1 black or sooty hagdón (*P. fuliginosus*), 7 jægers, and 1 young herring gull.

It was rainy during the first part of the 29th, and too rough and blowy to fish. In the afternoon the weather improved slightly, but the wind blew fresh all day, with occasional squalls and a choppy sea. Shortly before noon the M. A. Baston's dories went out to haul the trawls which had been set the previous evening. Soon after, we passed close to the Baston's stern, and Captain Thompson hailed, saying he had ordered his men to give us any small halibut they should get which appeared to be strong enough to live in our well. Being very desirous of ascertaining whether or not halibut that were caught in deep water (200 to 350 fathoms) could be kept alive in a vessel's well, I deemed it best to accept this generous offer. Accordingly, during the afternoon we got 4 halibut from the Baston's dories, the fish varying in size from 18 to about 50 pounds weight each. They appeared tolerably lively when put into the well, but they soon died, the last of them being dead on the following morning. The birds collected on the 29th were as follows: 3 hagdons, 1 noddy (*Fulmarus glacialis*), and 4 jægers.

September 30 was moderate, with fog in the latter part of the day. We set two halibut trawls to the westward of the M. A. Baston, beginning to set about 2 miles from her in 321 fathoms. The strong current carried the gear nearly 2 miles to the westward before it fetched up. The depth at the northwestern end of the trawls, where they brought up, was 266 fathoms. After the gear was set, and while we were waiting for the time to arrive when it should be hauled (between 10 and 11.30 a. m.), several birds were shot, as follows: 8 hags (*P. major*), 4 kittiwake gulls, and 6 jægers.

Much difficulty was experienced in hauling the trawls, owing to the great tenacity of the sticky clay bottom, into which the anchors were buried. The difficulty was increased by one of the trawls of the schooner Gertie May, of Portland, going across one of ours, the result being that our gear parted and we lost nearly half of one trawl.*

We caught 19 halibut, 14 of which were put into the well alive. Eleven of the live halibut were caught on a portion of trawl that we

* The Gertie May had just arrived at this place, from the eastward, and had set under sail some time after our gear was out. The current swept one of her trawls afloat of one of ours—a result that could not be anticipated, since no indications of the strong westerly tide were apparent to one on a vessel under sail, more particularly as there was little surface current.

hauled on board the vessel. These fish were lifted over the rail with the greatest care. They were immediately unhooked and put into the well. Every possible effort was made to guard against the fish receiving any injury. The conditions under which they were captured were certainly as favorable as they well could be, in deep water, to insure their living in the well; and it was felt that this would be an unusually good test of the feasibility of keeping alive halibut that had been caught in such a depth. The result, however, was contrary to our hopes; for, although we did not complete hauling the lines until 8.25 p. m., six of the fish were dead next morning, and all died in less than 36 hours after they were put into the well. This, though somewhat discouraging, was not entirely unexpected. It is self-evident that a fish taken from a depth of 200 to 300 or more fathoms must undergo a very great change in pressure and temperature in reaching the surface. Such changes are generally fatal to many species of fish, and might be particularly so to a halibut caught on a trawl-line, and which must necessarily be half drowned and so much exhausted that it would not have sufficient vitality left to endure what otherwise it could successfully withstand. It will, therefore, in my opinion, be difficult, if not absolutely impracticable, to get halibut from deep water which will have sufficient vitality to live until they can be carried into port alive.

This being the case, the attempt to obtain a supply of gravid halibut will be attended with many difficulties, and it is probable that success will be attained only after considerable experimentation. The fact that the breeding grounds of the halibut are usually, so far as known, in depths ranging from 150 to 400 fathoms, and that the species is now seldom found in any considerable abundance in shallow water, complicates somewhat the solution of the problem.

It is, however, a fact that halibut may yet be caught in a few localities on the west coast of Newfoundland, and along the shores of southern Labrador, in very shallow water—5 to 15 fathoms—during mid-summer. There is a strong probability that fish caught there would live for a considerable period in a vessel's well. The conditions of the water in the well would be the same as those in which they were living, and their capture on such shallow grounds would not seriously affect their vitality. It is, of course, not yet certain what effect the change of temperature might have on them before they arrived at Wood's Holl, for undoubtedly there would be a considerable difference in this respect between the littoral waters of Newfoundland and Labrador and those of southern Massachusetts.

We had hoped that some fish might be found with ripe eggs and milt, so that the eggs could be impregnated and some experiments made with them on board. But, although the majority of the halibut we caught, as well as those seen on board of the M. A. Baston, were apparently well advanced, none of them were ripe. This fact, together with our total lack of success in keeping any halibut alive, made me

determine to fish in shallower water the remainder of the trip, since it was possible halibut might be caught there, and if we got any they would have a much better chance to live.

The halibut we dressed had almost nothing in their stomachs. In eight that were carefully examined we found only a few bones, and pieces of fish that were wholly or partially digested. Among these I recognized the head of a "hand-saw" fish (*Alepidosaurus ferox*).

The wind blew a gale on the 1st and 2d of October, backing from SSE. on the morning of the 1st to WNW. and W. on the evening of the same day, blowing a smart gale, with a heavy cross-sea. On the 2d the wind veered from W. to NW. and blew a moderate gale, with a sharp choppy sea and heavy tide rips. This being the first gale of any magnitude to which the Grampus had been exposed, her movements were noted with care and interest. During the heaviest of the gale she lay to very steadily under a double-reefed foresail. She lay close to the wind, varied little more than one-half point in the direction of her head, and made comparatively little leeway. Later, the forestaysail, with the bonnet out, was set with the reefed foresail. Under this sail she lay steady and was very weatherly. In all cases she was remarkably dry on deck, apparently had less pitching and sending motion than the average vessel of her size, but her sideways motion was rather quick, as it generally is in small craft, though she lurched far less heavily than the ordinary fishing schooner.

The weather was fine on October 3, with a moderate breeze, varying from NW. to WSW. Between 7 and 8 a. m. two halibut trawls were set in 80 fathoms, latitude 42° 52' N., longitude 63° 04' W. No halibut were caught. The total catch was as follows: 18 cusk, 8 hake, 9 cod, 7 spiny-backed dogfish (*Squalus*), 1 blue shark, and 2 small skates.

This result, with our previous experience, led me to think it nearly useless to remain longer on La Have Bank. I therefore determined to work to the westward and be governed by circumstances as to whether we tried on Brown's Bank or Seal Island Ground, or both. Scattering halibut are sometimes found on these fishing grounds, and to visit them offered the greatest probability of success in seeking fish in moderate depths.

Fine weather prevailed on October 4, with moderate to fresh breeze, varying from SSW. to W. $\frac{1}{2}$ S. At 11.40 a. m. sounded on Roseway Bank, in 39 fathoms, sand and pinkish colored bryozoa; latitude 43° 19' N., longitude 64° 40' W. Hove to under mainsail and foresail and put out hand-lines. Cod were abundant. In about one and one-half hours we caught 50 or 60 cod and 4 haddock, all of which were immediately put into the well. Those fish which had swallowed the hook in biting generally had their gills wounded in getting the hook out. They died in a short time, and about one-third of the whole number had to be removed from the well. These were dressed and iced for halibut bait. Almost nothing was found in the stomachs of the fish that were dressed, and their generative organs were very little developed.

Shortly after meridian the supply of drinking water was reported nearly exhausted, and I determined to go into Shelburne to fill water. Accordingly, at 1.30 p. m., we got under way, and at 5.30 p. m. anchored in Shelburne, above Sand Point. Upon going on shore I learned that it would be necessary to go to the village of Shelburne, 5 miles further up the harbor, to fill water or to get other necessary supplies.

It was calm and foggy on the morning of the 5th, but at 9.30 a. m. the fog cleared off and a light northerly breeze sprang up. We immediately got under way to beat up to Shelburne village, but the wind was exceeding light, with occasional periods of calm, so that it was 1.30 p. m. when we anchored near the wharves.

At 10.50 a. m., on October 6, we got under way to go down the harbor to Sand Point. While beating down the harbor we met the schooner *Laura Sayward*, of Gloucester, whose captain spoke us and reported his vessel in distress, she being short of water, provisions, and light. In compliance with his request, I gave him 2 gallons of kerosene to supply his immediate need of a light, and also gave him a letter of introduction to F. C. Blanchard, esq., a citizen of Shelburne, who is a law partner of Mr. White, the American consul, asking him to use his good offices to assist Captain Rose in obtaining a supply of provisions, enough at least to enable him to reach home.* I have since learned that the officials at Shelburne refused to permit the captain of the *Laura Sayward* to buy provisions.

At 1.30 a. m., October 7, we got under way and left Shelburne. After getting out of the harbor a course was steered for Cape Sable, and it was my intention to set halibut trawls near the cape if the weather proved favorable, since reports had reached Shelburne that a considerable number of halibut had been taken in that locality a few days previously. But when we had reached the locality where it was proposed to fish, the wind blew fresh, and there was a sharp choppy sea running. It was too rough and windy to set trawls, therefore we ran into Pubnico for a harbor.

On the morning of October 8 we left Pubnico, but the wind was light, and we did not reach any fishing ground until the forenoon was well advanced. At 10.20 a. m. halibut trawls were set in 22 fathoms between Bon Portage and Seal Island, latitude $43^{\circ} 25' N.$, longitude $65^{\circ} 51' W.$ Nothing was caught except 9 spiny-backed dogfish and 17 skates, also a few sea lemons. Hand-lines were also put out, both before and after the trawls were hauled, but only dogfish were caught.

At 1.35 p. m. put out boat dredge, the vessel at this time drifting in a calm with the flood tide setting toward the Mud Islands. A small

* The letter was as follows: "This will introduce to you Capt. Medco Rose, of the schooner *Laura Sayward*, of Gloucester. He has just arrived here in a distressed condition, being short of provisions and water, owing to heavy adverse winds on his passage home from the banks.

"I know, of course, that he has the right to fill water, and I trust you will have no difficulty in securing for him sufficient supplies to obviate any risk of actual distress on his passage home from here."

quantity of marine life, chiefly shells and crustacea, was obtained from the dredge, but when it was put out again, at 2.10 p. m., the net bag was torn open by the rocky bottom and nothing was taken.

On October 9 two sets were made with halibut trawls on the Seal Island Ground, the localities being as follows: First position, latitude $43^{\circ} 04' N.$, longitude $65^{\circ} 54' 15'' W.$; depth, 50 fathoms; pebbly bottom. Second position, latitude $43^{\circ} 06' N.$, longitude $66^{\circ} 07' W.$; depth, 40 fathoms; bottom, sand and gravel.

Catch: First set, 39 dogfish, 10 skates, 15 cusk, and a few sea lemons. Second set, 21 dogfish, 9 skates, and 5 cusk; also 2 small sponges attached to stones and gravel.

At 4.40 p. m. the dories came alongside from hauling the trawls for the second time and were hoisted on deck. At the same time the boat dredge was put out, with 125 fathoms of towing line payed out on it. Nothing was got in the dredge.

The absolute failure which we had met with in the various attempts made to catch halibut in moderate depths convinced me that there was small probability of catching any fish of this species in shallow water, unless we were prepared to continue our cruise several weeks longer, for a new supply of bait would have to be obtained to start with, the small quantity of herring we had left on board being then unfit for use. Our ice was also exhausted. Besides this, little success could be expected so long as dogfish remained so abundant as we had found them on Seal Island Ground, and we certainly could not expect to find them less plentiful on Brown's Bank. For, not only will these pests of the fisherman gather round a trawl when it is being set, to eat the bait off or get caught, but their presence on a fishing ground is usually sufficient cause for other species to leave, at least to such an extent that other fish are seldom plentiful.

Not considering it desirable to refit, I determined to return to Wood's Holl. Therefore, as soon as the dredge was hauled, shortly after 5 p. m., October 9, we filled away, and after a pleasant passage—most of the time with unfavorable winds—we arrived at Wood's Holl at 9.45 a. m. on the 12th of October.

No noteworthy incident occurred on the passage home, with the single exception of falling in with three fishing schooners while beating down the eastern side of Cape Cod, on the afternoon of the 11th. As they were going in the same direction that we were bound, and all of them some distance to the windward of us (from 4 to 10 miles), it was a fair opportunity, at least a better one than had previously been afforded, of making a comparative test of the sailing qualities of the Grampus when beating dead to windward. Two of the vessels, a large two-masted clipper schooner of about 150 tons register, and the other a craft of perhaps 70 tons, we outsailed very much, beating them, at the most moderate estimate, two knots an hour, dead to windward. The third vessel is reputed to be one of the best sailers in the fishing fleet. At 2 p. m., when we were 4 or 5 miles to windward of Cape Cod

Highland Light, she was just fairly in sight to windward, the upper part of her sails showing above water, and with glasses I made her out to be a fishing vessel, beating to the southward. We gained on her rapidly, and at 9.30 p. m. we weathered her, when just off the bell buoy north of the Pollock Rip. The distance made to windward by our vessel did not exceed 28 miles, and though the other vessel towed a seine boat, the rate at which we outsailed her proved that the Grampus can at least make a fair rate of speed in windward work.

Since the latter was designed for an improved type of fishing vessel (more particularly, however, to obtain greater safety), it is gratifying to find that she is more than commonly swift, since speed is an important and necessary qualification in a schooner which must be employed in most branches of our fisheries.

The collections and fish obtained on the trip were landed on the 12th and 13th. Reference is made to the following notes, prepared by Mr. R. L. Newcomb, for a statement of ornithological collections:

List of ornithological specimens obtained by the U. S. Fish Commission schooner Grampus, from September 26 to October 9, 1886, inclusive.

(By Raymond L. Newcomb.)

Date.	Where obtained.	Remarks.
	<i>S. pomatorhinus.</i>	
1886. Sept. 28	La Have Ridges	Fourteen specimens were obtained. One of them was in the dark plumage.
20	La Have	Two specimens secured.
Oct. 9	Southeast of Nova Scotia, lat. 43.03 N., long. 65.55 W.	Twenty-one specimens were obtained. Four of these were in the dark plumage.
	<i>Stercorarius bufonii.</i>	
9	Southeast of Nova Scotia, lat. 43.03 N., long. 65.55 W.	Two specimens were obtained.
	<i>Puffinus major.</i>	
Sept. 28	La Have Ridges	Six specimens procured.
29	La Have Bank	Two specimens procured.
30	do	Six specimens procured.
	<i>P. fuliginosus.</i>	
28	La Have Ridges	One specimen was obtained.
	<i>L. argentatus, var. Smithsonianus.</i>	
28	La Have Ridges	One immature gray specimen was taken.
	<i>Rissa tridactyla.</i>	
30	La Have Bank	One adult and three immature specimens were obtained.
Oct. 3	La Have Ridges	One adult specimen procured.
9	Southeast of Nova Scotia, lat. 43.03 N., long. 65.55 W.	Three specimens were obtained.
	<i>Sterna macroura.</i>	
Sept. 26	La Have Bank	One specimen obtained.
	<i>O. leucorrhoea.</i>	
28	La Have Ridges	Seven specimens obtained.
	<i>Sula bassana.</i>	
Oct. 9	Southeast of Nova Scotia, lat. 43.03 N., long. 65.55 W.	Two immature specimens were obtained.
	<i>M. velvetina.</i>	
4	Passage from La Have to Roseway Bank...	One immature specimen was obtained.

Mr. James Carswell, who had been on board during the trip to the banks as an expert fish-culturist, left the vessel October 13, after her arrival at Wood's Holl.

On October 14 we got under way and made a short run to Gay Head to observe the movements of the fishing vessels, which were then engaged in hook-and-line mackerel fishing about the western end of Vineyard Sound. Mr. Thomas Lee, naturalist of the steamer Albatross, accompanied us, and he and Mr. Newcomb interested themselves in collecting and making observations on the sea birds that were seen near Gay Head. We returned to Wood's Holl in the latter part of the afternoon.

Having made preparations for a new cruise, we left Wood's Holl on October 17, for Gloucester, where we arrived on the following day. A supply of hand-line gear for catching pollock was obtained.

It was necessary for me to remain on shore to attend to business matters connected with the vessel and to do other necessary work for the Commission. Therefore, on October 20, I ordered the first mate, Mr. D. E. Collins, to take command of the vessel, and when the weather permitted to proceed to the fishing grounds in Massachusetts Bay and to the eastward of Cape Ann and procure as many live cod, pollock, etc., as practicable.

On October 24 the anchor of the vessel fouled a telegraph cable on Jeffrey's Ledge, when a kedge anchor, a 30-pound Chester anchor, and 5 fathoms of manila-hawser were lost. The Grampus not being provided with a suitable anchor and hawser for riding on the fishing grounds, I hired an anchor and 100 fathoms of 7-inch manila-cable from Daniel Allen and Son, of Gloucester, which served for the remainder of the trip.

The weather was very rough and fish difficult to obtain on the in-shore grounds during the latter part of October and the beginning of November. A good deal of difficulty was experienced also in endeavoring to keep the fish alive in the well. Cod caught in moderate depths appeared to live fairly well, but a very large percentage of the pollock died.

On November 13, having determined to take the fish that had been caught to Wood's Holl, I resumed command of the vessel. On November 15 we sailed from Gloucester and reached Wood's Holl on the following day. The total of live fish landed was as follows: 195 cod, 25 pollock, 17 haddock, 7 hake, 6 squirrel hake, and 2 cusk. After our arrival at Wood's Holl, Mr. Newcomb, whose term of service had expired, left the vessel.

At 7 a. m., November 20, we sailed from Wood's Holl, and at 2.10 a. m. on the following day arrived at Gloucester, when I immediately transferred the command of the vessel to the first mate, who remained in charge until December 8. During this period (from November 21 to December 8) he exerted himself, as opportunity offered, to procure all live fish which it was possible to obtain. Through all this time the

weather was exceedingly stormy and unfavorable, and cod were unusually scarce on the inshore grounds.

On December 8 I resumed command of the vessel, and on that afternoon we sailed for Wood's Holl, where we arrived at 3.50 p. m. on the following day, and began to transfer the live fish from the well to the cars. On this occasion 297 fish were landed, of which 287 were cod.

On December 11, at the request of Lieut. J. H. Weber, of the U. S. Signal Service, we made an attempt to sweep the submarine cable between Martha's Vineyard and Naushon Island, which had been broken a short time previously by the anchor of a coasting vessel. Lieutenant Weber and his assistant were on board, but the attempt to grapple the cable was a failure. The apparatus we had on board being too frail for the purpose was broken by being caught on the rocky bottom. After the failure of our attempt to get the cable, Lieutenant Weber and his assistant were, at their request, landed on Naushon Island.

Mr. Atkins informed me that cod had been found in abundance about No Mau's Land, as also on the grounds westward of Vineyard Sound; and suggested that it would be desirable to make an attempt to fish in that locality. Accordingly, a supply of bait was obtained, and a pilot familiar with those grounds was engaged to go with us. He belonged at Vineyard Haven, and after landing Lieutenant Weber and his companion we went over to the Haven, so that the pilot might get such clothing as he needed for the trip.

On the following morning we started for the fishing-grounds above mentioned, with a gentle but increasing wind from ENE. to NE. By the time, however, that we had reached the Vineyard light-ship the wind was blowing fresh, and the weather was threatening. We therefore steered for Newport, where we arrived at 3.40 p. m.

At 6.40 a. m., December 14, we got under way at Newport for the fishing-grounds, the wind at that time being NW. by W., and the weather generally clear. Outside of the harbor there was a heavy ground-swell, and the wind rapidly increased in force. Before we reached the grounds the wind was too heavy to carry on fishing operations; we therefore steered for Wood's Holl, where we arrived at 2.30 p. m.

On December 15 we left Wood's Holl, and at 2.10 p. m. tried for cod on Brown's Reef, to the westward of Vineyard Sound light-ship. No fish of any kind were taken. The weather was then very threatening, with indications of the near approach of a snow-storm. For this reason we went back to Vineyard Sound, and, at midnight, anchored off Falmouth.

A heavy storm prevailed on December 16, but the weather cleared on the following day. We left Falmouth at 6.25 a. m., December 17, and at 9.20 p. m. on the same day arrived at Gloucester.

After transferring the command of the vessel to the first mate, I went on shore. The Grampus continued to fish off Cape Ann and in Ipswich Bay whenever it was possible to get out of the harbor. The weather

was exceedingly boisterous and cold, with frequent storms, so that there was very little time when fishing could be prosecuted. I would say, as illustrative of the extreme inclemency of the weather in which it was necessary to fish, that on January 19 the *Grampus* visited the fishing-ground and the crew hauled her gear when the temperature ranged from 2° to 7° below zero Fahrenheit. The vapor was unusually dense, and seamen Collins and Campbell were considerably frost-bitten. Besides this adverse condition of the weather, cod were unusually scarce for this season of the year, and few were taken under the most favorable circumstances.

On January 23 I resumed command, and we left Gloucester for Wood's Holl. At 6.55 a. m. on the same day we anchored off Cape Cod, north of Chatham, the wind being to the southward and weather foggy. The wind blew a gale from SSW. to NW. on the 24th, and on the following day we reached Wood's Holl at 3.38 p. m., and immediately commenced to transfer the live fish from the vessel's well to the tanks beneath the hatching house. On that evening and the following day 219 fish were landed.

On January 27 we took on board 2,000,000 young cod and sailed from Wood's Holl for Gloucester, getting under way at 10.10 a. m. On the morning of the 28th the young fish were put overboard in 29 fathoms of water, Race Point bearing east $3\frac{1}{2}$ miles distant, temperature of air and water each 33 $\frac{1}{2}$ ° Fahrenheit. Shortly after noon we arrived in Gloucester, and I then transferred the command of the vessel to First Mate Collins, after which I went on shore to engage in other duties which demanded my attention. At this time the vessel had become very foul, and on January 31 she was hauled out on the marine railway to be cleaned, after which, on the following day, she was launched.

It had now been decided by the Commissioner to try the experiment of taking eggs from the cod on the fishing-grounds, by sending one or more men on board of the fishing-vessels to collect them. Accordingly, Mr. G. H. Tolbert, expert spawn-taker, who had been ordered to join the *Grampus*, reported on board the vessel on February 3. From that date until the close of the season's work eggs were obtained on every occasion when it was possible to get them, and were shipped to Wood's Holl either by express or in charge of Mr. Tolbert. I went on the vessel only on one occasion after Mr. Tolbert joined her, which was on February 18, when about one million eggs were obtained from the fishing- schooners off Eastern Point, Gloucester.

On February 25, in compliance with orders received from the Commissioner, I left Gloucester for Washington for a stay of several months, the *Grampus* being left in command of the first mate.

The work of collecting cod eggs was continued whenever opportunity offered until March 14, at which date 5,000,000 eggs were taken. It may be explained that the statistics of fish landed at Wood's Holl do not by any means represent the number taken. In many cases, as for

example in that of the pollock, not 5 per cent. of the catch lived until the vessel reached Wood's Holl, and the mortality to the other species was always large.

The Commissioner having decided to send the Grampus on a cruise to the southern mackerel grounds, orders were issued for the work of collecting fish eggs to be brought to a close and for the necessary preparations to be made to fit the vessel for the intended cruise.

In concluding this report upon the operations of the Grampus it is only just to say that the officers and men under my command have exerted themselves to the utmost to carry on successfully the work in which they were engaged. Hardships and dangers, which might intimidate and discourage men unaccustomed to the vicissitudes and perils of a fisherman's life, were cheerfully borne, and no opportunity was lost to obtain fish and fish eggs. Mr. D. E. Collins, while in command, not only exhibited much energy in carrying out his instructions, but he also exercised care and prudence in the management of the vessel, which met with no damage whatever during the winter, though she was constantly going in and out of crowded harbors, often at night and not unfrequently in thick weather.

Record of dredgings and trawlings of the U. S. Fish Commission schooner Grampus on the trip to the tilefish ground.

Serial number.	Date.	Hour.	Position.			Temperatures.		Depth.
			Lat. N.	Long. W.	Air.	Surface.		
	1886.		° ' "	° ' "	°	°	<i>Fathoms.</i>	
5001	Aug. 15	.....	39 59 00	70 15 00	63	70½	*96
5002	Aug. 16	.....	39 54 00	70 16 30	74	74	118
5003	Aug. 18	.....	39 59 00	70 17 15	74	73	110
5004	Aug. 18	.....	39 56 00	70 40 30	69½	76	168
5005	Aug. 19	.....	40 01 00	71 03 00	70½	75	104
5006	Aug. 19	a. m.	39 58 00	71 13 15	67	75	155	
5007	Aug. 20	m.	39 58 00	71 13 15	70	72	160	
5008	Aug. 20	7.45 a. m.	39 40 00	71 39 15	70	72	105	
5009	Aug. 20	2.45 p. m.	39 34 00	71 50 30	70½	72	185	
5000	Aug. 21	6 a. m.	39 27 00	71 58 45	71½	73½	145	
5010	Aug. 21	10.10 a. m.	39 20 00	72 04 15	71	72	80	
5011	Aug. 21	8.30 p. m.	39 33 00	72 05 45	.....	.....	45
5012	Aug. 21	5.30 p. m.	39 38 15	72 07 45	.....	.....	.....

* For sounding we used an ordinary cotton fishing line, marked at every ten fathoms, and a deep-sea sounding lead of 16 pounds weight. The depths given in this report may not on this account be deemed absolutely accurate, but will not in any case vary more than a few fathoms—probably in no case more than 2 or 3 fathoms—from the actual depth. The reason for using this method of sounding was threefold: (1) it was not deemed essentially necessary to make accurate hydrographic records; (2) our "Tanner machine" was not ready to use, and consequently we had to depend on the ordinary line, and (3) it would be impracticable to use the machine, even if it was ready, in carrying on rapid fishing operations, since the time required to make soundings, etc., would very much interfere with the time absolutely required for fishing, and where the vessel has only a small force, as in the present case, it was necessary to adopt the most feasible method.

Serial number.	Character of bottom.	Direction of wind.	Instrument used.	Fish caught.
5001	.....	NNE	3 trawls, 3,000 hooks	16 silver hake (Merluccius), 2 skate (Raia).
5002	White sand with black specks.	SSE	2 trawls, 2,100 hooks	11 silver, 3 common hake (Phycis chusa), 3 slime eels, crustacea, etc.
5003	Muddy	NE .....	.....do	2 silver, 1 common hake, 1 spearfish (Totrapturus albidus. Poey).
5004	.....do	NE	1 trawl, 1,050 hooks*	6 silver hake.
5005	Fine sandy	ENE	Trawl	115 common, 11 silver hake.
5006	Muddy	ENE .....	.....do	5 common, 33 silver hake.
5007	.....do .....	.....	.....do	18 common, 4 silver hake, 3 squid.
5008	.....do .....	.....	.....do	3 common, 2 silver hake.
5009	.....do .....	.....	.....do	18 common, 17 silver hake.
5010	.....do .....	.....	.....do	5 common, 3 silver hake, 1 slime eel.
5011	Sandy and muddy .....	.....	Dredge	Mud, gray sand, shells, shrimp
5012	.....	.....	.....do	Shells.

* In setting the trawl on this occasion we adopted a new method. Two dories were put out, each taking one tub of trawl, the ends of which were bent together; the dories then pulled in opposite directions at right angles to the wind, and when the line was out they let go the anchors and each boat lay by its respective end. This method of setting has a considerable advantage over the ordinary method, when quick work is desirable, for as soon as the men weigh the anchors and get them on board, there is comparatively little strain on the trawl, and it can be quickly and easily pulled in.

WASHINGTON, D. C., May 25, 1887.

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