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PART II.

THE COD, HADDOCK, AND HAKE FISHERIES.

1.—THE BANK HAND-LINE COD FISHERY.

By G. Brown Goode and J. W. Collins.

1. EARLY HISTORY.

Since the earliest days of the discovery of America there has been an extensive fishery with hand-lines for cod upon the Grand Bank of Newfoundland and the neighboring banks. In the seventeenth and eighteenth centuries and in the first half of the present century the fishing was carried on from the decks of the vessels in the same manner as is now the common practice on George's Bank. This method was continued to a limited extent until 1860, and there were in 1880 still a few vessels that followed this fishery. These were manned by old-fashioned fishermen from the coast of Maine. Cod hand-lining, at the present time, is carried on almost entirely from dories.

The introduction of the practice of hand-lining from dories on the Banks appears to have taken place between the years 1855 and 1858, though these little boats had long been used in the fisheries near the shore.*

The following history of hand-lining from dories in Maine was prepared by Mr. Earll:

The first vessel in this section to take dories for going out from the vessel to fish with hand-lines was the schooner American Eagle, of Southport, Capt. Michael Read, in 1858. Mr. Daniel Cameron says that they had been fishing with dories in Massachusetts only a year or two at this time, and that the idea originated with the fishermen of Marblehead.

The American Eagle sailed about April 10, in company with the schooner Ceylon, for Banquereau, and by the 10th of June had a full trip of 900 quintals, while the Ceylon, fishing from deck, had only 160 quintals.

On starting for home the American Eagle lent her dories to the Ceylon, which in turn began filling up very rapidly, and arrived home July 4 with 600 quintals.

The following season a number of the Southport vessels carried dories, and it was thought that they averaged one-third more fish in the same time than vessels hand-lining from deck, while the fish averaged about the same in size, about two-thirds large for each method.

In 1860, according to Mr. A. P. Hodgdon, North Booth Bay sent her first vessel with dories for hand-lining, and Booth Bay Harbor began about the same time.

*The Barnstable Patriot, May 10, 1859, says: "It is becoming a custom quite general among the Grand Bank cod fishermen to take dories with them upon the fishing grounds, and fish in them at a short distance from their vessels. Codfish will often take a hook from a dory while they will not notice a hook from the vessel anchored within a rod from the boat. * * * The motion of the boat, giving a quicker movement to the hook, renders it more attractive to the fish than that from the vessel. It is a great change of habit in fish, thus to desert the vessel for the dory."

Mr. B. F. Jewett states that Westport continued in the old way until 1872, when Capt. James McCarty bought a set of dories for the Eastern Clipper, but the results did not seem to warrant the extra expense, and the vessels of the island have not adopted the method very extensively in the Bank fisheries.

The result of this style of fishing has not been very satisfactory, especially to the shoresmen, who claim that the fish caught average much smaller than in the old way, and that the additional expense of dories much more than counterbalances the extra weight of fish. They all strongly favor going back to hand-lining from deck, but the crews object, and generally refuse to go in that way. The fish taken in this way in 1879 averaged between one-third and one-half large.

2. THE FISHING GROUNDS.

Before the beginning of the present century the fishing was almost exclusively carried on upon the Grand Bank, on its shallow portions, the early fishermen rarely attempting to fish in water of a greater depth than 40 fathoms. At the beginning of the present century vessels fished to a considerable extent upon Western or Sable Island Bank and Banquereau. A fleet also visited Brown's Bank and Seal Island Ground. These vessels were from the coast of Maine, but it is recorded that many of the Marblehead fleet used to fish on Brown's Bank previous to the Revolutionary war, and this locality has been a favorite resort for the past thirty years, of the Gloucester hand-line fishermen—the so-called George's-men—who often find it more profitable to go there than to visit George's Bank.

Since the introduction of the use of dories in hand-lining, the favorite fishing grounds have been the Grand Bank, more especially in the vicinity of the Virgin Rocks, the shoal water or "rocky bottom" of Banquereau, and Western or Sable Island Bank.

There is no fishing for cod on the Grand Bank in winter, though unsuccessful trials have in past years been made.

The Cape Cod vessels rarely leave home for the Grand Bank until April, May, or even June. Occasionally, however, an earlier start is made.*

Captain Hurlburt thinks that cod spawn after May 15, on the the Grand Bank. The fishermen find the fish on the southern and western edge of the Bank in April and May; later they are lost track of, though many remain throughout the year. A smaller school goes up the shoal parts of the Bank later in the season, following the schools of capelin.

3. THE VESSELS.

The vessels employed in the early history of the fishery were much smaller and less thoroughly equipped than the modern fishing schooner. During the first century of the American fisheries they were usually of the rig known as the "ketch"; occasionally, also, the old-fashioned vessels known as "snows" were employed. In the eighteenth century there were employed in this fishery a large number of schooners of 40 to 70 tons, old measurement. The "schooner" appears to have been invented about the year 1714. The best records indicate that the first vessel of this class was built at Gloucester by Andrew Robinson.†

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*1870.—"The schooner Storm King sailed from Provincetown for the Grand Bank on Tuesday of last week. She is the first vessel that has sailed from that port for the Banks so early for many years. About the year 1835, Capt. Godfrey Ryder started for the Banks about the middle of March in the schooner Godfrey. He encountered severe weather and intense cold, the fishing lines freezing stiff as they were drawn in over the rails. This, however, did not prevent his catching a full fare and returning home in time to make another successful voyage the same season to Chaleur Bay."—*Gloucester Telegraph, March 23, 1870.*

†Sabine, p. 130.

Prior to the Revolutionary war Gloucester, Marblehead, Beverly, and other Massachusetts ports had employed in the Bank fishery many square-sterned vessels of this rig, some of which survived until the latter part of the first half of the present century. The square-sterned schooners of the olden time had high quarter decks, corresponding to the old-fashioned poop deck, and, in later days (when they had grown to be considered as antiquated in structure, and the lower quarter decks had come into fashion), they were known as "heel-tappers," the name referring to the resemblance of the high quarter decks to the heels of boots.

In 1731 there were 5,000 or 6,000 men employed in the fisheries of Massachusetts; a large portion of them undoubtedly in the Bank cod fishery. In 1741 there were no less than 400 fishing vessels owned in Massachusetts—160 in Marblehead alone. The average size of these vessels was 50 tons. There were also at least 400 ketches, shallops, and undecked boats.*

In the present century the vessels used for hand lining have been mostly of the same build as those employed in other branches of the fisheries, and the change of methods and manner of fishing were generally not accompanied by any change in the structure of the vessels. In some instances, however, the hand-line cod fishing vessels have been built much larger than those employed in other branches of the Atlantic food fisheries, and in a few cases these vessels have been rigged as three-masted schooners. These large schooners are often employed in some branch of the merchant carrying-trade in winter and are somewhat fuller in the midship section, and have proportionately greater carrying capacity than the average fishing vessel. The Lizzie W. Matheson, of Provincetown, one of the largest of the Bank hand-line fleet, is a three-masted schooner of 193 tons register, and has a carrying capacity of 5,000 quintals of fish.

This fishery is carried on entirely in the summer months, and, consequently, there are among the dory hand-liners, as well as among the trawlers, many vessels below the grade of the average Gloucester schooner. A vessel is fitted out for dory hand-lining in the following manner: Her anchors are lighter than those of a halibut trawler, or even those of a cod trawler, weighing from 250 to 400 pounds for a schooner of 75 to 100 tons. To the anchor is usually attached a piece of chain from 30 to 35 fathoms in length, by which it is connected with the manila cable. The cables are lighter than those used on the halibut schooner, and their length, including that of the chain, is about 200 fathoms. A chain is substituted for a hawser next to the anchor, in order to avoid chafing upon the rocky bottom, upon which the vessels usually lie at anchor. To the upper end of the chain is fastened a warp, a rope 2½ to 3 inches in circumference, which is of less length than the depth of water, and is attached to a large buoy, usually a 50 or 60 gallon cask, which is thrown over when the vessel is at anchor. The object of this arrangement is to float up the lower end of the cable and to keep it off the bottom. When a greater amount of cable is out other buoys are attached at a distance of 50 or 60 fathoms apart, it being undesirable that any part of the hawser should touch the bottom.

Many of the hand-liners, especially those from Cape Cod, coil their "riding cable" upon the starboard side of the forward companion-way instead of upon the port side, which is the universal custom on Gloucester vessels. Hand-liners carry no ballast except salt, water, bait, and provisions. The hold is divided into compartments, in which the salt is stowed and the fish are packed. The manner of fitting up these compartments varies in vessels from different ports and in different vessels from the same port, and cannot be definitely described, some vessels having simply the bulkheads extending from side to side of the hold, while others have the compartments between the

* Sabine, p. 131. Sabine makes a distinction between *vessels* and ketches or shallops. It is probable that by vessels he means schooners, since there appears to be no other good reason for not calling the ketches and shallops by the common name of vessel.

bulkheads subdivided into three or four sections. The water is in the forward part of the hold, and often on the Banks is taken on the deck to make room for the fish. The hold is almost entirely filled with salt, and as fast as the pens are emptied the partitions are knocked down, and when the hold is filled with fish there are no divisions left, the fish forming one great pile in the body of the vessel from the keelson to the deck-beams.

The provisions, as in other fishing vessels, are stowed next to the forecastle bulkhead, but when the vessel is well filled up they are often moved from this position and packed away wherever it may be most convenient.

Many of the hand-liners of the present day have the deck provided with a set of checker-planks similar to those already described as in use upon the halibut trawlers. The arrangement on deck in other respects corresponds in the main to that on the halibut vessel, though most of them have booby-hatches over those leading to the hold, the object of these being to prevent the splashing of salt water into the hold when the vessel is rolling—this being much more necessary with a load of salted fish than with a load of iced fish.* This arrangement, though very convenient, is not practicable on board of the halibut-catchers during the winter season, and therefore it is not in favor at any time. Another objection to their use on the halibut vessels is that the halibut cannot be conveniently passed through a hatch protected in this manner, on account of their weight and the difficulty of lifting them to the necessary height above the deck. The hand-liners require no bait-boards on account of the character of the bait used in this fishery.

The old-fashioned deck hand-liners were accustomed to carry on each side of the deck several—usually from three to four—"fish kids." These were boxes 7 or 8 feet long, and about 3½ or 4 feet wide, and about the same height as the bulwarks. They were arranged along the rail on each side of the vessel and divided into two compartments. When there were two upon one side of the vessel's deck one was placed between the fore and main rigging, and the other one on the quarter between the main rigging and the taffrail; when there were three, two of them were usually placed on the main deck between the fore and main rigging and the other on the quarter. In the interval between the "kids" stood two fishermen, each of whom were thus provided with a receptacle for his fish.

The quantity of salt carried by a hand-liner is the same as that carried by a cod-trawler of the same size. The supply of water is, however, very much greater, since, unlike the trawlers, the hand-liners do not expect to visit any harbors during their voyage, after they have once reached the Banks. The quantity of water carried is from 60 barrels to 120 barrels, while the trawlers rarely carry more than 30 barrels.

4. APPARATUS AND METHODS OF FISHING.

BOATS.—The old fashioned deck hand-liners, like the George's-men, carried a single yawl boat at the stern.

When dories were introduced, the vessels at once adopted the custom of carrying a dory for every man in the crew except the skipper and the cook. The number at present carried will vary from 8 to 20, according to the size of the vessel. The dories are generally 12½ to 13 feet in length on the bottom and, at night or during rough days on the Bank, they are piled in two or three nests on the quarter of the vessel, bottoms down. During the passage, the nests of dories are turned bottom up and lashed down.

A dory fully equipped for fishing and ready to leave the vessel is fitted with the following arti-

* It is impracticable to have booby-hatches on halibut schooners, since it is often necessary, especially in winter, to move the dories amidships during gales, when the vessels are at anchor on the Bank.

cles: Anchor, anchor line or "rode"; one pair 8-foot oars; one or two pairs of woolen nippers; two hand-lines on reels, with gear attached; bait-bucket; bait-board; dinner-box; spare hooks; gaff; bait-knife; water-jug; bailing scoop; and gob-stick. If fishing in a locality infested by sharks a shark-lance forms part of the outfit, and also, at certain seasons, when squid or birds can be obtained for bait, squid-lines and jigs, or bird-lines. The painter, stern-becket, thole-pins, and dory plug may be considered to be parts of the boat since they are usually attached to it in a permanent manner.

The tackles for hoisting the dories on the deck are attached differently from any yet described, the forward tackles being fastened to the after main-shroud, and the after ones to the main-boom topping-lift.

FISHING GEAR.—The gear used in hand-lining from the deck resembled, in a general way, the George's gear elsewhere described, except that the leads did not generally exceed 4 or 5 pounds in weight, and the spreaders, or "sling-dings," had not been invented.

The gear used by the dory hand-liners of the present day, in some respects, resembles the George's cod-gear, but is smaller. The lines are of the size weighing from 14 to 16 pounds per dozen, and the leads are 3 to 5 pounds in weight, the heaviest being used on the Western Bank, where there is considerable tide. The dory-lead, unlike the George's lead, has no tail, the line being bent into a hole in the top of the lead; the horse is usually made of line, though sometimes of metal or wood, and is shorter than that in the George's lead. When two snoods are used the spreaders are generally omitted, though sometimes they are employed, but frequently only a single snood is used. This is usually the case in fishing about the Virgin Rocks or on the "rocky bottom" of Banquereau, where large numbers of dories congregate together upon the same spot of ground, hundreds of them frequently lying side by side. It is an unwritten law among the fishermen that only one snood shall be used on these fishing grounds, and any infringement would be punished in a summary manner. The objection against the use of two hooks on these occasions is that it would tend to cause a snarling of the lines of the different fishermen. The hooks used are usually about No. 12 in size.

Hand-lining from dories is rarely carried on in water deeper than 45 fathoms. Two lines, each having 50 to 75 fathoms of line, are used by each fisherman, these being wound up on light wooden frames called "reels." In the vicinity of the Virgin Rocks most of the fishing is done in the neighborhood of 3 to 25 fathoms of water in depth, while on the shoalest parts of Banquereau the water is but little, if any, over 15 to 18 fathoms.

BAIT.—The ordinary bait is salted clams (*Mya arenaria*) or squid, which are very extensively used, but when capelin or fresh squid can be obtained on the fishing grounds, these are used in preference to any other bait. Birds are sometimes utilized for bait when they can be obtained in sufficient quantities. The kinds principally used are the hagdon (*Puffinus major*), the noddy (*Fulmarus glacialis*), and petrels, or Mother Carey's chickens (genera *Cymochorea* and *Oceanites*). These are caught on hook and line and knocked down with clubs. Vessels ordinarily carry about 50 barrels of clams for a trip of two and a half months to four months. These clams are obtained very largely from the coast of Maine. Many of the vessels go to Portland, the principal depot for bait of this description, and there obtain their supply; again, large quantities are sent from Portland to the ports where hand-liners are fitted out. The price of bait in 1881 was about $5 to $6 per barrel, which is not far from the average price each year. The Cape Cod vessels, and perhaps others as well, often carry large quantities of salt squid, which are used instead of clams. Hand-liners never visit the British Provinces for bait, this practice being confined to the trawlers. Several clams are used every time the hook is baited, the hook being passed first through the soft parts

and then through the tough, muscular portions about the siphon. When baited, the hook is entirely covered.

THE MODE OF FISHING.—A dory hand-liner having arrived upon the Banks and anchored, the mainsail is usually unbent and stowed away below, its place being supplied with a riding-sail. This operation the fishermen call "going to housekeeping." A vessel may remain for weeks in one place if the fishing is good, though usually she makes occasional changes. Vessels fishing on the Virgin Rocks or on the rocky parts of Banquereau frequently lay for several weeks in one berth.

Fishing begins at or before sunrise. The dories are put out on both sides of the vessel, and supplies of bait and lines are placed in them. Each man takes his own dory and rows away in search of a good place for fishing. Sometimes the dories scatter in various directions, trying here and there in the hope of finding an abundance of fish. At other times, as in the vicinity of the Virgin Rocks, all the dories in the fleet will gather in some favorite locality, crowding closely together side by side. When hand-lining was more common than at present it was not unusual for 500 or 600 dories to be fishing together about the Virgin Rocks or on Banquereau. In other localities they are apt to be more scattered. The direction in which they row from the vessel is, to a great extent, governed by the tide and force of the wind. When one of the fishermen is perceived to have good success, his mates are apt to gather around him and try their luck on the same spot of ground. While the dories are out fishing the skipper and the cook generally fish from the deck of the vessel. The men continue their solitary employment until nearly noon, when they are recalled to the vessel by a signal announcing that dinner is ready. In clear weather the signal is made by hoisting some conspicuous object, generally a large basket; in thick weather by the blowing of a horn. The men return to the vessel, unload their fish, and after partaking of their meal again go out in their boats, remaining at their work until they are again recalled by the skipper. The second recall is usually about the middle of the afternoon. The men then go on board, get their supper, and proceed to dress their fish. A careful record is kept by the captain of the number of fish caught by each man, and upon this record depends each man's share of the proceeds.

Even when men are working for wages, extra pay is given to the man who proves to be most efficient. In this fishery, as in all others where record is kept of the achievements of individuals, there is a strong emulation among the crew to be high-line.

When there is good fishing a man may get four or five dory loads a day, under which circumstances he will necessarily return to the vessel more frequently than he is recalled by the skipper.

On the old-fashioned deck hand-liners the men fished much as in the George's fishery, except that they were stationed on both sides of the vessel and often fished "watch and watch." The day and night were divided into watches of four hours each, half of the crew being thus constantly occupied in fishing. While one watch was fishing the other watch was employed in dressing the fish and then in sleeping until they were called. It has been stated that on the dory hand-liners the skipper and the cook usually fished from the deck of the vessel; in some instances there is a dressing gang on board, consisting of the skipper, cook, and a boy, or "green hand," also in some cases a salter. Under these circumstances the men on board do not fish, but devote their time to dressing and salting the catch; and, if not hired, they draw a definite share of the proceeds of the voyage.

The number of fish which may be caught by a crew of hand-line fishermen is shown by the accompanying memorandum of the work of each member of the crew of the schooner Gertie Lewis, of Portland, Me., on her first trip to the Western Bank in 1879.

This list illustrates the ordinary variations in the catch of different men in the crew:

No. of share.	No. of fish caught.	No. of share.	No. of fish caught.
1 (high line)	4,657	10	3,080
2	4,036	11	3,070
3	4,000	12	3,017
4	3,969	13	2,771
5	3,913	14	2,726
6	3,831	15	2,422
7	3,652	Total	52,068
8	3,474		
9	3,450		

The following extract from the Gloucester Telegraph of October 26, 1870, shows the result sometimes obtained by dory hand-lining: "Schooner Lizzie Lee, of Trenton, Me., has had extraordinary good luck thus far. She is about 90 tons measurement, and for the first and second years she brought home 1,700 quintals of fish each year, and this year she has a fare of 1,800 quintals. Captain Stubbs, of Bucksport, has had command of her for the three years." Some of the large vessels from Provincetown have in several instances brought home fares of between 3,000 and 4,000 quintals.

The Expert, of Stonington, is said to have been the first "Bank fisherman" ever fitted from Connecticut. She returned in 1815 with 1,000 quintals.*

5. THE CARE OF THE FISH.

The manner of dressing and salting the fish corresponds precisely to that on board the trawlers.

A correspondent of the Cape Ann Advertiser, writing to that paper January 23, 1863, over the signature of "Antiquarian," gives some very entertaining reminiscences of the fishing carried on from the port of Gloucester at the beginning of this century. He says:

"There were about 70 sail of vessels engaged in the Grand Bank fishery at that time, all low-decked vessels, very similar in model, built with high quarter decks, which extended nearly half the length of the vessel, about 4 feet higher than the main deck, and reached by a flight of steps. There were no bulwarks around the main deck, the waist, 14 inches high, being the only protection. The rigging was not especially neat, the spars being short, with clumsy caps and cross-trees. The bowsprit was pitched at an angle of 45 degrees, being lashed to a huge gammon-knee underneath. The cabin was quite spacious, and contained an immense chimney and fire-place—stoves not then being in use—while the entrance to the forecastle served the double purpose of chimney and companionway. This was considered the most comfortable part of the vessel, but in very rough weather the crew were obliged to put on the scuttle and retreat aft to safer quarters.† The vessels at that time made usually three trips yearly, starting for the Banks about the 1st of March and ending the season by the middle of November. The crew consisted of seven men, who generally went on their own hook, each man furnishing his own provisions, which consisted of hard crackers, salt pork, molasses, &c.—fish being the principal dish while on the Banks.

"On their arrival in port 'washing out' was the first ceremony. This was effected by hauling the 'pound' alongside—a large square pen, half-filled with water, which was attached to the vessel

*Alexander Starbuck.

†The old Manchester is cited as the last of the old fleet. She was sold from Gloucester about 1843, and in 1863 was still employed in the coasting trade.

by means of tackles, into which the fish were thrown, and, after being thoroughly cleansed, were taken into a boat alongside and carried ashore, where they were carted to the flake-yard, at the Cut, to be 'made.' After all had been cured, they were weighed off, and the price per quintal which the crew were to receive was decided upon by disinterested parties and their proportional parts paid them. After taking out the store bill there was not much balance left, and the consequence was that there was much poverty among most of the fishermen of that time. The fish were mostly sent to Bilboa and other foreign ports, where they generally sold for $6 and $7 a quintal. It was not uncommon for some of the vessels to carry their fish to France before they were cured.

"At the close of the season some of the vessels were usually fitted out for trading voyages to Virginia.

"The Bank fishery gradually died out, giving place to the mackereling business and the George's fishery."

6. THE MARBLEHEAD HAND-LINE FISHERY.

The following description of the cod fishery of Marblehead, published in the Boston Sentinel of September, 1839, is of special interest, since it acquaints us with the methods of the Bank hand-line fishery at the time of its greatest relative importance:

"There are about eighty vessels, all schooner-rigged, employed from Marblehead in the Bank fishery, and are built, principally of oak, in Massachusetts. They make about two fares in a year: the first fare commencing early in April, at which time they sail for the Bank of Newfoundland, commonly called the 'Grand Bank'; the second fare commences early in September. The duration of each fare depends, of course, on the degree of success attending it, but four months must be passed each season in fishing in order to secure the bounty offered by the General Government for the encouragement of the fisheries, amounting to $4 per ton on all vessels of 90 tons and under, no allowance being made for any excess of burden. Each vessel takes from 120 to 130 hogsheads of salt for a fare, at from $3 to $3.25 per hogshead. Cadiz salt is preferred, but occasionally other kinds are used. More salt is now expended in curing the fish than formerly, and 100 quintals of fish require about 13 hogsheads of salt. Occasionally, though not seldom, a 'spring fare' is made, when the vessel is expected to return by old 'election day.' This fare is called 'spring fish,' and usually consumed in the neighborhood, being a superior quality. The word 'fare' applies as well to the cargo or lading of the fish as to the voyage.

"The 'shoresman,' as the title implies, and who is generally sole or part owner of the vessel, superintends all operations on the shore relating to the fare. In addition to the vessel he furnishes the salt and bait, the latter article being either salted clams or mackerel in barrels. He also supplies the knives for splitting the fish, mittens for the crew while splitting and salting, and trousers of oil-cloth or canvas for the 'salter.' This part of the outfit is called the 'great general,' three-eighths of which is paid for by the shoresman and five-eighths by the crew (consisting generally of a skipper and five men) at the final settlement of the fare. In contradiction to the 'great general,' the 'small general' is furnished by the crew, consisting of their sea-stores, the expense of which is entirely defrayed by themselves; and each man provides his own fishing apparatus. Barrels are provided by the shoresmen to contain their store of fresh water, but all subsequent cooperage is paid for by the crew.

"A fair passage to the Bank is made in a week, and on their arrival there they generally 'lie to and try for fish;' and when 'they strike a school,' as the phrase is, they anchor. The depths at which they fish are various, from 30 to 60 fathoms; but generally from 35 to 50 fathoms. When the fish are plentiful, the fare is made up in about six weeks—that is, when they have wet or expended

all their salt. Fish caught with mackerel bait are larger than those caught with clams, for the supposed reason that a larger bait of mackerel can be put on the hook than of clam, and the largest fish take the largest bait. Whatever may be the reason the fact is incontrovertible, and the proportional difference is about thus: Fish caught with clam bait will average about 25 quintals to 1,000 fish, and those caught with mackerel bait about 40 quintals to the 1,000.

"This is a general result, but there are occasionally variations from various causes, the principal of which is a different depth at which the fish are taken, the largest fish being taken in the deepest water. The flesh of a sea-bird called a 'hagdon' is a fine bait for codfish, and is frequently used.

"The equipment of a fisherman is singular and grotesque. Over their common dress they wear a pair of 'petticoat trousers,' made very wide, and descending to the calf of the leg; generally they are made with an insertion for each leg, but sometimes like a woman's petticoat, with no intersecting seam, and are of coarse canvas or oil-cloth. A pair of thick cowhide boots of a russet color, and with soles an inch or more thick, reach quite to the knees, with tops to turn up and cover the thighs. The barvel, or leather apron, extending from the breast to the knees, and a tarpaulin hat complete the costume, which secures to the occupant perfect immunity from the assaults of the element in which he procures his subsistence. The hands are preserved from the cutting of the fishing-lines by a sort of digitless woolen gloves called 'nippers.' Each man tends two lines, and they generally fish near the bottom of the sea, but sometimes the codfish will ascend to mid-water, or even much higher, in pursuit of herrings, capelins, and other fish of that class, which swim in immense shoals near the surface; and in such cases the labor of the fishermen is much lightened, and the fish are taken with much greater celerity. In the day-time during the first fare all hands generally fish, and at night the crew is divided into watches that fish alternately; but circumstances create variations in this mode, such as the scarcity or abundance of fish, the inclination of the skipper and crew, &c. During the season of the second fare the fish feed principally in the night, at which time most of them are taken, and on the succeeding day they are prepared and secured below. At any time, however, when the decks are full of fish, they proceed to cure them, and this is the process: The operators being placed in juxtaposition before a bench or platform, about mid-height, the 'cut-throat,' wielding a sharp two-edged knife, which bears the same sanguinary and ominous name, seizes the fish, and separating the connecting integuments between the head and body he then passes his knife through from the nape to the vent and abstracts the viscera. He then passes it to 'the header,' who by an adroit process, separates the articulation of the spine at the shoulder and detaches the head from the trunk, which he passes to the 'splitter,' who, commencing at the shoulders, proceeds to lay the fish open to the tail and detach the sound bone. The fish being thus prepared is thrown into the hold to the 'salter,' who strews on the salt, and stows it neatly away, in compact layers, with the skin down. And in this manner they proceed daily until all the salt is wet, if they are so fortunate as to get a full fare. They are sometimes obliged, however, by the scarcity of fish, by losing their anchor, by sickness or casualty on board, or by other causes to return without wetting all their salt.

"Besides the bodies of the codfish and the bounty, there are other emoluments accruing to the adventurers, such as the oil extracted from the livers of the cod, of which about 15 barrels to 800 quintals of fish is produced, and is sold at about 50 cents per gallon; and halibut, which was mostly thrown away formerly, and now constitute a considerable portion of the profits. It is salted like the codfish, and sold green from the vessel on arrival, at about $2 per quintal, the subsequent process of drying and smoking for the market being performed by the purchasers. This article is mostly derived from the second fare, and about 15,000 quintals are annually brought

into Marblehead, and with the oil is divided in the same proportion as are the codfish and the bounty. As regards the proportional proceeds of the fare, on return of the vessel to the port, one-quarter part is considered to be the property of the shoresman and the other three-quarters of the crew, but the shoresman is allowed one-eighth part more on articles that it is his province to prepare for the market, such as drying the codfish, &c. The sounds or air bladders and the tongues of the codfish, with the fins of the halibut, collectively called 'garney,' are the perquisites of the crew, but of which the shoresman is allowed some proportion according to mutual convention. From 20 to 30 barrels to a fare are saved, the fins selling for about $8 per barrel, and the sounds and tongues from $6 to $7. When the vessel returns she is moored head and stern at about a cable's length from the shore, and the crew proceed to 'wash out' the fare, which is done by unlading it into boats, taking it into 18 inches depth of water, when it is washed clean and then transported to 'the fence,' as the inclosure is called, where the fish are dried. It is then placed in 'water-horse,' that is, it is staked up in a pile, with the skin up, to drain; from thence it is taken to 'the flakes' to be dried. The flakes are a series of horizontal hurdles, at a convenient height from the earth, for the shoresman and his hired men to spread, turn, and take off the fish, the labors of the vessel's crew ceasing with the 'washing out.'"

The following notes in regard to the fitting of the hand-liners from Marblehead previous to 1850, the method of fishing, &c., have been obtained from an interview with Mr. John Ford, of Gloucester, a former resident of Marblehead, and who was employed in the fisheries from that place a few years later than the date mentioned above:

When a vessel was fitting out for the Bank, the owners or fitters supplied her with salt, bait, beef, flour, beans, pork, tea, coffee, and one keg of molasses. In addition to the above list each man carried a fit-out of his own, the variety and extent of this depending on his means and inclination, as well as upon the expected length of the proposed trip. As a rule, however, each one supplied himself with a sufficient quantity of hard bread, sugar, molasses, and gin (from 2 to 14 gallons of the latter was taken by each man). Butter was not carried, as a rule, though occasionally the skipper might take a small quantity. In addition to food, each individual provided himself with fishing gear—leads, lines, hooks, gaffs, and reels. In settling, the salt was considered as the "great general," and was deducted from the "gross stock," while the other provisions, bait, &c., furnished by the fitters, were considered the "small generals." The value of the latter is deducted from the crew's share.

About 1850 the custom was introduced of employing boys of twelve to fifteen years of age to act as cooks, though previous to that time the fishermen usually took turns cooking, each man having his day or week, as the case might be. There was, of course, little cooking to be done compared with the present time. The diet, while on the Bank, consisted largely of fish, chiefly halibut, prepared in various ways. Large numbers of birds, principally hags (*Puffinus major*), were eaten. The fishermen relished these birds very much, and since they could be obtained in large quantities they formed an important item in the bill of fare. It is related of the old Marblehead fishermen, those who have not been to sea for many years, that they will exchange a turkey for a pair of hags which the fishermen from this port often bring home from the Bank in the fall. Almost with no exceptions, hard bread was the only kind used, "soft tack" being rarely cooked. Duff was boiled once a week and "fat-cake" baked on Sunday, on which day no fishing was done. The fat-cake was a sort of short-cake, without sweetening, composed of flour, water, pork, &c. After being mixed, the dough was spread on one side of a barrel-head and patted down to about one-third of an inch in thickness, after which it was baked in front of the fire-place.

Six men and the boy cook usually constituted the crew.

When fish were plenty, and could be caught equally well both night and day, the crew was divided into two gangs, the men fishing watch and watch, each gang dressing its own catch after the next watch took the deck. Sometimes, however, when the cod could be caught during only a portion of the twenty-four hours, all of the men fished while it was most profitable to do so, be that either night or day, and slept the rest of the time—always, of course, dressing the fish before turning in.

Salt clams (*Mya arenaria*) and menhaden slivers were used as the principal bait, though bank clams and hags, when obtainable, were also utilized for the same purpose, being preferred to salt bait.

2.—THE LABRADOR AND GULF OF SAINT LAWRENCE COD FISHERIES.

By G. Brown Goode and J. W. Collins.

1. EARLY HISTORY.

This fishery, in years past participated in by various New England ports, is now of very slight importance. In 1879 not a single vessel from the United States fished on the coast of Labrador, though it is said that before the war of 1812 several hundred American vessels were engaged in this fishery. In 1880 a single vessel from Newburyport visited this coast, returning with 1,000 quintals of cod and 400 barrels of herring. In 1878, also, a single vessel from Newburyport was on this coast. In 1817 Newburyport had a Labrador fleet of 60 schooners, 1 brig, and 4 sloops; in 1860, a fleet of 16 vessels; in 1870, 26 to 30 in the Gulf of Saint Lawrence; in 1872, 2 on the coast of Labrador. The Gloucester Telegraph of June 15, 1870, contained the following paragraph:

"Only two vessels, the Edward Lee and White Sea, have gone to Labrador from Newburyport this season. They are in the employ of Messrs. Boardman and Sanborn, who have pursued this business for the past thirty years, and although it does not pay as well as it should, they take a pride in keeping alive this branch of industry which was once so prominent there. It is only a few years since quite a large fleet went to Labrador, and codfish seemed more plenty then. Now they depend upon herring to make themselves whole."

In 1820, according to the estimate of Captain Robinson, of the English navy, there were 530 sail of American schooners, with a few sloops and brigs, engaged in this fishery. The number of men employed was estimated at 5,830.*

The aggregate catch of the United States fishermen was estimated at 530,000 quintals, and the catch of English fishermen, in the same waters and about the same time, 134,580 quintals.†

The fishery in the Gulf of Saint Lawrence was also extensively prosecuted in years past, in part by vessels going to or returning from Labrador and in part by a special fleet of vessels. At present the number of vessels engaged in this fishery is very limited. In 1881 the number of these hailing from Provincetown was 12, and few or none engage in this fishery from other New England ports. In 1882 10,300 quintals of cod were taken in this fishery by 15 vessels from Provincetown and other Massachusetts ports.

The history of the Labrador and Gulf fishery cannot now be presented in any detail. The time at our command will not allow the necessary elaboration of the extensive material in the

* Journal of Geographical Society, 1834.

† Hind, *op. cit.*, p. i, p. 163.

archives of the Fish Commission, and we shall attempt only an outline, reserving the full discussion for some future occasion.

2. THE FISHING GROUNDS.

The fishing grounds of Labrador and those of the west coast of Newfoundland, which were also frequently visited by the Labrador fleet, are described as follows by Prof. Henry Youle Hind: "The fishing grounds on the Atlantic coast of the Labrador, as far north as Sandwich Bay, have been occupied to a greater or less extent for one hundred and twenty years. Those extending from Sandwich Bay to Cape Harrison or Webeck have also been visited by fishing craft for a generation or more; but north of Aillik, about 40 miles from Cape Harrison, the coast has only been frequented by Newfoundland codfishing craft during the last fifteen years. A Quebec and London house have possessed detached salmon-fishing stations as far north as Ukkasiksalik or Freestone Point (latitude 55° 53″, longitude 60° 50″), for about thirty years, but these have all passed into the hands of the Hudson Bay Company. Until the recent publication of Staff-Commander Maxwell's surveys* our knowledge of the Labrador coast has been chiefly derived from the Moravian missionaries and the surveys of certain harbors far removed from one another by the officers of Her Majesty's vessels.

"A glance at Commander Maxwell's chart, when compared with any document published previous to 1876, shows how little is known respecting the geographical outlines of this extended coast line, which, from its amazing fish wealth, promises to become a very important commercial adjunct to Newfoundland.

"The leading characteristics of the coast northwest of Aillik are as follows:

"1. The shore-line is deeply serrated by a constant succession of profound and narrow fiords stretching from 30 to 50 miles into the interior.

"2. It is fringed with a vast multitude of islands, forming a continuous archipelago from Cape Aillik to Cape Mugford, averaging 20 miles in depth from the mouth of the fiords seawards.

"3. Outside of the islands, and about 15 miles seawards from them, are numerous banks and shoals, which form the summer feeding grounds of large cod, while outside of the shoals there appears to be a second range of banks and slopes, which are probably their winter feeding grounds.

"4. The island-studded area forms an immense codfishing ground, which covers between Cape Harrison (Webeck) and Cape Mugford a boat fishing ground, exclusive of the shoals and banks outside, nearly as large as the combined area of the English and French boat fishing ground on the coasts of Newfoundland.†

"For the sake of distinction I have styled the area under review, 'The Northern Labrador Fishing Grounds,' beginning at Cape Harrison (Webeck), and, for the present at least, terminating at Cape Mugford.

"*Area of the Northern Labrador boat fishery.*—The following table shows approximately the area of the boat fishing grounds about the island of Newfoundland and the Northern and Southern divisions of the Labrador. From this table it will be seen that the area of the Northern Labrador fishing grounds alone, exclusive of the Banks, amounts to about five-sixths of the entire area of the British and French boat fishery on the coast of Newfoundland. The area of the inner range of banks cannot be even approximately stated:

*See Colding "On the Laws of Currents in Ordinary Conduits and in the Sea," in Nature, December, 1871.

†See paper by H. Y. Hind entitled "Notes on the Influence of Anchor Ice in relation to Fish Offal and the Newfoundland Fisheries," Parts I and II. Saint John's, Newfoundland, 1877.

Comparative table of Newfoundland fishing-ground area.

	Area of fishing grounds (geographical square miles).
Northern Labrador boat fishery—Cape Harrison to Cape Mugford, 260 miles, averaging 20 miles deep (among islands)	5,200
Newfoundland boat fishery, French shore—Cape St. John, via Cape Bauld to Cape Ray, 696 miles, by 3 miles deep (shore fishery)	2,088
South shore of Newfoundland boat fishery—Cape Race to Cape Bonavista, 294 miles, 3 miles deep (shore fishery)	882
Northeast shore of Newfoundland boat fishery—Cape Bonavista to Cape St. John, 225 miles, 3 miles deep (shore fishery)	675
Northeast shore of Newfoundland boat fishery—among the islands in Bonavista Bay and Bay of Notre Dame, 120 miles, 7 miles deep	840
Area of British Newfoundland boat fishery	4,116
Area of French Newfoundland boat fishery	2,088
Total area of Newfoundland boat fishery	6,204
Area of Northern Labrador boat fishery—Cape Harrison to Cape Mugford	5,200
Area of Southern Labrador boat fishery—Cape Harrison to Blanc Sablon, estimated, 5 miles deep	1,900
Total area of Labrador boat fishery	7,100

"*Physical outlines of the coast.*—As in Norway, so on the Labrador, the whole coast, from the Straits of Belle Isle to Hebron, is deeply cut by profound fiords, penetrating the land from 30 to 70 miles. These fiords have been mapped so far as Hamilton Inlet by the officers of Her Majesty's vessels, but beyond that point no surveys have been made and published, with the exception of those before mentioned. As an illustration of one of the unsurveyed fiords, I append a sketch plan, made this summer, of Kypokok Bay, the next bay north of Aillik. It is 53 miles deep, estimated from Aillik Head, and has an average breadth of 3 miles. Opposite the Hudson Bay Company's post, 35 miles from Aillik Head, the water is more than 50 fathoms deep, although not above a mile across. This bay or fiord has been excavated by glaciers, like all the other fiords on this coast, and the innumerable islands of the coast are rocky eminences, which have escaped the general glacial denudation. But the glaciers of Labrador have probably left even more valuable records, in the form of moraines, of their early existence here than deep fiords or innumerable islands. These are the shoals or banks which lie some 15 miles outside of the islands, and on which icebergs strand in long lines and in groups. I have styled them the Inner Range of Banks, to distinguish them from a supposed Outer Range in deeper water, where large icebergs sometimes take the ground. The inner banks, as far as they are known, are stated by fishermen to have from 20 to 40 fathoms of water on them. Commander Maxwell's soundings between Cape Harrison and Gull Island, near Hopedale, and just outside of the island zone, rarely show depths greater than 40 fathoms. In one instance only, in a distance of about 110 nautical miles, is a depth of 59 fathoms recorded.

"*Absence of islands on the Southern Labrador.*—The Admiralty chart portrays a very important confirmation of the Labrador coast line, from Saint Lewis Sound to Spotted Island. The trend of the coast line between the Battle Islands, south of Saint Lewis Sound, and Spotted Island, Domino Run, a distance of 65 miles, is due north, and, with very few exceptions, there are no islands off the coast throughout this distance, excluding the group close inshore between Spotted Island and Stony Island. As soon as the coast line begins to turn northwesterly, islands become numerous and continually increase in number as far as Cape Mugford, and even towards Cape Chudleigh. Between Cape Harrison and Cape Mugford the island zone may be estimated as having a depth of 20 miles from the mouth of the fiord seawards. The cause of the general absence of islands south of Spotted Island and Stony Island can probably be traced to the never ceasing

action of northern ice, driven on the coast line where it suddenly makes its southerly bend by the influence of the rotation of the earth upon the arctic current. This current sweeps past the Labrador coast with a speed of from 1½ to 2 knots an hour, and a westerly pressure, due to the earth's rotation, which may be estimated at about 11 inches. That is to say, the mean level of the sea on the coast of Labrador is supposed to be about 11 inches above the level it would assume if uninfluenced by the earth's rotation. As soon as the ice-ladened current reaches Spotted Island it is in part relieved from this pressure by the trend of the coast from southeast to due south; hence the current changes its course southerly and onto the land. But the effect of this sudden change in the direction of the current near the shore is to throw the icebergs onto the coast from Spotted Island to Cape Saint Lewis, where they may be seen stranded each year in great numbers. The islands which doubtless once existed here have been removed by constant abrasion, acting uninterruptedly for ages, and with the islands the moraines lying seawards. We may thus trace the cause of the vast difference between the distribution of stranded icebergs south of Spotted Island and northwest of it. In one case they are stranded near the coast line, wearing it away and deepening the water near it, assisted by the undertow; in the other case they are stranded some 15 miles from the island fringe and continually adding to the banks the débris they may bring, in the form of mud streaks, from the glaciers which gave them birth in the far north and northeast. It is more than probable that this distribution of icebergs has a very important bearing upon the food and feeding of the cod, which justifies me in referring here with so much detail to the action of glacial ice.

"*The inner range of banks.*—The foundation of the inner range of banks consists, very probably, as already stated, of glacial moraines. In their present state they may reasonably be assumed to be formed in great part of remodeled débris brought down by the same glaciers which excavated the deep fiords.

"The absence of deposits of sand in the form of modern beaches on every part of the Labrador coast visited this season, except one, was very marked. The exceptional area observed lies between Sandwich Bay and Hamilton Inlet, Cape Porcupine being the center. It is protected from the northern swell of the ocean by the Indian Harbor Islands and promontory. Here large deposits of sand are seen, covering many square miles in area. The reason why sandy beaches are not in general found on this coast, notwithstanding that enormous quantities of rock are annually ground up by coast ice and ice pans driven on the shore, arises from the undertow carrying the sand seawards and depositing it on the shoals or banks outside of the islands.

"It may be advisable here to advert to a popular error which assumes that the depth of water in which an iceberg grounds is indicated by the height of the berg above the level of the sea. It is commonly stated that while there is one-ninth above there will be eight-ninths of the berg below the sea-level. This is approximately true only with regard to volume or mass of the berg, not with regard to height and depth. A berg may show an elevation of 100 feet above water, and yet its depth below may not exceed double that amount, but its volume or mass will be about eight times the mass it shows on the surface. Hence, while icebergs ground in 30 and 40 fathoms of water, they may expose a front of 100 or 150 feet in altitude, the broad, massive base supporting a mass about one-ninth of its volume above the sea-level.

"*The climate.*—Experience, now extended over twelve years, shows that the seasons are sufficiently late and long to permit Newfoundland fishermen to come from their homes after spring fishing is over there and their garden work attended to. They may arrive on the Northern Labrador fishing grounds from the 10th to the 20th of July, or even later, if they go north beyond

Nain. They may return in general by the 10th to the 20th of September to Southern Labrador rooms, or even to their homes, with full fares of green fish.

"The extremities of many of the deep fiords from Cape Harrison to Ukkasiksalik, or Freestone Point, a distance in an air line of 120 miles, contain timber fit for spars, for the construction of 'fore-and-afters,' and for all ordinary building purposes. The climate there, namely, at the bottom of many of these deep fiords, permits of the cultivation of potatoes and other garden vegetables. Between Aillik and Ukkasiksalik there are at present about sixty resident settlers in the deep fiords, most of whom have been in the service of the Hudson Bay Company or the fishing firms already named, and some of them are married to Eskimo women.

"There are several other points of great interest in regard to the Northern Labrador which are worthy of notice, but the details would swell this paper to dimensions far exceeding those of a brief descriptive outline sketch of a comparatively new field for that kind of enterprise and industry in which Newfoundland is so distinguished, and from which she annually derives so much wealth.

"The expansion and preservation of her fishing grounds for the use of her own people appears to claim, however, thoughtful and liberal consideration, and not only from those who may profit by the industry, but from those also who may be able to assist in lessening the difficulties with which it is beset, in ameliorating the hardships inseparable from its pursuit, and in aiding the development of the resources of the vast area it may yet be made to occupy."*

The fishing grounds in the Gulf of Saint Lawrence frequented by the vessels of the United States were chiefly south of the line of Cape Ray and Cape Gaspé. In the spring the vessels have of late years fished principally on the east and north coasts of Cape Breton, and in former years there was a great deal of spring and summer fishing about the Magdalen Islands, but these grounds have been but little frequented since the introduction of trawl fishing. Later in the season fishing is carried on about Bradley Bank, Orphan Bank, Miscou Flat, off the mouth of Bay Chaleur, and on Pigeon-Hill Ground, lying along the coast between Shippegan Island and Miramichi. More or less fishing is carried on in other parts of the Bay of Saint Lawrence, as it is called, by our fishermen, including that part of the Gulf between Cape North and Cape Gaspé.

3. THE FISHERMEN.

These fisheries were carried on at a time when all the fishermen of the United States were native born. At present there is nothing particularly distinctive about the men in this fleet. A large percentage of the Provincetown schooners fishing in the Gulf of Saint Lawrence hire part of their crews on the Nova Scotia coast.

4. THE VESSELS.

The vessels are, with the exception of a few Gloucester vessels which make one trip to Cape North in the spring, among the oldest in the off-shore fishing fleet. They are generally employed only in the summer, and are equipped in the old-fashioned way. The arrangement of decks and hold is much the same as that on the Grand Bankers. They carry no ballast, excepting the salt which is to be used in curing the fish. Some of the Provincetown vessels carry on deck large tierces, such as are used on the whaling-vessels for oil. In these the fish are "struck" or pickled in brine previous to stowing away in the hold.

The vessels of the Labrador fleet always carried four or five boats of the pattern now generally

* H. T. Hind. The Effect of the Fishery Clauses of the Treaty of Washington on the Fisheries and Fishermen of British North America. 1877. Part II, pp. 68, 69.

known as the "Hampton" boat, but about Newburyport still known as the "Labrador" boat. These boats were made at Seabrook, N. H., and were often called whale-boats. The average length was about 19 feet on the keel and 23 feet over all, lap-streaked, very sharp forward and aft, and with a straight stern-post. They were generally provided with two masts and rigged with sprit or leg-o'-mutton sails. These boats were stowed upon deck, two on each side, with one swung upon the davits at the stern.

About 1815 a fishing company was established at Gloucester, Mass., for the purpose of carrying on the Bank and Labrador cod fisheries. This company had a fleet of vessels built numbering 10 or 12 sail. Most of these were topsail schooners, the others being fore-and-aft rig. The former were most generally employed in the Labrador fisheries, though they occasionally visited the Banks. Their size varied from 50 to 80 tons, old measurement. The rig was peculiar on account of the single square topsail on the foretopmast. They had full, bluff—almost square—bows, straight sides, very round bilge (usually called "kettle bottom"), short, full run, square stern, and high quarter-deck. The latter was usually elevated 4 to 5 feet above the main deck, and reached by step-ladders. Being so high, and quite short (as a rule but little more than one-fourth the length of the hull), the quarter-deck had much the appearance of the heel on an inverted shoe, and for this reason these schooners were spoken of in later years as the old fashioned "heel-tappers." Top-sail schooners were also employed in the Labrador fisheries from Newburyport and Provincetown, according to Mr. Daniel Sayward, of Gloucester, who says that vessels of this class belonging at the above-named ports often came to Gloucester to cure their fish.

These vessels were similar in all respects to those of the same class engaged in the coasting trade of that period (1820 to 1850), varied in size from 130 to 150 tons, old measurement, and, as a rule, were old schooners. The quarter-decks were not so high as those of the vessels formerly sailing from Gloucester.

There can be no doubt, however, that the Labrador fleet was mostly made up of fore-and-aft schooners, of the ordinary types employed in the fisheries at that period.

5. APPARATUS AND METHODS OF FISHING.

TRAWLS.—Trawls are now exclusively used in the Gulf of Saint Lawrence, and have been during the last twenty-five years or more.* The equipment of dories is similar to that of a Grand Banker. In former years the fishing in the Gulf of Saint Lawrence was carried on by hand-lining from the deck of the vessel, in a manner now practiced in the George's fishery, excepting that the leads were much lighter, weighing 4 to 5 pounds, and that the vessels often fished while drifting with the wind and tide.

The trawls used in the Gulf of Saint Lawrence are similar to those used on the Grand Bank.

Captain Atwood states that before the introduction of trawling in the Gulf of Saint Lawrence the majority of the fish were comparatively small, about seventy being required to make a quintal. On Bank Bradley, for instance, the cod would usually be about as large as a common haddock. Occasionally one would be taken as large as a porpoise, weighing 70 or 80 pounds, perhaps one or two to every hundred. When trawling was introduced great quantities of these large fish were taken, and for several years a considerable fleet of Provincetown vessels frequented these grounds. The large fish were nearly all caught up in time, however.

* We learn that quite a number of our fishing-vessels are fitting out for a trip to the Bay for the purpose of trawling fish, which are said to be quite plenty in the vicinity of Cape North. This is somewhat of a new field for our fishermen. * * Several of the Marblehead and Beverly fishermen have fished there in past years and found fish abundant. The vessels start about the middle of April, and will probably stay two or three months.—(*Cape Ann Advertiser, March 30, 1860.*)

Large fish were taken in considerable numbers at least as late as 1879, on the fishing grounds of the Gulf of Saint Lawrence, especially in the vicinity of Miscou Flat, some 10 to 14 miles from Point Miscou. A peculiarity of these great cod, many of which would weigh nearly 100 pounds, *was that they could be caught only in the night—they were "night fish."* A trawl set during the day would catch only small fish, while, on the same ground, a considerable number of large cod, and only a few small ones, would be caught on a trawl set between sunset and dark.

The large cod appear, both in size and habits, to be a distinct school of fish from the smaller kind. Among the latter it is rare to find an individual more than 35 inches long, so that there seems to be no intermediate sizes between the day school of small cod and the night school of large fish. Of the latter, one is rarely taken that would weigh less than 45 to 50 pounds. This is all the more remarkable, since, on all the outer fishing banks, there appears to be a regular gradation from the smallest to the largest cod.

HOOKS AND LINES.—The gear used by the Labrador fishermen in hand-lining from their small boats was an ordinary boat-gear, with a single hook and a lead weighing about one pound and a half. In former years a special form of hook, known as the "jigger," was used by the Provincetown fishermen, this being an implement made in the shape of a fish, with a cod-hook soldered to it. This was used when bait could not be obtained, and to deceive and attract the cod by imitating the movements of a small fish, it was drawn up and down in the water at a short distance from the bottom.

NETS.—Vessels fishing on the Labrador coast were accustomed to carry seines for the capture of capelin. Vessels fishing in the Gulf of Saint Lawrence carry gill-nets, 2½ to 2¾ inch mesh, from 15 to 20 fathoms in length and 2½ fathoms deep. When the vessel is on the fishing ground they are set from her stern. Bait is sometimes sought at the Magdalens in the spring, and the nets are then anchored near the shore.

BAIT.—On the coast of Labrador the bait chiefly relied upon is capelin, as will be shown in the description of the methods of fishing. Herring and lant are also used when capelin are not to be had. In the Gulf of Saint Lawrence herring is the principal bait; mackerel also are often used, and squid when they can be obtained.

METHODS OF FISHING.—The manner in which the codfishery is prosecuted on the coast of Labrador is well described by Mr. Charles Hallock, who, in 1861, visited this region on a fishing vessel. Mr. Hallock's notes are supplemented by extracts from the autobiography of Capt. N. E. Atwood, who forty years before was engaged in this fishery as one of the crew of a Provincetown fishing schooner.

Mr. Hallock writes: "This fishery is perhaps equally divided between the Provinces and the States, though the number of men and vessels employed by the former is much the largest in proportion to the population. * * * Little idea has the world of the populous community to be found on the Labrador coast from the 1st of June to the end of September. Every little harbor as far up as latitude 56° is filled with vessels, and fleets are constantly moving from place to place, following the vagaries of the fish. * * * Many parties have salting rooms and dressing stages on shore, but the majority of vessels cure their fish on board.

"When the fish bite sharp, all is activity and bustle throughout the fleet. Boats are constantly leaving for the fishing grounds, or returning loaded to the 'gunnel,' and all day long is heard the cheery song of the dressing gang on deck, and the splash of the offal as it falls from the 'splitting table' over the side to the water below. At early evening, after the labors of the day, the seine boats go in quest of capelan (bait), carefully searching the little coves and inlets and creeping along the shores; three men pulling in the usual way, an oarsman in the stern standing up and pushing,

while he scans the surface of the water for the ripple of passing schools, and a lookout in the bows, motionless as a figure-head, resting upon his elbows and peering into the depths before him. Now one gives warning, and over goes the seine smoothly and noiselessly, and with a rapid circuit the bait is impounded and quickly hauled on board. One cast is generally sufficient, for the capelan swarm in millions, swimming so densely that often a dip-net can be filled from a passing shoal. They keep near the shore to avoid their finny pursuers, and are left floundering upon the rocks by every reflex wave. The cod often leap clear of the water in their pursuit, and at such times may be taken by the hook almost the instant it touches the water. The capelan is a delicate fish, about 6 inches in length and not unlike a smelt; his back a dark olive green, sides of changing rainbow hues, and belly silvery white. * * * Later in the season, after this bait-fish disappears, launce are used for bait, and herring in their turn.

"Returning to the vessel the seines are hung to dry, and from every masthead flaunt like gossamer veils swayed by the evening breeze. The boats float alongside, moored to outriggers, and with their vessel seem like fledgelings nestling beside the parent bird. From many a deck lurid fires flash and flicker in the gathering darkness, revealing dusky figures grouped around—the fishermen preparing their hasty supper. They use no stoves, but build their fires in halves of hogsheads filled with sand. Then follows a night of refreshing slumber, and at earliest dawn they start for the ground again.

"At the stages on shore work goes briskly on. From the loaded boats the cod are thrown upon the platform with pitchforks. There they pass respectively through the hands of the 'cut-throat' and 'header,' who remove the livers, tongues, and sounds; thence to the 'splitter,' who takes out the backbone, and thence, divested of the entrails, which are shoveled into the water, below to the salter, who piles them in 'kenches,' head and tail, salting profusely between the layers. After remaining thus for three weeks the water and 'gurry' are absorbed, and they are then placed upon the 'flakes' to dry. At the end of three days they are said to be 'made.' After this they are piled in 'kenches' again for a day to 'sweat them'—that is, to remove remaining moisture—and are again thrown upon the flakes for a day. They are then ready to be stowed in bulk in the vessel. Thus cured they bring from $2 to $3.50 per quintal.

"Woman, too, hath a part in this business, and in the recesses of the moss-roofed hovels her voice may be heard singing gaily as she 'heads,' while the unceasing splash of the water beneath fitly chimes in unison. These are wont to stand in tubs while at work, protected from the filth and offal by long gowns—cod-liveries—of oil-cloth extending to the floor; and when their task is done they emerge from these like butterflies from their chrysalids, clean and intact, *in statu quo*. An expert will split 8,000 fish per day, or head twice that number. The lodging shanties are constructed of spruce poles or sheds, generally boasting but a single apartment, and here both sexes occupy in common, the only partition being that mathematical one which excludes all objects not within the line of vision."*

Captain Atwood writes: "We sailed from Provincetown on June 6, 1820. We went to the coast of Labrador, but, as it happened, we were unfortunate in getting codfish. Our men were not the best of fishermen, so we got only a very small share. We carried 160 hogsheads of salt and brought back about 30. I don't know how far north we went, but it was to the locality familiarly known to us as Grosswater Bay. Our mode of fishing then was to let the vessel lie in the harbor and send the boats out. At that time Provincetown had not a single vessel on the Grand Bank, and had two or three small vessels which went to the Gulf of Saint Lawrence for mackerel. All the fishing vessels were on the coast of Labrador. We carried four boats. We used one to get capelan for bait when capelan

* Harper's Magazine, xxii, 1861, 595.

were plenty during the capelan school. The bait boat would seldom go fishing. The fishing boats were baited out of her. We had one of the crew to throat, one to head, and one to split, and a salter in the hold of the vessel salting them as they came down. On our arrival on the coast of Labrador very few could be caught until the capelan came in, and then the capelan schools of cod came in also. The capelan school lasted about three weeks. After they went away we picked up fish very slowly. After the capelan had finished spawning the fish slacked off, and we used to say that the cod were 'capelan sick.'

"In the spring of 1821 we started, about the 10th of May, for the coast of Newfoundland; being ahead of the capelan school, we fished with clams about the Straits of Belle Isle and Bonne Bay. When it was time to go north to meet the capelan school we left the Newfoundland fishing and fished in Indian Harbor on the south side of Grosswater Bay. Here we remained until we had consumed all our salt, excepting a few hogsheads. We got about 1,200 quintals of fish, which was considered a good fare. Then we came down into the Straits of Belle Isle and went to a place called Pinwire, where we washed our fish out and took them ashore to dry them on the rocks. We had to turn and dry them on both sides. I think we staid here about four weeks. We then took our fish aboard for home. On our arrival here, the fish were not dry enough for market and we went to Gloucester and took them out and dried them over again, and then carried them to Boston where we sold them.* My share of the voyage amounted to $83.

"In 1823 I again shipped for the Labrador fishery in the schooner Favorite. I think we carried 160 hogsheads, or 1,280 bushels of salt. We sailed from Provincetown about the middle of May, and proceeded first to the northern coast of Newfoundland, making a stop at the Bay of Islands where we commenced fishing with clam bait, which we carried with us. We were too early for the capelan school. After fishing here eight or ten days we proceeded and arrived at Indian Harbor, on the north side of Grosswater Bay. Soon after we arrived the capelan came on the coast, and while they remained we wet nearly all our salt. The school lasted about three weeks. Having some salt left, we proceeded homeward, stopping at the Straits of Belle Isle at a place called Henley's Isle. The capelan were gone, and we were compelled to fish with launce, or sand-eels. We used up all the rest of the salt, excepting a few bushels; left the coast and proceeded on our voyage homeward, arriving about the 20th of September.

"In 1824 I shipped on the schooner Independence, of Boston. We sailed for the Gulf of Saint Lawrence on the 27th of April, but could not get into the Gulf on account of the ice. We first harbored at Barrington, near Cape Sable; then we moved eastward and anchored in Liscomb's Harbor. By the next move we got to Canso, where we remained several days, the northern part of the strait being filled with ice. After some days of southerly wind the ice drifted northward, and we made another move, harboring again at Port Hood, where we were detained a few days. We were bound for the Magdalen Islands. A few days later the ice cleared away, so that we could reach the Magdalen Islands, and we anchored in Gridley's Harbor. We went out into the Gulf and brought back a part of a fare of fish, which was cured by a French fisherman on the island. He received 10 per cent. for curing them. We then went over to Bank Bradley, fishing

* Mr. Daniel Sayward, of Gloucester, Mass., in describing the topsail schooners employed in the Labrador fisheries, said: "Several of this class of vessels, belonging at Newburyport and Provincetown, resorted to Cape Ann, during the first half of the present century, to cure their fares of fish, which had been caught at Labrador. At first the favorite locality for curing was at Wheeler's Point, on 'Squam River, but afterwards some of the schooners visited Gloucester Harbor for this purpose. The vessels generally arrived home from Labrador about September. A flake yard was hired, and the crew, who remained on board, 'handled' the fish and prepared them for market. The time necessary for the proper curing of a Labrador trip was usually about five to six weeks." It would seem from this that, as a rule, the fish were not dried any before reaching Gloucester.

The crews of the vessels, according to Mr. Sayward, were hired.

also off North Cape, Prince Edward Island. We didn't get more than two-thirds of a cargo of fish when it was time to come home. We came home, notwithstanding the fact that there were some 40 hogsheads of salt not used.

"In 1825 I shipped on the schooner President. This schooner measured 84 tons and carried 160 hogsheads of salt. This and the previous year we used mackerel exclusively for bait, and had no trouble in catching as many as we wanted. The mackerel were caught with 'jigs,' the offal which was thrown from the decks being sufficient to keep the fish at the surface. We used the spawn of codfish as toll-bait with which to keep the mackerel at the surface. We fished, for the most part, on Bank Bradley and at the North Cape of Prince Edward Island and along the west shore from Escumenac Point to Point Miscou. We used up all our salt. We wet all our salt and came home, arriving the latter part of September."

During the last thirty years the cod-seine has been used on the coast of Labrador, especially by vessels from Newburyport. Fishing with the seine is thus described by Mr. W. A. Wilcox: "A small boat is first sent to look over the ground, a water telescope being used—this being a small box 8 by 10 inches square, with a glass bottom. By the use of the water telescope the cod school may be seen moving through the water. When the fish are discovered the seine is set around them; the length of the seine is usually about 100 fathoms; its depth, 55 to 75 feet, the mesh ranging from 3¼ to 4½ inches. From 2,000 to 12,000 codfish have been taken at a haul. Herring are also often taken in nets and salted; these are brought home as part of the cargo. These are caught near Bradore and Assizes Harbor."

6. FORMER IMPORTANCE OF THE LABRADOR FISHERY.

Mr. Wilcox writes: "Since 1875 only one Newburyport firm has been engaged in the Labrador fishery. This same firm has prosecuted this fishery for over thirty-five years, with from one to four vessels each year; and, until within the last five years, not one unprofitable trip was made."

The Labrador fishery is still extensively prosecuted by British Provincial fishermen. We quote from Professor Hind the following description of the status of the Northern Labrador fishery in 1876:

"About 400 fishing craft, from 18 to 90 tons burden, are supposed to have passed Cape Harrison this season. Taking the average of the entire fleet, they carried each eight men, three fishing boats, and one shore boat. Out of the 3,200 hands we may assume that 2,400 were actually engaged in fishing. The estimated catch was 60 quintals per man, or in the aggregate 144,000 quintals. This work was accomplished in an average aggregate of twenty-four fishing days, and to a large extent with the jigger, that is, without the use of bait. The average weight of the fish is about 3 pounds fresh. Allowing one hundred and thirty fish to the quintal the number taken would be about eighteen millions, the number wounded and lost about four and a half millions, although some fishermen consider that one fish out of three is wounded by the jigger and lost when the fish are very numerous.

"During the gale of the 11th and 12th of September there lay next to us in Indian Harbor, off Hamilton Inlet, a small craft of 30 tons burden, just arrived from off Nain. She had been fishing about the islands near the Missionary station, in latitude 56° 40′, about 600 miles northwest of Saint John's, and in three weeks had taken 300 quintals. Her complement consisted of six men and two fishing boats. She arrived, like all the fishing fleet this year, too late to take advantage of the season. The cod had 'struck in' many days before she commenced fishing. Had she arrived a fortnight earlier she might easily have taken 80 quintals to the man in place of 50,

but she had used all her salt, and the crew were satisfied with the result. Her fishing days were eighteen in number, excluding Sundays, which are always observed by fishermen on this coast.

"Another craft, also lying alongside and hailing from Notre Dame Bay, was of 60 tons burden, her complement twelve men and four boats. She reached the islands off Hopedale (latitude 55° 27′) on the 22d of July, fished for six weeks, and took 700 quintals of fish, or about 60 quintals per man. She takes her green fish direct to Notre Dame Bay to make there. No fish are made or cured on this shore, as yet, north of Long Island Tickle, some 25 miles northwest of Cape Harrison.

"Hitherto on the Northern Labrador coast the jigger, as already stated, has been almost exclusively used; it is only lately that launce have been tried as bait, and with marked success. But it is well known that only the smaller sized cod come into shallow water, the larger fish remaining to feed on the banks outside and in deeper water. Very few attempts have been made to fish on the Labrador Banks, but when tried, I have been assured by trustworthy persons that large fish have always been taken with bait.

"Larger boats than those used about the islands are required for this kind of fishing; indeed, a totally different organization and equipment will be necessary for the Northern Labrador bank fishery, which appears destined to become, under proper encouragement and management, the fishery of the future."

The Gloucester Telegraph of March 19, 1842, says:

"In 1807 four vessels fitted out at Newburyport for the Labrador cod fishery. These were the first vessels from the United States that made their fares in Esquimaux Bay."

Lorenzo Sabine, in his report on the American fisheries, published in 1852, gives the following account of the Labrador fishery as carried on at that time:

"The first American vessel which was fitted for the Labrador fishery sailed from Newburyport towards the close of the last century. The business, once undertaken, was pursued with great energy, and several hundred vessels were engaged in it annually previous to the war of 1812. A voyage to Labrador, unlike a trip to the Banks of Newfoundland, is not without pleasant incidents even to landsmen. The coast is frequented for a distance of 10 or 12 degrees of latitude. It has been preferred to any other on account of its security, and a general certainty of affording a supply of fish. Arriving in some harbor early in June, an American vessel is moored, and remains quietly at anchor until a full 'fare' has been obtained, or until the departure of the fish requires the master to seek another inlet. The fishing is done entirely in boats, and the number usually employed is one for about thirty tons of the vessel's register. Here, under the management of an experienced and skilful master, everything may be rendered systematic and regular. As soon as the vessel has been secured by the necessary anchors, her sails and light rigging are stowed away, her decks cleared, her boats fitted, and a day or two spent in fowling and sailing, under color of exploring the surrounding waters and fixing upon proper stations for the boats, and the master announces to his crew that they must try their luck with the hook and line. Each boat has now assigned to it a skipper or master and one man. At the time designated the master departs with his boats, to test the qualities of his men and to mark out for them a course for their future procedure.

"The love of power, so common to our race, is exemplified even here, since the skippers of these boats, though commanding each but a single man, often assume airs and exercise authority which are at once ridiculous and tyrannical; while their ingenuity in explaining the causes of a bad day's work, really occasioned by idleness, or by time spent in shooting sea-birds, frequently puts the patience and the risibility of the master to a severe trial. If fish are plenty, and not too distant from the vessel, the boats are expected, in good weather, to catch two loads in a day.

Their return, if laden, is the signal for the dressing-crew, who are left on board, to begin a series of operations which, when completed, leave the fish in the form in which the consumer buys them. From the dressing-table the fish are thrown down the hatchway to the salter, who commences the process of curing by salting and placing them in layers in the bottom of the vessel. If the master intends to remain on the coast until his fish are ready for market, they are commonly taken on shore as soon as caught, and there dressed, salted, and dried before being conveyed to the vessel. If, on the contrary, it is his intention to dry them at home, as is now the common practice, the salter's duty is the last that is performed aboard. The bait used in the Labrador fishery is a small fish called capelan. This small but useful fish seldom remains on the fishing ground for more than six weeks in a season; a time which is long enough for securing a full supply, and which an experienced and energetic master does not often allow to pass away without one. The average produce of this fishery may be estimated at about 10 quintals to every ton of the vessels employed in it, though the best masters are dissatisfied when they fail to catch a fourth or fifth more."*

Concerning the Labrador cod fishery from Newburyport, Mr. John G. Plummer writes us as follows: "Capt. Charles Sandborn says that he went first in 1833, and there were then about eighteen or twenty large vessels. One was a ship of 360 tons. They went down to Salmon River, anchored in the river, and went down along the shore in boats and caught most of the cod with nets or seines. They used those seines that were knit flat and gathered at the sides, so as to have them bag some, and when they could not take all the fish in the boats they used to buoy up the lead-line and leave the fish in the nets until they returned for them. Sometimes they used large bags made of nets, which they would fill with fish and anchor them until the boats could return for them. The vessels carried fine-mesh nets in which to catch capelan for bait.

"The voyage usually lasted about three months. The fish were dried at home and the cost of drying, one-twelfth, was paid in shares. They were packed in drums and shipped to the West Indies, to Bilboa, Spain, and up the Straits.

"The vessels employed were not very high cost, and were fitted at low rates. They had a codfish bounty from the Government, and so made good voyages, but after a while the Government cut off the bounty, and the cost of vessels and expense of fitting, including wages, increased so that there was no money in it. One after another the vessels were withdrawn, until November, 1881, not one is left. Last year there was one vessel, and this year none.

"The cod that were dried here in Newburyport and packed in drums brought the best price in the West Indies of any in the world. They were not very salt and were thoroughly dry, so as to stand the heat.

"Fishermen all say that even now, with good large vessels, and with little assistance from the Government, they could compete with the French and English fishermen and make it pay; but where the French get a good bounty from the Government and we get none, and the cost of fitting is higher than in France, it is impossible to make the fishing pay. These small Labrador fish have to be shipped to the same market as the English and French fish.

"Our vessels carried mostly men and boys and taught them to be sailors. Some of these were in our Navy during the war, and one or two in the Kearsarge when she sunk the Alabama; about twenty of them, I think, were in the Navy.

"We used to have great times here when the vessels came in from Labrador. All the men and boys we could scare up were employed in washing, hauling, drying, and packing the fish, and shipping them to market. The oil was shipped mostly to Philadelphia, and the vessels usually brought back coal, corn, sugar, and molasses.

*American Fisheries, pp. 170, 171.

"The first American vessel to engage in the Labrador cod fishery sailed from Newburyport about the year 1794, and from that time until the year 1879 there was scarcely a year when one or more Newburyport vessels have not visited the Labrador coast. In 1806 this fleet numbered 45 sail; in 1817, 65 sail; in 1860, 60 sail; in 1874, 2 sail; in 1876, 2 sail; in 1879, none; in 1880, one vessel.

"Captain Sandborn thinks there were not more than twenty or twenty-five Newburyport vessels that engaged in the Labrador fishery when it was at its zenith, but I thought there were more than that number. I can't tell of any cause for their leaving off except what Captain Sandborn says, that if Government would help us as other Governments help the fishermen we could beat them out of their boots."

In 1858 a vessel from Northern New York participated in the cod fishery on the coast of Labrador. This was the schooner Charlotte, of Rochester, Captain Farnham, which fitted out in that city in 1858, and proceeding down the Saint Lawrence River and through the canals made hardly a reasonably successful voyage, returning home in September. On the 2d of September she entered in the Rochester custom-house with the following cargo, consigned to A. Wilder, esq.: 6,000 pounds of codfish, 3½ barrels of salmon, 2 barrels of halibut, ½ barrel of sounds and tongues, 300 pounds of trout, 24 seal-skins.

Contemporary newspaper paragraphs stated that the Charlotte obtained 90,000 pounds of codfish and a large quantity of salmon and seal-skins. An examination of the custom-house records, made by Mr. W. T. Hornaday, shows that the cargo was small. It is, however, a remarkable circumstance that a vessel from this locality should have attempted to engage in the sea fisheries.

7. CAUSES OF THE DECLINE OF THE LABRADOR AND GULF FISHERIES.

The causes of the decline of the Labrador and the Gulf fishery are not thoroughly understood. There appears to be no scarcity of fish in those regions. Two reasons for the abandonment of these grounds by American vessels are mentioned, (1) the demand in American markets for larger fish than can be found on the Labrador coast, the exportation of salt codfish, for which small fish were formerly preferred, having fallen into the hands of the British Provinces and Norway; (2) the introduction of trawling upon the off-shore grounds, which has been accompanied by improvements in the fishing vessels, the capture of larger fish, and in an increase of skill and daring on the part of our fishermen, so that it is now unnecessary for our fleet to go so far from home, or engage in voyages where the vessels lie in harbor while fishing, since fares of higher-priced fish can be readily obtained on the banks lying off the coast.

8. WINTER FISHING BY GLOUCESTER VESSELS ON THE WEST COAST OF NEWFOUNDLAND.

This fishery, though of no great importance, deserves mention. It is so different from the summer fishery, which has just been described, that it seems more appropriate to make reference to it in a separate paragraph. In the winter of 1861 and 1862 four vessels fitted out and started on a cod fishing trip for the west coast of Newfoundland. One of these, the Ocean Traveller, was lost on the passage. The others resorted to Bonne Bay and the Bay of Islands, but were not very successful. Other vessels have since that time made occasional trips in the winter to the same localities, but on account of the extreme severity of the weather at that season, the results have rarely been favorable.

9. EARLY LABRADOR FISHERIES FROM PORTS IN MAINE.

During the first half of the present century, writes R. E. Earll, the Labrador fisheries were extensively prosecuted from the towns of Westport and Booth Bay.

The first vessel engaging in the business of which we get any trace was the schooner Ruby, 115 tons (old measurement), Capt. James Sennett, of Harpswell. The vessel was sent from North Booth Bay about 1817, and was joined the next year by the schooner Union, 84 tons, Capt. Timothy Kemp, from the same place. The next season (1819) there were two other vessels, the Dennis, 78 tons, from North Booth Bay, and one from Westport.

These vessels continued yearly to visit Labrador, but it seems that they were about the only ones from this section to engage in the business for some years. They fished in and about the Straits of Belle Isle and frequently farther north, to Cape Harrison, starting about the 10th of June and returning by the middle or last of September.

The fish were generally very light salted, only 8 bushels being used to 10 quintals. The vessels got full trips and frequently took a part of their fish out and spread them on the rocks to partially dry them and thus lighten the vessel and save salt. They always brought full fares of from 1,000 to 1,500 quintals, but the fish were small and brought a low price. Mr. Timothy Hodgdon, an old man who was interested in curing at that time, is authority for the statement that in those days no large fish were ever taken by these vessels, and that when thoroughly dried it took one hundred and thirty in number to make a quintal. After being cured they were invariably sold to Boston parties for exportation to Bilboa, and came to be known as "Bilboa fish."

The business in later years began to grow, and about 1840 East Booth Bay began sending vessels, while Westport sent a larger fleet. Mr. Daniel Cameron, of Southport, thinks that in 1844 Westport and East Booth Bay each sent four vessels, while North Booth Bay had a like number. This seemed about the height of the business, and soon after it began to decline, so that by 1850 almost no vessels were sent, but through William T. Maddocks, we learn that his father sent the Osprey as late as 1856 from Southport.

The vessels averaged about 100 tons, the extremes being 45 and 140 (old measurement), carried yawl boats at first and always remained in the harbors while the men were fishing. The crew were divided up into a dressing and fishing gang, the former remaining on board and dressing the catch of the others. They were provided with small drag-seines and caught their bait each morning before the fishing began. They used capelin wholly, which were always found in great abundance in the shoal waters along the shore. The crews fished in shoal water and usually very near the vessel, fished at the halves, counting their fish as they were thrown aboard the vessel, and generally averaged about $140 to $160 per man for the trip.

The fishing was always good, and we get no record of a vessel from this section returning without a full fare, neither can we learn of either a man or vessel being lost. But, notwithstanding the abundance of fish, they were so small that they brought even less than those classed as small from other localities, and the firms were driven out of the business.

The following additional statements concerning this fishery are made by Capt. A. P. Hodgdon:

While fishing in the vicinity of Partridge Harbor in 1844 or 1845 the crew of the schooner Dennis, Captain Hodgdon, caught 1,100 quintals in fourteen days. The fish came in great numbers after the capelin, and frequently the water would be filled with them for acres at the surface, where they would make a good deal of noise splashing about in chasing their prey. They only

remained a few days, and when they struck the fishermen had to work pretty hard to get their trip before the fish left.

During the height of the season, fifteen to twenty-five days, the men would "turn out a little after 2 in the morning and fish until about 11 at night." They used what they called "set lines," which were merely hand-lines tied to the side of the boat and reaching to the bottom; and "jigs" for fishing near the surface, made on something the same principle of the mackerel jigs. While fishing at the bottom with "set lines" they frequently caught large cod, but with the jigs they often got the small ones as fast as they could haul them, and had an arrangement for slatting them from the hook to save time.

Among the first vessels to go to Labrador was the schooner Angler, Capt. Thomas Pinkham, belonging to Wiscasset, while the smallest one that ever went from this section was the schooner Frederick Reed, of East Booth Bay, being only 45 tons, old measurement.

Most of the fishing towns in Eastern Maine engaged in the Labrador fisheries to a greater or less extent during the early part of the present century. The fishermen of Vinal Haven (one of the Fox Islands) began to visit Labrador about 1805. They did not pursue this fishery with much regularity, sending two or three vessels some seasons, and perhaps none for several years in succession. No vessels went after 1840. Lamoine, Maine, sent two vessels, 65 and 67 tons respectively, to Labrador in 1850, but has never at any other time engaged in the cod fishery of that locality.

Capt. J. S. Mayo, of Tremont, Maine, says that the Labrador cod fishery was pursued by the fishermen of Mount Desert and the adjacent islands as early as the beginning of the present century. The fishery prospered until 1839, after which time it declined and was finally abandoned about 1845. The reasons that induced the fishermen of Mount Desert to give up this branch of the fishery were (1) the shortness of the season, (2) the uncertainty of obtaining bait, without a full supply of which it was impossible to procure a fare of codfish, and (3) the small size of the fish taken and consequent low market value of the same.

The fleet belonging at Southwest Harbor and Cranberry Islands that fished on the Labrador coast in 1839 numbered eight schooners, namely: the Brainard of 78 tons, Temperance of 56 tons, (from Cranberry Islands); Four Sisters of 35 tons, Bannister, 68 tons, Eratus, 46 tons, James, 70 tons, Sea Serpent, 75 tons, and Leo of 56 tons, (from Southwest Harbor), the total tonnage employed being 484 tons, old measurement. These vessels were usually engaged in the Magdalen herring-fishery in the spring; making one trip for herring before starting for the Labrador coast.

According to Capt. E. B. Stanley, of Cranberry Islands, the Labrador cod fishery revived somewhat after 1845, and in 1857 three schooners owned at Cranberry Islands engaged in bringing home a total of 2,100 quintals of codfish.

The fishery was kept up by two or three vessels until 1862, since which time no one at Mount Desert has engaged in it.

Mr. W. E. Hadlock states that the first vessel which went to Labrador from the Cranberry Islands was a schooner of about 40 tons, under command of Capt. Samuel Hadlock. This trip was made in 1810. The fish were cured at Cranberry Island, after which they were loaded on board of the same vessel that had caught them, and carried to Spain.

The schooner Starlight, of Cranberry Island, made a cod fishing trip in 1862 to Bellesimore Bank, off the coast of Labrador. She secured a good fare of large fish, but the prospects were not sufficiently encouraging for her or others to engage in the same fishery afterwards.

3.—THE BANK TRAWL-LINE COD FISHERY.

By G. Brown Goode and J. W. Collins.

As has already been stated in the chapter on the Bank cod hand-line fishery, an extensive industry has for several centuries been prosecuted on the Grand Bank of Newfoundland and neighboring off-shore banks, the principal object of which has been the capture of cod, though of late years a considerable quantity of halibut has been taken incidentally by the same fishermen. Except in the George's cod fishery, the practice of hand-lining from the deck of the vessel, which was formerly the only method, has been discontinued almost entirely within the last twenty-five or thirty years, though a number of vessels are still fitted with hand-lines and dories. A very large majority, however, of all the vessels fishing on the off-shore Banks use trawl-lines, these being exclusively employed by the French fishermen and almost exclusively by the Canadian fishermen.

The American trawl-fishery is so recent in its origin but little can be said about its history, and this chapter will be devoted to a discussion of the methods in use at the present time which are essentially the same as those introduced when trawling first became customary.

1. THE FISHING GROUNDS.

The American trawlers frequent all the off-shore banks as well as those in the Gulf of Saint Lawrence. The most important fishing ground is of course the Grand Bank of Newfoundland. This great shoal throughout its entire extent is an excellent fishing ground for cod, though in some seasons there are limited areas which are more or less barren. The gully called "Whale Deep," having a muddy bottom, is never resorted to. The trawling vessels ply their lines over a larger area than the hand-liners, which, for a greater part of the year, congregate in the shoaler waters in the vicinity of the Virgin Rocks. From April to June the best trawling is usually obtained on the southern part of the Bank, between the parallels of 43 and 45. From July to October the fish are distributed over a much larger area, and fishing is carried on from latitude 44 to the extreme northern limits of the Bank.

In July and August a favorite locality for the trawlers is that portion of the Bank lying east of the Virgin Rocks, a distance of 15 to 45 miles, and known as the "eastern shoal water." The portion of the Bank lying between the parallels 44 and 45.20 is a favorite fishing ground for cod at all seasons from April to October.

Next in importance to the Grand Bank, so far as the American fishermen are concerned, is the Western Bank, on which Gloucester vessels can be found in nearly every month of the year, and which in summer is resorted to by bankers from nearly every port. Large numbers of Canadian vessels fish here during the spring and summer months, but the French vessels are excluded by the provisions of the convention of 1818 from all grounds within 100 miles from the coast of Nova Scotia, and therefore are never seen on any of the fishing banks south or west of Banquereau. The Western Bank affords excellent fishing over its entire surface.

Banquereau is also extensively resorted to by American, Canadian, and French vessels, though it is not so favorite a fishing place for the Gloucester trawlers as the Western Bank. Like the Grand Bank fishery, that upon Banquereau is exclusively a spring and summer fishery.

Saint Peter's Bank is now almost abandoned to the French, though it was formerly a favorite spot for the American trawlers, especially those of Gloucester.

Green Bank, until very recently, has not been resorted to for cod, but the influence of the halibut trawlers has carried the Gloucester trawlers thither, and it has proved to be an excellent ground for cod as well as halibut. The former ignorance concerning this Bank is accounted for by the fact of its proximity to Saint Peter's and Grand Bank, which were so well known to be good that the fishermen had no disposition to leave them in search of uncertain luck elsewhere.

The other off-shore Banks frequented by trawlers are La Have Bank and La Have Ridges, Brown's Bank, Roseway Bank, and banks in the Gulf of Saint Lawrence, especially that about Cape North, for spring fishing. All these banks, however, are of slight importance to the trawl fishery in comparison with those previously mentioned.

Except upon the fishing ground off Cape North, cod trawls are rarely set at a depth exceeding 60 or 70 fathoms, the common depth being from 25 to 45 fathoms on all the banks. At Cape North trawls are set at depths of from 75 to 110 fathoms.

The general character of the trawling grounds is more fully discussed in Section II, on fishing grounds.

2. THE FISHERMEN.

Trawling for cod is carried on from Gloucester, Provincetown, Beverly, Hingham, and a few other places in Massachusetts, and from several ports in Maine.

The crews are made up somewhat differently from those in other branches of the fishery. It is true that Gloucester vessels fishing on the Western Bank carry picked crews which will compare favorably with those in any other branches. Vessels going from Gloucester, Provincetown, and elsewhere on long trips to the Grand Bank carry a considerable number of inexperienced men—young men trained up in the shore fisheries of the British Provinces and Maine, who have not yet learned the routine of the vessel, and who can be hired at a low price. In setting the trawls two men go out in each dory, one of whom, the "skipper of the dory," must be an experienced fisherman, while the other, the "bowman," needs only to possess courage and endurance and to be a *good* boatman. In fitting out vessels from Gloucester four or five men, who are sharesmen in the voyage, often get the vessel ready and take her down to the Canadian coast, where at some of the ports they hire the remainder of their crew.

The trawling fleet has now become the training school for young fishermen, the introduction of the purse-seine in the mackerel fishery having broken up the practice of carrying a number of boys on each schooner. It is a feeling of old fishermen at Provincetown and elsewhere that the introduction of this element into the fishing crews has had the effect of lowering their former standard of intelligence and efficiency, the young men of fishing towns being unwilling to enter upon careers as fishermen in competition with others so much their inferiors in capacity and social position. This, however, is probably unavoidable, for the educated sons of the fishermen of the last generation would naturally feel little inclination to enter upon the laborious livelihood in which their fathers were engaged, even though they were not confronted by this particular objection.

In the chapter on the characteristics of the fishermen will be found a full discussion by Mr. H. L. Osborn of the routine life and the characteristics of the crew of a Gloucester trawling vessel, which may be regarded as fairly typical not only for this fishery, but for the other vessel fisheries of New England.

3. THE VESSELS.

The vessels used in the trawl fishery are of the largest class of fishing schooners, ranging from 60 to 125 tons in register. There were in 1880 about 200 schooners in the American trawling fleet, one of them, which sailed from Beverly, being a three-master andt he largest of all.

The trawling vessel is usually one of the stanchest class of fishing schooners of the ordinary type, though there are a number of second-class vessels sent out from Provincetown, Beverly, and Plymouth, the summer voyage to the Grand Bank not being a very severe one. The Gloucester trawlers are all first-class vessels, being employed, when not trawling for cod, in some branch of the winter fishery, such as the Newfoundland herring trade, or in fishing for haddock or halibut.

In their general rig the trawling vessels have no peculiarities to distinguish them from those in the haddock and halibut fleets.

The arrangement of the deck is very similar to that described elsewhere in the discussion of the halibut schooners, the checker-boards, the bait-boards, and the manner of stowing cables and dories being essentially the same. A few Gloucester trawlers carry a gurry-pen, placed forward of the house, in the same manner as that described in connection with the George's schooner. This is used for the storage of the spare gear and to give more room for cutting up the bait. The anchors are precisely the same as those carried by other fishing vessels. The cables are of the same size as those carried by the halibut fishermen, but shorter, their usual length being 200 or 250 fathoms. The dories are the same size as those carried by the halibut fishermen. Vessels from other ports do not generally carry such large cables and anchors as are taken by the Gloucester schooners.

The trawler carries on its deck from three to five "liver butts," which are ordinary molasses hogsheads, with a capacity of 130 to 175 gallons. Three or four of them are stowed together in chocks and lashed to ring-bolts in the deck, just forward of the house, and with their ends toward it. Others are sometimes carried, stowed on their bilges in front of the main hatch, or standing upright, lashed to the fore or main rigging. These butts remain in these positions during the voyage, and are filled up with livers through the scuttle-holes in the tops, the water being drawn off from time to time through the "spile-holes," bored in the heads or in the staves near the bottom. The scuttle-holes are covered with canvas or boards to keep out the water.

The splitting tables and dressing tubs, which are used when the vessels are dressing fish on the fishing grounds, will be described hereafter.

The interior fitting of a trawler is somewhat peculiar. As a rule these vessels carry no ballast, the quantity of salt, provisions, and water carried for a bank trip being sufficiently heavy to serve in its place until the vessels begin to fill up with fish. The greater portion of the hold is occupied by salt-pens, which are built of single boards nailed to stanchions and extending along the sides of the vessel, beginning at either side of the bait-pen, in the after part of the hold, and extending forward nearly to the store-room, which occupies the forward part of the hold.

Amidships, between the after hatch and main hatch, the hold is completely filled with salt-pens; these are called the "midship pens," in distinction from the others which are known as "wing-pens." Under each hatch is a clear space called the slaughter-house. The forward slaughter-house, or that under the main hatch, is used in salting and kenching the first fish before the pens begin to empty, while that under the after hatch serves as a storage for spare gear and also as a passage-way. The pens, which vary from 12 to 18 according to the size of the vessel, hold from 15 to 25 hogsheads of salt each, the aggregate capacity varying from 180 to 300 hogsheads.

The bait-pen is built forward of the cabin bulkhead and between this and the after hatch. It is 9 or 10 feet wide and 10 or 12 feet long, holding about 60 barrels of bait in addition to the ice necessary for its preservation. The bottom of the pen is raised about a foot above the keelson, and it has a center partition by which it is divided into two sections. This is necessary in order that one pen may be kept closed and protected from the air while the bait is being used from the other. The bait-pen is built double, the boards breaking seams to prevent the passage of air, and in the forward bulkhead it has a door on either side of the partition opening into the after side of

the slaughter-house. The sills of these doors are about two feet above the bottom of the pen. When the bait is being iced and stored the door openings are gradually filled up by boards sliding into grooves to prevent the fish from falling out, and after the bin is entirely full the door, which is not hinged, is secured in its place by means of a horizontal bar.

The store-room or forehold is connected with the forecastle by a door and is used as in other vessels for fresh water and provisions, and also by the cook for a pantry.

As fast as the salt-pens are emptied they are knocked down; the space they occupied is filled up with salted fish, so that when the fare of the vessel is completed the hold is entirely clear, with the exception of the store-rooms and bait-pens, and is filled with fish, and even the latter are also often filled with fish.

The supply of water for a trawler is much less than for a hand-liner, since the latter rarely visits any harbor after they have once reached the Bank until the voyage is completed. The trawler seldom carries more than 30 barrels, while the hand-liner carries from 60 to 120.

4. APPARATUS AND METHODS OF FISHING.

THE APPARATUS.

EQUIPMENT OF DORY.—The cod trawl-line is described in detail in another section of this report under the heading "Apparatus of the fisheries."

Each vessel carries from 4 to 6 dories, which are in the main equipped as in the halibut fishery, though with some slight differences. One of these dories ready to leave the vessel is fitted with the following articles:

1. Painter, 5 fathoms of 2-inch manila rope. 2. Stern becket, 3 feet of 2-inch rope. 3. Stern painter, 3 fathoms of buoy-line. 4. Two pairs of 9-foot ash oars. 5. Wooden scoop for bailing. 6. Gob-stick, 2 feet long. 7. Gaff in wooden handle, 2½ feet long. 8. Single-score trawl roller. 9. Two pairs woolen nippers. 10. Plug with becket and line. 11. Four thwart lashings, each 3 feet long, of buoy-line. 12. Rubber boot-heel bumper on stem. 13. Leather on forward ends of dory ribband strakes. 14. Dory knife, 5½-inch pointed blade. 15. Brass dory compass in wooden box (compasses are not always carried). 16. Four to six tubs of trawl. Each tub of trawl is rigged in the following manner: Ground-line of 11½ 25 fathom skeins of 18-pound tarred cotton line, 300 No. 14 cod-hooks (center-draught eyed), 5⅔ feet apart, on ground line, gangings 3 feet long, of 6-pound tarred cotton line. 17. One buoy, rigged with staff, swivels, and black ball. 18. One buoy, rigged with staff, swivels, and small flag. 19. Two buoy-lines. 20. Two 16-pound anchors, served in ring and part of stock with spun yarn and strap bent into ring. 21. One and a half dozen thole-pins.

The tackle for hoisting the dories on deck is like that used on halibut schooners, rather than those used in the hand-line cod fishery.

BAIT.—In the early part of the season the vessels trawling on the Western Bank bait with frozen herring, *generally that brought from Grand Manan and Newfoundland*, and later in the year use herring and mackerel which they obtain in the various ports of Nova Scotia and New Brunswick. Mackerel are sometimes obtained from seining vessels encountered on the passage to the Bank. *Vessels going to the Grand Bank in April usually carry a few barrels of salted clams, but* rely chiefly upon herring obtained at Newfoundland in spring and capelin in June and the early part of July, and squid, which are used for the remainder of the season, are obtained also at Newfoundland. Not infrequently a full supply of squid can be obtained on the Bank by the crew of a vessel. From 150 to 200 barrels of bait are required by an ordinary banker for a season's work; sometimes the quantity is as great as from 300 to 350 barrels.

In the course of a season on the Grand Bank the vessels are accustomed to visit the Provincial ports three or four times for bait, and sometimes much more frequently. These baiting trips occupy, according to circumstances, from four days to three weeks, occasioning great loss of time and more or less demoralization among the fishermen. One of the greatest needs of this fishery is the invention of some method by which the necessary supply of bait can be obtained by the bankers without interruptions of this kind. The salt which it is necessary to carry occupies so large a part of the vessel's hold that there is no room for the great bulk of fresh bait which is required for catching a full fare of fish. A still greater difficulty is found in the impossibility of keeping bait fresh longer than from twelve to twenty-one days.

The vessels frequenting the Western Bank also make three or four baiting trips, though occasionally, when fish are very plenty, the vessel is partially filled up at one baiting, and it is found more profitable to carry in the fare while it is green and weighs heavy than to get a new supply of bait and return to the Bank for an additional catch of fish.

The method of icing bait on a "salt trip" is as follows: When bait has been secured, the ice is removed from the pens and taken on deck. Four or five men, with fish-forks, pick the ice up fine in hogshead tubs, putting in a cake of 100 to 200 pounds at a time. Others of the crew are engaged in passing the baskets of herring and fine ice to those who are icing the bait. There are generally two men in the hold, one in the bait-pen and another at the hatchway. A layer of ice is first put upon the floor of the pen, after which a thin layer of herring, then another layer of ice, and so on, until the pen is nearly full. The whole is covered by a quantity of ice varying from six inches to a foot in thickness, according to the season, the pen to be opened last having the largest quantity.

Mode of fishing.—The Western Bank trawlers, as has already been implied, leave home in February and March, and continue fishing until October, making on an average five or six trips a year, while the Grand Bankers, leaving home in April, as a rule return home in August or September, having made one trip. The schooners of a smaller class fill up and return home sooner. Occasionally a vessel makes two trips to the Grand Bank, but this practice is not so common as in past years. The fish are now found to be scarce on the Grand Bank after the first of September, and there is often much difficulty in procuring squid for bait. Within the past year or two fish have been scarce on the Western Bank in the fall months, and the trips among the Western Bankers have been less.

The routine on a trawling vessel is very different from that on a vessel fishing with hand-lines, for the former never "goes to housekeeping" in the old-fashioned way. The mainsail is never unbent and stowed away, but is simply furled up whenever the riding-sail is hoisted. Years ago, when the trawlers rarely went to Newfoundland for bait, and depended on "shack fishing," or baiting with birds and refuse fish which they obtained while lying at anchor, they were accustomed to remain for a long time in one berth, as do the hand-liners now, and then they sometimes unbent their mainsails, but this custom was abandoned about 1870. Life on a trawler is much less regular and monotonous than on a hand-liner. The crew of the hand-liner rests on Sunday; that of a trawler seldom or never. The trawl fishermen work with all their might—frequently day and night—until their bait is used up, and then weigh their anchors and are off for port, where they have an opportunity for rest and change of scene.

The day's work begins with breakfast, which is served at daylight or before, the first gang being called out at 3 or half-past 3 in the morning in mid-summer. As soon as they can see, the fishermen start out to haul their trawls, which have been set all night. From four to six dories are rowed out from the vessel in different directions toward the outer ends of the trawl-lines unless the

fog is so dense that there is no probability of finding their outer buoys, in which case they commence at the inner ends and haul outward. Fishermen, however, become so expert in rowing through the fog that they often succeed in finding the outer buoys when it is impossible to see more than one-eighth of a mile through the fog. A row from 2 to 3 miles brings the dory to its destination, and the line is hauled in the manner elsewhere described, the operation requiring from three to six hours. The length of time depends upon the strength of wind and current, the number of fish on the hooks, and the dexterity of the fishermen. Sometimes the boat has to carry five or six loads of fish to the vessel during the process of hauling a whole trawl. When it is necessary to leave a trawl which has been partially hauled the anchor is kept in the boat and the end of trawl-line is fastened to the buoy with the black ball and left swinging free in the tide. If the men are hauling from the inner end of the trawl the inner buoy is used for the same purpose. At the present time two or two and a half dory-loads from a string of trawl would be considered very fair fishing. A fair average dory-load of fish would weigh from 1,500 to 1,800 pounds, though in smooth water as much as 2,500 pounds might be carried.

In using their trawl-lines the bankers, as a rule, pursue the method known as setting and hauling, though the process of under running is not unusual. The manner of setting is thus described by Capt. D. E. Collins: "One man sitting on the forward or midship thwart rows the dory, while the other, standing aft, first throws over the buoy and then pays out the buoy-line until he reaches the end which is fast to the anchor. He then lifts a 'tub of trawl' upon the thwart in front of him, and clearing the end makes it fast to the anchor. He then throws out the anchor and the trawl follows it, hook after hook being thrown over the side of the dory, the thrower seizing each time the ground-line and heaving it out with a quick, nervous jerk. Considerable dexterity is required to set a cod-trawl without fouling the line or getting the hooks in the clothing or hands of the fishermen. When one tub is out the bottom end of its line is bent fast to the top end of the next tub and the empty tub put aside, and so it goes on until the end of the last line is reached. This is bent to the anchor, the anchor is thrown overboard, the buoy line paid out, and last of all the buoy is thrown over: this, if the outer buoy, has a 'black ball' on it. Owing to the small size of the hooks and baits the men are obliged to bait the hooks bare-handed, and in cold weather they suffer severely."

The same expert describes the method of hauling the trawl: "A 'patent roller,' similar to that used in the halibut fishery, is attached to the gunwale of the dory 3 or 4 feet from the stem, the iron shank being shipped in a hole in a cleat which is fastened to the inside of the gunwale. This apparatus is used to aid in hauling the trawl-line, which passes over it, and the new method is a decided improvement over the old in pulling the line over the side of the boat. While hauling the 'first buoy-line' the positions of the men are the same as when hauling a halibut trawl, one standing forward and the other aft. When, however, the anchor has been lifted and the trawl cast off from it, the after man shifts his position farther forward so as to stand just behind the man that hauls. Placing his tub on the thwart in front of him he coils in it the trawl, 'slatting' (or jerking) the fish off behind. Such as do not come off with a 'slat' he unhooks by using the 'gob-stick.'" At the end of the process of hauling, the trawl-line has been coiled in the tubs to be carried on board the vessel to be rebaited."

When fish can be caught, both at night and during the day, and the weather is suitable, two sets are usually made each day. It frequently happens, however, especially on the Grand Bank and in the Gulf of Saint Lawrence, that but few fish can be caught in the daytime. In such cases the trawls are set only once in the twenty-four hours, being put out about sundown and hauled the following morning. Owing to this peculiarity of the cod which frequent the Grand Bank,

the fishermen have of late years come to use much longer trawls than formerly, finding it to be more profitable to set long strings of gear, and make but one set a day, instead of two, as was formerly the custom.

On some of the banks where fishing can be carried on with equal success both night and day, and where there is not too strong a current and comparatively shoal water, the fishermen find it to their advantage to underrun their trawls, instead of hauling and setting. Captain Collins, above quoted, says: "Underrunning codfish trawls differs entirely from hauling, insomuch, that, although the same results are obtained, the trawl is not hauled into the dory, but across her, coming in one side and going out over the other, the fish being taken off and the hooks baited as the line passes over the boat. The advantages of underrunning are: First, a larger amount of gear can be handled, or the same trawl more frequently—for instance, a trawl can be underrun three times a day easier than it can be hauled and set twice; second, it requires only one-half the rowing, as it is all baited and set when it is left, and the pull out and back, incident to setting a trawl, is dispened with; third, it being always in the water, it has more time to fish. Cases have often occurred, where there was good fishing, that the men would keep on underrunning, and getting a load of cod each time, until fish enough for the day had been taken, which was sometimes as many as 75 or 80 tubs; the fourth reason is that the dories are not 'cluttered up' with gear, but have more room to put fish in. Trawls cannot be underrun very well where there is much tide in more than 40 fathoms, and are not often set for that purpose, excepting where cod are abundant."

The different methods of setting trawls for underrunning are described in another section of this report.

Each dory's crew has a station around the house for baiting their trawls which corresponds to the berth they set their gear in—for instance, a dory's crew who set their trawls ahead of the vessel bait on the forward end of the house, those who set lines on the starboard bow or beam bait on the forward end of the starboard side of the house, and so on. These stations are secured by lot, the crews belonging to the dories on each side of the vessel drawing their respective berths for setting trawls as well as for their positions for baiting. Plank are secured to the sides and ends of the house to protect it from being injured by the knives with which the bait is cut. When the order is given to "bait up," one man from each dory goes in the hold and fills a basket with herring, squid, mackerel, or whatever kind of bait they are using, and reaches this to his dorymate, who empties the lot on top of the house in the berth where they stand to bait their trawls. As soon as the bait is cut up (a herring making from five to eight pieces) each man begins on a tub of trawl. The trawl is turned out onto the house near the edge, the tub set on deck (occasionally on the house), and as fast as the hooks are baited the line is coiled in the tub, considerable care being taken in placing the hooks around the edge of the tub so that they will not foul when the trawl is being set. Only one piece of bait is put on a hook. The operation of baiting is very quickly and dexterously performed, an expert being able to bait five hundred hooks in three-quarters of an hour or less.

The operation of baiting consumes from an hour and a half to two hours, and is always deferred until after the fish are dressed and salted, unless the men are in haste to make a second set of the lines.

To dress the fish requires from half an hour to fifteen or twenty hours, depending, of course, upon the quantity of fish taken, which may vary from one to one hundred tubs. Each tub contains from 600 to 800 pounds of round fish, which, when salted and kenched, would weigh from 200 to 300 pounds. When there is a large catch the men are obliged to work all day and nearly all night. From 1870 to 1874, when squid were very abundant on the Grand Bank, there were instances where

vessels caught more than a hundred tubs of cod in a single day's fishing, and in several cases such fishing continued for several days. The schooner Ben: Perley Poore, of Gloucester, in one season found fish so abundant that the men were kept constantly at work night and day for several days in succession, until the vessel was entirely filled up. When the crew were heaving up the anchor some of the men were so fatigued that they fell asleep with their hands on the windlass-brakes. On an ordinary long trip to the Grand Bank a day's catch is likely to vary from one to forty tubs of fish. The vessel seldom fills up from one anchorage, even if it does not go into port to bait. Sometimes they do not change more than five or six times, and sometimes more than fifty times, as they work after the fish.

The trawl-fishermen, of course, are subjected to the same inconveniences of fog and squalls which have been alluded to in the chapter on the hand-line fishery. On foggy days horns are frequently blown while the dories are out, in order that they may be kept informed of the position of the vessel. The danger of loss is very much greater, however, than in the case of the hand-liners, because of the longer distance which the trawl-line fishermen go from their vessels in thick weather. But when a dory is hauling from the outer end of the trawl-line the danger of going astray is not so great, since the fishermen gradually draw nearer to the schooner, and they are assisted by the trend of the line, by which the direction of the vessel is indicated.

"The man who ventures on a trip in a 'trawler,'" writes Mr. George H. Procter, "finds little of the 'pleasing content' described by the early voyager. For him at least there is little of romance in 'the apostles' own calling.' Life on the Banks he finds a constant round of drudgery so long as he is able to make his daily rounds. He must rise early and work late in order to visit his trawls, remove his fish, rebait and reset the lines, and take care of the day's catch. Tossed on the waves in his frail dory, at greater or less distance from his vessel, he is subject to perils unknown to the fisherman of the olden time. His frail boat rides like a shell upon the surface of the sea, but in experienced hands no description of small sea craft is safer. Yet a moment of carelessness or inattention or a slight miscalculation may cost him his life. And a greater foe than carelessness lies in wait for its prey. The stealthy fog enwraps him in its folds, blinds his vision, cuts off all marks to guide his course, and leaves him afloat on a measureless void. Instances are on record of many a wearisome trip, of days and nights without food or water, spent in weary labor at the oars, at last to find succor from some chance vessel or by reaching a distant port; and imagination revolts from the contemplation of the hardships experienced, the hopes awakened and dispelled, and the torturing fate of the many 'lost in the fog,' of whose trying experiences nothing is ever known."*

Each dory being manned by two fishermen, only the captain and the cook ordinarily remain on board.

The dories have usually all returned from their morning's task by 9 or 10 o'clock, but when fish are scarce they are back much earlier. If the vessel is setting its trawls only once a day, as is at present the ordinary practice on the Grand Bank, the dories do not go out again until near sundown, when an hour and a half or two hours' work is sufficient for the laying out of the lines for the night. When the weather is rough the task is a much longer one. Capt. D. E. Collins, in his journal of April 9, 1879, writes: "We had 19 tubs of large fish to-day, and with such a good prospect we feel like making extra efforts; so, although there was a smart breeze of wind, we hove out the dories, and the men started to set at 4 p. m. It was rough enough, and some of those who set to leeward had all they could do to get back to the vessel. To pull a light dory nearly two miles against a fresh breeze and a short choppy head sea is not child's play, for the utmost strength of two men is barely sufficient to force her to windward, and though the pull continues for hours

* Gloucester and its Fisheries, 1876, pp. 57, 58.

before the vessel is reached, every stroke of the oars must be as strong as the one which preceded, or the boat goes astern instead of ahead."

On the Western Bank, where two sets are generally made daily, and on the Grand Bank, when this is done, the dories make their second trip in the forenoon and haul in the middle of the afternoon.

5. THE CARE OF THE FISH.

The manner of dressing the fish is essentially the same as that practiced on the George's-men and the dory hand-liners. It is graphically described in the journal of Capt. D. E. Collins:

"First premising that a 'deck of fish' means the fish that are on the deck at one time, a good catch being spoken of as a good deck, I will proceed to explain how a deck of fish is dressed down and salted.

"Generally we 'rig up' two gangs on deck, though on special occasions we may have three. A splitting-table is put up on each side of the vessel abaft the main rigging and held in its place by shipping one of its ends on a cleat or a pair of pins in the rail, while the other is kept in position by a board brace placed against the bottom of the waist. By this arrangement the tables can be put up or taken down in a few moments. In rough weather they are stowed away to keep them from being washed overboard. The dressing-tubs, which are halves of large molasses hogsheads, are placed near the splitting-tables, abaft the one upon the starboard side and forward of that upon the port. A tub partly filled with water is placed at the end of each splitting-table, and into this the fish fall as they come from the knife. When there are two gangs, the crew is divided up so that there shall be three men in the hold, and three men—the header, gutter, and splitter—in each dress-gang, and four idlers, whose duty it is to pitch the fish along and fill the tubs and also to pitch the fish out of the washing-tubs into the hold. When there are three gangs, as is the case when there is a good deck of fish, there is but one idler, who is, notwithstanding his name, the busiest man of the crew. Of the three men in the hold two are salters and one, who is called the 'devil,' has for his duty the filling of the salt basket and the passing of salt baskets and fish, if necessary, to the salters.

"The tubs being filled, the header seizes with his left hand a fish by its nose, and hauling it along so that the back of its neck lies across the edge of the tub, proceeds to head it. One quick downward cut for the throat, a rip down the belly, a quick motion of the knife on either side of the head, unjointing the bones, and a "yank" of the left hand, and the head is detached and thrown overboard. The gutter grabs the fish by the nape with his left hand, removes the liver, which he puts in a basket standing by his side, and throws the guts overboard, passing the fish at the same time to the splitter. On Provincetown vessels and on those of some other ports the head is broken off by the gutter. The splitter, working at the splitting-table, cuts out the backbone and lets the fish fall into the washing-tub.

"In salting the fish we make the first kench across the forward part of the hold next to the water barrels. Some vessels have a bulkhead, against which they salt the first fish. The kench is built four or five feet wide fore and aft and wider at the bottom than at the top. Some salters take the salt from the baskets and scatter it over the fish with their bare hands, but the majority of them prefer to save their hands by using a scoop.

"No part of the work on a 'salt trip' requires so much care and judgment as the salting. The salters must have a perfect knowledge of how to test the strength of the salt, know at a glance just how much each fish requires and on what part the most is needed. Otherwise the fish either come out 'slack' and strong-smelling for want of salt, or 'dry as a chip' from oversalting.

"As fast as the salt is used out of the pens these are knocked down and additional kenches formed, and so on to the end. When the fish settle, which they always do, they are 'packed up' by removing a portion from the after kenches and packing them on the top of those which are forward until the latter extend up to the deck. After this process has been two or three times repeated the settling does not amount to much."

At the present time codfish-roe is never saved by the Bank fishermen, but all the livers are carefully preserved in the "liver butts," already described. As the oil begins to make its appearance at the top of the cask, or "makes out," as the fishermen describe it, it is dipped out into water barrels and stowed away in the hold. Sixty barrels of liver yield from 20 to 24 barrels of oil. The livers are fattest in midsummer and have least oil in winter.

The sounds are occasionally saved by the cook, and, less frequently, the tongues, and these are the perquisites of the person who saves them. On some of the Western Bank trips, when hake are abundant, the cook's profits from the saving of sounds often amount to as much as his share of the voyage.

The manner of discharging the cargo of a banker is somewhat different from that customary with other vessels and should be briefly referred to. The fish are first taken out upon the wharf and weighed. They are then pitched into a tank of water, or very frequently into an old dory, which serves instead of a tank. Men standing around with brushes clean off the slime and dirt which remain upon the skin and flesh of the fish, and they are then thrown upon barrows and wheeled into the salting building, where they are either packed in kench for "water-horseing" or resalted in butts. The process of curing is described elsewhere.

6. THE FINANCIAL PROFITS OF THE TRAWL FISHERY.

The statistics of the Bank fishery from Gloucester are discussed in Section II, Geographical Review of the Fisheries, pages 155, 156, and several examples of large fares are noticed, which show the profits sometimes realized in this fishery.

The following statement shows the result and the manner of settling the proceeds of a trawling trip on the schooner Victor, of Gloucester, sailed July 12 and returned October 13, 1879:

71,200 pounds large cod, at 2 cents		$1,424 00
7,440 pounds small cod, at 1 cent		74 40
280 pounds halibut		3 50
Oil sold by captain		27 20
Livers landed in Gloucester		20 00
	1,549 10	
Stock charges	236 57	
	1,312 53	
One-half to vessel	656 26	
	656 27	
One-half of one per cent. for widows' and orphans' fund	3 28	
	652 99	
General charges	29 50	
Balance to crew and skipper	623 49	

This amount, $623.49, was shared among the crew and skipper, the twelve receiving $51.96 per man. In addition to his share as one of the crew, the skipper received 4 per cent. of the net stock, $1,312.53, or $52.50.

Under the head of stock charges are included the following items:

Bait and ice	$234 15
Customs fees	2 42
	236 57

The general charges include:

Water and extra provisions	$16 00
Nippers	7 00
Sawing wood	1 50
Medicine	3 00
Milk	2 00
	29 50

7. HISTORY OF TRAWLING.

STATEMENT OF CAPT. N. E. ATWOOD.—It is said that in early days a treaty between England and France forbade French vessels from anchoring on the Grand Bank, and in those days trawling was, of course, an impossibility. The American vessels fishing on the Banks were in constant terror of the great French ships as they drifted hither and thither over the fishing grounds. At the time of Captain Atwood's first visit to the Grand Bank they were in the habit of setting trawls from their shallops as at the present day. As early as 1843 Captain Atwood set trawls for halibut in Massachusetts Bay. Before that he had been in the habit of putting two or three hooks on the rode-line of his dory, close to his anchor, and would occasionally catch a fish or two when he pulled in the anchor. As early as 1843 he was accustomed to set a regular trawl-line 60 fathoms long, with snoods 4 or 5 feet in length, placed 4 or 5 fathoms apart. About 1845 the schooner Oneco, Charles Aspley, a Welshman, master, went to the Grand Bank fitted out for trawling like the French vessels. She made only about 5,000 fish, 150 quintals. When he had made a miss it stilled the Provincetown fishermen on the subject of trawling. So they said nothing more about this kind of fishing.

About 1851 or 1852 an old Irishman down at Swampscott bought an old dory and went to work rigging a trawl as he had been accustomed to do in the old country. The Swampscott fishermen laughed at him and the idea that he could catch any fish with his clumsy trawl; but when he went out they soon changed their tune, for he could catch two fish to their one. They then fitted out trawls for themselves and went fishing with them, and thought it was nice. They soon encountered another difficulty, however, for an entirely new class of fishermen, mostly Irish, were called in, and their monopoly of the Boston market was destroyed. A great many Irishmen began trawling, and they soon began to build little vessels, such as they had on their own coast. The first one they got was a little boat called the Moby Dick, and they made money like shells. These Irish boats rapidly increased in number, and they had the St. Patrick and the St. Mary, and the Daniel O'Connell and the Maid of Erin; and in 1857 there were seventy-five Irish boats tending Boston market. The Swampscott fishermen began to be alarmed, and petitioned the legislature for laws forbidding the use of trawl-lines; but they had leave to withdraw their petition.

In 1858 another petition was sent in by the Swampscott people, begging that trawling should be forbidden within three miles of the shore. They thought if this could be passed the small fishermen would be driven out of the business. Their petition was again refused. Captain Atwood's account of this occasion is interesting as a matter of history, and particularly so, as it fixes the time at which trawling became common at Provincetown. In 1856 the captain was at home engaged in manufacturing cod-liver oil, and his brother, Capt. John Atwood, with three others, entered into partnership for the purpose of buying the winter shore catch of fish, to send them to Boston market. Captain Atwood consented to become the fifth partner and to be on duty at Central Wharf. That fall he was elected to the State legislature, and was obliged to furnish a substi-

tute at the wharf. This year trawls were just coming into general use, and an unusually large quantity of haddock were caught. The enterprise was, however, fairly successful. He paid his substitute $90, and made $90 in addition as his share of the winter's work. The following year trawls were used by every one, and haddock, which had formerly been as valuable as cod, were so abundant that the company was nearly swamped. Their agreement with the fishermen was that both cod and haddock should be paid for at the rate of $1.25 a hundred-weight. This year haddock brought only 37½ cents a hundred-weight at Boston, and, though cod were worth $2.25, the venture was a losing one, and the captain had to pay $90 back to the firm in addition to the $90 which he paid to his substitute.

It was at this time that the second petition from the Swampscott people was brought up in the Massachusetts legislature, and was referred to the committee of fisheries, of which Captain Atwood was the chairman. The committee voted "that the petitioners should have leave to withdraw;" but the bill was brought up by the Hon. Caleb Cushing, of Newburyport, who made an eloquent speech on the floor of the house in favor of the petition, stating that he had been told that the custom of trawling was rapidly exterminating the haddock, and from present appearances they would soon be as scarce as salmon, and that he was told that even at that time poor people could not afford to eat them. When he got through, says the captain, most of the members were apparently deeply impressed, and those that loved haddock evidently thought that they had eaten their last one. Mr. Cushing closed by calling upon the chairman of the committee on fisheries, who, he understood, was a practical fisherman, to state his own experience in the matter. This was Captain Atwood's first speech, but, though he felt somewhat diffident, he felt sure of his ground. He rose and said that it was necessary for him to speak somewhat in detail, and began to recount the history of the haddock in Massachusetts Bay. He told how in the days of his boyhood they had been extremely scarce, so that not more than one haddock was taken to every three or four hundred cod; how they had increased gradually in numbers until at the present time they were swarming in the waters in the greatest abundance. The gentleman from Newburyport had stated that they would soon be as scarce as salmon, and that poor people even then could not afford to eat them, and had asked him for his practical experience in the matter. "I would state, Mr. Chairman, that I am one of a company of five fishermen in Provincetown who entered into partnership for the purpose of buying all the fish which should be brought to the shore this winter; that this very morning we received 4,000 pounds of haddock, for which we paid $1.25 a hundred, and which we were obliged to sell for 37½ cents; not 37½ cents a pound, Mr. Chairman, but 37½ cents for a hundred pounds; and if any of the members will take the trouble to walk down by Commercial Wharf they may see women going back into the city with their arms full of haddock, the small fish, which are called unmarketable, for which they had paid not more than 10 cents for all that they could carry. They might not be too plenty for the people, but they are too plenty for the dealer and too plenty for the fishermen." The speaker's time had now expired, but he was allowed by unanimous vote to continue his remarks; and at their close it was voted "that the Swampscott petitioners have leave to withdraw."

HISTORY OF TRAWLING IN THE VICINITY OF BATH, WISCASSET, AND BOOTH BAY DISTRICTS.—Mr. Daniel Cameron, of Southport, gives the following statements about the introduction of trawls into this section:

"The first ever known of trawling here was a report brought from Cape Ann of Peter Sinclair using them on the schooner Anna as early as 1854 or 1855. He used them on the Cape shore and Banks for cod and halibut, and was remarkably successful. In 1858 Booth Bay sent her first trawler, the schooner Albatross, Captain Farmer, belonging to N. McFarland. She went to the

Bay of Saint Lawrence and fished in from 15 to 30 fathoms around Bank Bradley and the Magdalen Islands, bringing home about 900 quintals of very large fish that brought a much higher price than large fish taken with hand-lines. The impression seemed to be at that time that trawl-fish were better than those caught in the old way. She kept on in the business and in 1860 was joined by the schooner Island Queen, Captain Orchard, belonging to Cameron and Orne, of Southport.

"This method was new to the owners at the time and they were afraid to risk the whole chance of a trip, so they took a crew of Captain Cook and eight men, gave them material for two trawls, each 1,000 fathoms long, with No. 9 hooks, one fathom apart, and hand-lines for fishing in the usual way. They used manila six-thread line, about the size of the present buoy-line, for the ground-line, and had buoys at intervals of 100 fathoms, so that if the line parted they might get it again. The boats taken were Hampton boats, 15 to 18 feet long, two men going in each.

"They were also provided with a bait-mill to chop bait for tolling the mackerel, which were taken with hooks, to be used for bait, and with a string of eight herring nets, 40 yards each, to catch herring for the same purpose. They sailed about June 15, after she had made a trip to the Banks, for the Bay of Saint Lawrence, and began fishing in the vicinity of the Magdalens. She soon found the fish so plenty that the hand-line fishermen on board gave up their fishing and spent their time dressing the fish taken on the trawls and catching mackerel and herring for bait. The closer they came to shore, especially in the vicinity of Dead Man's Island, the better, and frequently one end of the trawl came nearly to the land. The average depth was about 5 to 10 fathoms.

"The fish taken were very large and averaged only ten to the quintal when dried. They saved nearly 30 quintals of small cod that were taken from the mouths of the large ones, *i. e.*, the small ones would swallow the bait and get caught when a large one would bite at the small one and thus the large and small would come up on the same hook. The vessel returned after an absence of two and a half months, landing 750 quintals of large fish, averaging ten to the quintal, while other vessels fishing in the same locality required seventy to eighty fish to the quintal.

"After curing, the fish were sold to Moses B. Nickerson, of Portland, at $4 per quintal, while other large fish were bringing only $3.25. They were resold to Crowell, of New York. The success of these vessels had a tendency to bring trawling into general use, and by 1862 most of the vessels of the section used them and continued to do so up to a late date.

"But a reaction has taken place since the fisheries have been paying so poorly, and owners have refused to supply trawls for their Bankers owing to the extra expense and great loss of gear. For fully eight years the tendency has been to do away with them among Bankers, and in 1878 and 1879 the same ideas are being advanced by the shore-fishermen, so that we now have but three Bankers using trawls, and an occasional shore-fisherman hand-lining from deck and claiming to make more money than the trawlers.

"The price has also been affected so that instead of trawl-fish bringing more, as they did up to 1876, we find the fresh-fish market at Booth Bay refusing to buy them, claiming that they will neither keep as well in ice, nor stand shipping as the hand-line fish do."

FRENCH METHODS OF TRAWLING IN 1843.—The Gloucester Telegraph, of October 18, 1843, has the following description of the French method of fishing with set lines or trawls on the Grand Bank:

"French vessels, it appears, mostly anchor in latitude 44° N. and longitude 50°.20′ W., in about 45 fathoms water, veer 90 or 100 fathoms of cable, and prepare to catch codfish with two ¼-inch lines of 3,000 fathoms long each. On these a small cork is placed at every 12 feet, and while metal hooks, baited with parts of small fish (by us called kiblings) [capelins are no doubt meant],

are alternately fastened by snoods of 3 feet long, 6 feet apart, and the whole neatly coiled in half-bushel baskets clear for running out. Half the number of baskets are then placed in a large, strong-built lug-sail boat on each side, at 3 o'clock in the afternoon; both make sail together at right angles from the vessel, and when the lines are all run out straight, sink them to within 5 feet of the bottom.

[This is probably a mistake of the writer, since the ground-lines of the trawls were undoubtedly, as now, sunk to the bottom.]

"The crew having rested all night, they proceed again the next morning at daybreak to trip the sinker, and while hauling in lines, unhooking fish, &c., the men left on board heave in the other end with a winch. When in that manner 400 codfish are caught in a night, some are then employed in line-clearing, fish-beheading, splitting, salting, and stowing them away in layers across each other below; livers and refuse boiled to oil put in large casks on deck. Three months seems to be the average time employed, arriving early in June and departing again in October.

"As British fishermen are said to be continually holding lines in a perpendicular position over the side in all sorts of weather, for the same purpose, owners of vessels, we conceive, should give the above method some consideration."

8. REPORT ON A COD-TRAWLING TRIP TO GRAND BANK IN 1879.

By Henry L. Osborn.

a. ITINERARY OF THE CRUISE.

A BRIEF ITINERARY OF THE SUMMER TRIP.—We ran out of Gloucester harbor with a light northerly breeze at 3 o'clock on Saturday afternoon, July 12, 1879. As we rounded Eastern Point the wind died out and we lay in a flat calm until late at night. The following day, Sunday, was clear and pleasant. Land had sunken out of sight and we were moving very slowly east half south. Had it not been the Sabbath the men would have begun at once to rig their trawls, but, partly from respect to the day and partly using it as an excuse for not working, they did no manner of work. Early on Monday morning they all turned out, and after breakfast began work on their gear, continuing it steadily all day and all the day following. By Wednesday they had, for the most part, finished this work.

On Tuesday night we saw a light on shore and decided that it was Sambro Light, off Halifax. On Thursday morning, when I came on deck at half-past four, we had rounded Cape Canso and were standing toward Arichat. It was blowing strong and the air was full of mist, moreover it was very cold although it was the middle of summer, and I found heavy clothing and an "oil-skin" suit very comfortable. The treeless and barren hills seemed very inhospitable, and the few houses nestled under them here and there did not seem very cheerful to one who had but just come from the warm weather of New Jersey. A few miles off Arichat we put over a dory, and three or four men jumped into her and pulled ashore to visit their homes in the vicinity, for a day or two. With the rest of the crew we stood off for Guysborough, and, at about nine in the morning, dropped anchor off the village.

We staid at Guysborough until the 20th, thus giving the remainder of the crew, except two Massachusetts fellows, a chance to visit their homes. On that evening we dropped anchor off Arichat. In the morning of the next day we picked up the rest of the crew, took ice for our bait, and, at about 2 or 3 o'clock p. m., made sail for Cape Broyle, Newfoundland. The wind was fair and strong and we flew over the water at the rate of 10 or 11 knots per hour. When I went below for the night the land was no longer in sight and we were tearing through the water. All day Tuesday we had the same strong and fair breeze and sailing became really enjoyable. On

Wednesday morning the skipper judged from his log that we must be nearing Cape Broyle, but the land was wrapped in a thick fog and he could not determine his position. In the middle of the forenoon the fog lifted and there lay Cape Broyle on our port quarter; we were just passing it. He at once put about and we were soon in the harbor, having made the run, something over 40 miles, in forty hours.

We remained at Cape Broyle till the 25th, during which time we filled the water barrels and purchased the first baiting of squid, then made sail for the Grand Bank to try our luck with the codfish. During this, the "first baiting," the skipper kept continually on the move, making a new berth every day. The catch of fish was not large at any place and grew smaller every day as the bait became more and more injured by keeping. The latitudes and longitudes given in the following table of fish taken are those received from the skipper:

Table of fish taken.

FIRST BAITING.

Station.	Date.	Latitude.	Longitude.	Night set.	Day set.
		° ′	° ′	*Tubs.*	*Tubs.*
1	July 27	46 39	50 37	9	.....
1	July 27	46 39	50 37	.....	3
2	July 28	46 43	50 34	7	.....
3	July 31	46 47	51 30	7	.....
4	Aug. 1	46 46	50 07	9	.....
5	Aug. 2	47 02	49 53	8	.....
6	Aug. 3	47 06	49 49	8	.....
7	Aug. 4	46 50	49 33	8	.....
8	Aug. 5	46 49	49 37	1	.....
9	Aug. 6	46 51	49 49	2	.....
10	Aug. 7	46 43	50 13	5	.....

The weather during the first baiting was extremely unpleasant. At the very start the fishing was interrupted by a storm of wind that lasted three days and made the sea too rough to allow of the dories venturing out. After this the sea became more quiet, but the noted Newfoundland fogs came down and were scarcely absent during the remainder of the baiting. The temperature was very agreeable. The thermometer did not at any time fall below 50°, averaged about 56°, and at times rose above 60°. The water did not vary much in temperature from the temperature of the air, averaging one or two degrees lower. A record of temperatures and the weather was kept; the observations are tabulated at the close of this introduction.

After making 11 sets and capturing 67 tubs, or about 23,000 pounds of split fish, the bait became exhausted, and we returned to the land for a fresh supply. We headed the vessel for Cape Spear, near Saint John's, and "came to an anchor" in Freshwater Cove on August 9, a little after midday. This cove is just round South Head, the left promontory as one is entering Saint John's harbor, and is so convenient to the city that the skippers often avoid the high harbor fees by anchoring in it and rowing into the city for business. A heavy "easterly" was blowing, but the skipper determined to row into the city in spite of the heavy sea and attend to his business. From Saint John's we went to Tor Bay, Carbonear, and King's Cove in succession, in search of bait, but could not find any. At last we made our way into Open Hall, a very small fishing hamlet in Bonavista Bay, and, after lying there nearly a week, picked up a few squid and with them returned to the Banks.

The second baiting was used in a single berth, latitude 45° 4′, longitude 50° 33′. At this place the fish bit well so long as our bait remained fresh. On the 30th of August a "breeze of wind" broke us adrift from our moorings and favored our immediate departure for land to obtain

a third supply of bait. Our luck during this baiting was fair; we captured 85 tubs of fish, or more than 28,000 pounds of dressed fish. The numbers taken on each day are shown in the following table:

SECOND BAITING.

Station.	Date.	Latitude.	Longitude.	Night set.	Day set.
		° ′	° ′	*Tubs.*	*Tubs.*
11	Aug. 22	45 4	50 33	15	.....
11	Aug. 23	45 4	50 33	12	.....
11	Aug. 24	45 4	50 33	11	.....
11	Aug. 25	45 4	50 33	13	.....
11	Aug. 26	45 4	50 33	14	.....
11	Aug. 27	45 4	50 33	12	.....
11	Aug. 28	45 4	50 33	6	.....
11	Aug. 29	45 4	50 33	.....	.....
11	Aug. 30	45 4	50 33	2	.....

The gale which had driven us from our moorings on the Bank, and with which we ran to Cape Broyle, raged over the Bank for five days in so bad a storm that, as we afterward learned, it was impossible to do any fishing. We rode through this storm safely, anchored in Cape Broyle harbor, and on the 6th of September, finding no bait there, sailed for Bay of Bulls, hoping for better success in that place. None were to be had there, nor in the adjoining harbor of Witless Bay, though we staid three days. On Sunday and Monday nights the men varied the monotony of existence on a fishing schooner by attending a native dance. It was the most remarkable hop I ever attended, and is more fully described in another part of this report. From Bay of Bulls we coasted alongshore, putting in at Tor Bay, and, on finding no bait there, we stood out again, and finally, at nine in the evening, came to anchor in Portugal Cove, Conception Bay. Though it was dark when we anchored, the instinct of the Newfoundlander sent numbers of the natives on board at once, almost before our anchor had dropped, and we had purchased a good many squid before all hands turned in for the night.

We remained at "Portugee Cove" until the 11th, then sailed away for the Bank again. On this, our third baiting, we did finely at first, and we were jubilant when seventeen tubs came on board on the first morning. During this baiting we made fifteen sets in twelve different berths, and captured in all one hundred and three tubs of fish. Our positions during this time and the catch from each set are given in the following table.

THIRD BAITING.

Station.	Date.	Latitude.	Longitude.	Night set.	Day set.
		° ′	° ′	*Tubs.*	*Tubs.*
12	Sept. 15	45 12	51 00	17	.....
12	Sept. 16	.....	.....	6	2
13	Sept. 17	45 12	50 44	12	.....
14	Sept. 18	45 12	50 42	11	.....
14	Sept. 19	45 12	50 42	10	.....
15	Sept. 20	45 12	50 40	8	.....
16	Sept. 21	45 12	50 38	7½	.....
17	Sept. 22	45 10	50 36	8	.....
18	Sept. 23	45 10	50 10	5	.....
19	Sept. 24	45 18	50 25	.....	1
20	Sept. 25	45 10	50 25	7	.....
21	Sept. 27	45 07	50 00	4	.....
22	Sept. 28	45 03	50 05	1	.....
23	Sept. 29	.....	.....	2	.....

The weather during the second baiting was quiet until, toward the last of August, we had perpetual fog, hardly a day passing when the sky was clear in every direction. The thermometer marked on the average in the vicinity of 60°, with a little lower reading for the temperature of the surface of the ocean. During September the weather was perfect; not only was the average temperature warmer, but the air was clear from fog during a large part of the time. The sun shone brightly all day and set in splendor, and during the nights the moon shone in almost cloudless skies. Once during the third baiting the wind rose to a gale, and though the trawls were all out the skipper did not think it prudent to risk going after them. Late in the day the sea went down a little, and the dories ventured out. The trawls were very much injured from the rough usage they had passed through, and more than half were entirely lost. I made thermometric observations during this time, until a heavy lurch of the vessel threw down my thermometer and broke it, and during the third baiting barometric observations.

On the 29th of September the skipper gave the order to "give her the big mainsail." The dories were all cleaned out and fastened securely in their places, the vessel was thoroughly scrubbed, and the vestiges of two months' "gurry" removed in as many hours. Then the course was laid for Saint Pierre, and away we sailed. On the 2d of October we called at Saint Pierre. During the afternoon of that day we encountered a heavy gale between Saint Pierre and Scatari, the southeastern point of Cape Breton Island. At first we ran before the fierce gale, but finally were forced to "lie to;" we arrived at Arichat on the 4th. We ran to Guysborough the next morning for a short call, thence, on Monday, October 6, to Halifax. From Halifax we ran to Gloucester, and, delayed by dead calms when little more than 100 miles from home, finally worked in toward the land, made our way up the harbor, and anchored off the wharf belonging to the owners of the vessel on the morning of October 12. For convenience I have prepared the following condensed tabulated statement of the various movements of the vessels during the entire cruise:

CALENDAR OF THE CRUISE.

Date.	Movements of vessel.
July 12 to 17	From Gloucester, Mass., to Guysborough, Nova Scotia.
July 17 to 20	Stay at Guysborough.
July 20 to 21	To Arichat, Cape Breton Island, and stay.
July 21 to 23	Arichat to Cape Broyle, Newfoundland.
July 23 to 25	Stay at Cape Broyle.
July 25 to 26	Cape Broyle to Station 1, north 46° 30′, west 50° 37′.
July 26 to August 7	First baiting. Anchored in various places on Banks.
August 7 to 9	To Saint John's (Fresh-Water Cove), Newfoundland.
August 9 to 11	Saint John's to Tor Bay, Newfoundland.
August 11 to 13	Tor Bay to Carbonear, Newfoundland.
August 13 to 14	Carbonear to King's Cove, Newfoundland.
August 14 to 20	King's Cove to Open Hall, Newfoundland, and stay.
August 20 to 31	Open Hall to latitude 45° 4′, longitude 56° 33′, and stay. Second baiting.
August 31 to September 6	To Cape Broyle and stay.
September 6 to 9	Cape Broyle to Bay of Bulls, Newfoundland, and stay.
September 9 to 11	Bay of Bulls to Portugal Cove, Newfoundland, and stay.
September 11 to 13	Portugal Cove to Grand Banks, latitude 45° 12′, longitude 51°.
September 13 to 29	Third baiting.
September 29 to October 2	To Saint Pierre.
October 2 to 4	Saint Pierre to Arichat.
October 4 to 6	To Guysborough from Arichat, and stay.
October 6 to 8	Guysborough to Halifax.
October 9 to 12	Halifax to Gloucester; arriving at Gloucester at 3 a. m.

b. TABLE OF METEOROLOGICAL OBSERVATIONS MADE DURING THE CRUISE.

Date.	Latitude.	Longitude.	Time.	Temperature.		Meteorological remarks.
				Air.	Water.	
	° ′	° ′				
July 13	42 37	70 08	9.16 a. m.	65	64	Fine; moderate breeze.
14	42 53	67 30	4.30 p. m.	58	45	
15			12 m.	74	55	
22	46 06	56 41	12 m.	53	43	
23				56	51	
26			3.30 p. m.	55	50	
27	46 43	50 37	8 a. m.	50	50	
28	46 43	50 34	12 m.	55	50	
29	46 43	50 34	6 p. m.	53	51	
30	46 43	50 34	3 p. m.	56	54	
31	46 47	51 30	7 p. m.	55	53	Cloudy; fog in p. m.
August 1	46 46	50 07		54	52	
2	47 02	49 53	4 p. m.	59	52	
3	47 06	49 49	9 a. m.	59	53	Fog
3	47 06	49 49	3 p. m.	55.5	52	Do.
4	46 50	49 33	9 a. m.	57	52	Do.
4	46 50	49 33	3 p. m.	56	54	Thick fog.
5	46 49	49 37	9 a. m.	62.5	54	Fog.
5	46 49	49 37	3 p. m.	57	56	Do.
6	46 51	49 49	9 a. m.	60	60	
6	46 51	49 49	3 p. m.	63	57	
7	46 43	50 13	9 a. m.	60	60	Stiff breeze, cloudy.
7	46 43	50 13	3 p. m.	55	52	Rain; stiff breeze.
8			9 a. m.	56	54.5	Cloudy; stiff breeze.
8			3 p. m.			
23	45 04	50 33	3 p. m.	56		
24	45 04	50 33	9 a. m.	63	59	Fog; moderate breeze.
24	45 04	50 33	3 p. m.			Clear; light breeze, WSW.
25	45 04	50 33	9 a. m.	62	59	Fog; light breeze, SW.
25	45 04	50 33	3 p. m.			
26	45 04	50 33	9 a. m.		63	Fog.
26	45 04	50 33	3 p. m.		58	Cloudy.
27	45 04	50 33	9 a. m.	56	58	Clear; light breeze, NE.
27	45 04	50 33	3 p. m.	54	57	Clear; wind, NE.
28	45 04	50 33	9 a. m.	62	57	Clear and pleasant; light breeze, E. by N.
28	45 04	50 33	3 p. m.	65	59	Clear and pleasant; light breeze, E.
29	45 04	50 33	9 a. m.	55	57.5	Clear; stiff breeze, NE.
29	45 04	50 33	3 p. m.	57	59	Rain; rough sea; blowing SE.
30	45 04	50 33	9 a. m.	64	59	Clearing; fog; light breeze, SE.
30	45 04	50 33	3 p. m.	63	59.5	Thick fog; mist; wind, SW.
31			9 a. m.	56	55	Clear; light breeze, SW.

Date.	Latitude.	Longitude.	Time.	Temperature.		Barometer	Meteorological remarks.
				Air.	Water.		
	° ′	° ′					
September 13			9 a. m.	60	55	29.78	Fog; wind light, ESE.
13			3 p. m.	56.5	56.5		
14			9 a. m.	58	58	29.60	Fog; wind light, SE.
14			3 p. m.	60	60	29.60	Do.
15	45 12	51 00	9 a. m.	65	60.5	29.98	Light fog; wind light, SE.
15	45 12	51 00	3 p. m.	63	60	29.94	Do.
16	45 12	51 00	9 a. m.	64	60	29.95	Clear; wind stiff, W.
16	45 12	51 00	3 p. m.	65	63		Do.
17	45 12	50 44	9 a. m.	68	62.5	29.90	Cloudy; strong breeze, SW.
17	45 12	50 44	3 p. m.	68	61.5	29.90	Clear; strong breeze, SW.
18	45 12	50 42	9 a. m.	71	63	29.82	Clear; heavy breeze, SW.
18	45 12	50 42	3 p. m.	64	62	29.85	Clear; light breeze, W.

b. TABLE OF METEOROLOGICAL OBSERVATIONS MADE DURING THE CRUISE—Continued.

Date.	Latitude.	Longitude.	Time.	Temperature.		Barometer.	Meteorological remarks.
				Air.	Water.		
	° ′	° ′					
September 19	45 12	50 42	9 a. m.	64	61	29.96	Clear; light breeze, S.
19	45 12	50 42	3 p. m.	61	61	29.94	Fog; light breeze, S.
20	45 12	50 40	9 a. m.	62	62	29.92	Fog and rain; light breeze, S.
20	45 12	50 40	3 p. m.	64	62	29.86	Cloudy; light breeze, ESE.
21	45 12	50 38	9 a. m.	63.5	61.5	29.85	Thin fog; strong breeze, NW.
21	45 12	50 38	3 p. m.	60	62	29.96	Clear; moderate breeze, NW.
22	45 10	50 36	9 a. m.	60+	.....	29.96	Clear; stiff breeze, NE.
22	45 10	50 36	3 p. m.	.....	.....	29.96	Do.
23	45 10	50 10	9 a. m.	.....	.....	29.96	Do.
23	45 10	50 10	3 p. m.	63+?	.....	29.94	Cloudy; stiff breeze, SE.
24	45 18	50 25	9 a. m.	55+?	.....	29.86	Fog; moderate breeze, SE.
24	45 18	50 26	3 p. m.	60+?	.....	29.80	Fog; light breeze, S.
25	45 10	50 25	9 a. m.	60?	.....	29.68	Fog; light breeze, W.
25	45 10	50 25	3 p. m.	60?	.....	29.64	Clear; stiff breeze, SW.
26	45 11	50 25	9 a. m.	55+?	.....	29.86	Cloudy; heavy gale, N.
26	45 10	50 25	3 p. m.	60+?	.....	29.90	Cloudy; heavy blow, N. by E.
27	45 07	50 00	9 a. m.	55+?	.....	29.98	*Charming weather; light breeze, SE.*
27	45 07	50 00	3 p. m.	60+?	.....	30.18	Do.
28	45 03	50 05	9 a. m.	65+?	.....	30.18	Do.
28	45 03	50 05	3 p. m.	70+?	.....	30.06	Do.
29	.....	.....	9 a. m.	65+?	.....	30.00	Fine; moderate breeze, N.

c. NATURAL HISTORY OF THE FISH.

GENERAL APPEARANCE.—I did not notice that the Grand Bank cod presented any peculiarities in appearance. In point of size they averaged larger than specimens I saw taken inshore by the people in the various harbors of Newfoundland. I had no means of determining the weight of fresh specimens, but took numerous measurements of specimens brought on board the vessel. A few of these maximum, minimum, and average sizes are as follows:

Table of measurements (in inches).

Tip of snout to end of middle caudal rays.	Tip of snout to posterior end of supra-occipital.	Greatest girth.	Tip of snout to vent.
31	7.	14⅜	14¼
25½	6.	12⅛	11
24	.6	12⅛	12
41	.10	21	20
63	.16	35	28

The average length of the fish brought on board the vessel was 45 inches; some were caught and rejected because too small to be worth bothering with. These were in some cases not much over one foot in length. In the various harbors of Newfoundland I saw the people curing fish not over a foot long, and they never caught any as large as the average Grand Bank fish.

MIGRATION.—It is the opinion of the fishermen that the fish migrate at regular seasons. During October and later the catch of fish is very small. In December and January none are taken. Toward March those who go thus early to the Banks begin to take a few, and as the year advances the fishing steadily improves. Those who fish early in the year anchor their vessels on *the most southern and eastern edge of the Banks. Later, as the year advances, the fishing fleet* move further north and west, till finally in July most of the vessels are anchored in the neighbor-

hood of the Virgin Rocks, latitude 46° 27′, longitude 51° 6′. After this, as the year progresses, the vessels begin a movement back again towards the south and east, until at last those who have remained till November are again fishing on the very outer edge of the Bank.

This movement of the vessels and the facts regarding the fish were furnished me by the skipper. I believe they are correct. It is perfectly plain that, if they are true, there is a definite migration among the cod of the Grand Bank. Early in the year, during the first of March or a little later, a large school of fish moves in from the deep ocean waters and comes over the southern edge of the Banks. This large school is followed by others which drive the first comers further to the north and west until the season reaches its height. These fish move over the Banks, feeding on the places that are rich in the proper forms of life to suit the conditions of their existence. Later in the year a movement toward the deep water is initiated and continues until finally the large schools disappear.

To prove that the fish do migrate in this or in any other manner would require more observations than I could make. The men believe that they migrate in this manner, and on it base their own movements.

SCHOOL AND GURRY FISH.—The fishermen make a division among the fish, separating them into two groups called "school fish" and "gurry fish." The school fish are supposed to move over the bottom in large schools seeking fresh feeding grounds as fast as food became scarce in any of the regions where they have been fishing. The fish we captured during the first and second baitings were of this sort. They presented a plump appearance, looking very vigorous and healthy. They were, moreover, in large numbers in any one spot, and could not all be "fished out" in a single haul. The term gurry fish, on the other hand, seemed to be applied to the few stragglers who remained on the Bank after the larger schools had migrated. These had a thin and hungry look; their flesh was almost flabby. Nor did they kick about in such a lively manner when brought on board. It is supposed also that these fish will bite readily on gurry, or bait made from the "pea" and other intestines of the fish, and from this fact they have derived their name, while it is averred that the school fish will not take any bait save the very best. These gurry fish are thought by the men to be a body of stragglers which never leaves the Banks, but, instead of partaking in the usual migration, remain in small and scattered numbers, picking up a scanty living on whatever they can obtain.

As I have mentioned, in the paragraphs referring to bait, it is at present the habit to use only fresh bait until late in the year, when salt bait or gurry is used with some success. I saw this illustrated during our trip. In places where the fish had been biting well they fell off suddenly on the introduction of salt bait and gurry. During the second baiting, fishing had been excellent. We had been taking daily an average of 12 tubs when our bait became greatly deteriorated. The skipper then thought to try salt bait and gurry, and on the 30th day of August took only two tubs of fish. The same thing happened during the third baiting. These facts show that during the early season the fish are rather fastidious. I was told that later in the year, during October, they caught a few fish with gurry, and the skipper had with him 10,000 salted squid to be used at that time if he should remain so late.

SPAWNING.—The fish did not appear to be spawning during any of the time of my visit to the Grand Bank. The ovaries were usually quite small, having a length of not more than 5 or 6 inches, as a rule, and, indeed, to find them so large as that was rare. The eggs were very immature indeed. In one case did an ovary appear that was large and more natural than any of the others, but in this one case only were the fish anywhere near the time of spawning. That spawning at that time is infrequent I remember the better from the remarks of the men. When I inquired

for eggs in order to try eating some of them fried they replied *that they never found the pea so late in the year*.

FOOD.—The food of the cod is extremely various, and on account of this fact collectors have always paid much attention to an examination of their stomachs and been richly rewarded. The fish is liable to swallow almost anything that comes in its way, so that stories are by no means uncommon of jack-knives lost overboard returning to their owners again when the day's catch of fish was dressed. Invertebrates of many sorts are a favorite food, and other species of fish are often eaten. Of fish I noted only two species among stomach contents; the lant, *Ammodytes americanus*, was very often found and seemed to be very much liked by the fish. One specimen of *Cottus spinosus* was also observed. Among the invertebrates *Hyas araneus* was found in enormous numbers, from fifty to one hundred specimens being obtainable from almost every haul. Curiously the more common species of the genus *H. coarctatus* was not observed on the Bank by any of the crew. Numerous other crustaceans were also found. Among mollusks two or three species of *Buccinum* were found, *Fusus ventricosus*, *Pecten islandicus*, *Siliqua costata*, and sundry other species. Large numbers of *Thyone elongata*, sea urchins, and sea anemones also occurred frequently.

KINDS OF BOTTOM.—The habit among the fish of frequenting certain kinds of bottom and keeping away from others seems quite well recognized among the fishermen. The fact is always kept in view by a skipper when he is about to anchor, and when he does not know from his chart or by experience the character of the bottom, he makes a sounding, and from the greased end of the lead draws his own conclusions. Should this lead him to infer a bottom of bright sand, and one almost destitute of invertebrate life, he would not come to anchor. If the indications led him to expect hard rocks or shells, and hence the presence of "curios," he would regard it as a likely place for fish, and bring the vessel "to an anchor." The charts are usually constructed so as to show the character of the bottom at any part of the Grand Bank, and to the knowledge that he may gain in this way the skipper adds the knowledge of places that were good in former trips. He never anchored in a place blindly, in total disregard of the character of the bottom, and informed me of it in every station in which we fished.

THROWING GURRY OVERBOARD.—It has often been affirmed that the practice of throwing the gurry overboard had the effect of diminishing the daily catch. I did not observe that it had any effect whatever. By a reference to the tabulated statements of the catch made by the Victor it can be seen just how many fish were taken in each haul. It will be noticed at once, by a glance at this table, that the vessel, during the second baiting, remained in Station 11 from August 22 till August 30, making eight successive sets in the same berth. It is true that toward the end of this time the catch fell off. The same thing occurred in the first and third baitings, when the vessel made a berth every day, and is to be accounted for by the poor bait. After having remained several days in the bait-pen, the lower layers become so much deteriorated as to be almost worthless, and fail utterly of attracting the fish. In the second baiting, so long as the bait held out, the fish were captured, and the table shows a fair average haul each day, with such fluctuations as show that the gurry thrown overboard in the operation of dressing could not have made much difference in the numbers of fish taken.

FRESH VERSUS SALT BAIT.—I have elsewhere alluded to the relative efficiency of fresh and salt bait. I presume that it is not so much for me to say what are the tastes of the fish regarding bait as what usages I observed among the men. It is a very well known fact that the practice of using fresh bait is only a recent one among the Grand Bank fishermen. In former times salt clams and salt herring were used, and with good effect. To-day, however, the practice is almost,

if not quite, universal, of buying fresh bait where it can be most conveniently obtained and using it fresh. It is the unanimous belief of the men that the fish won't bite on salt bait during the summer and early fall. It is, hence, only fair to suppose that the fish at such times find so much invertebrate life on the bottom that only a tempting morsel attracts them, and they refuse salt bait because they are not hungry. That they do refuse the salt bait is an unquestionable fact. On our second baiting, we averaged thirteen tubs of fish daily, until the number suddenly fell. We tried salt bait, and, in place of thirteen tubs, took two. The same thing happened in one or two other instances. As soon as the fresh bait was replaced by the salt, there was no decent catch, even when, from past success, it was but fair to expect the ordinary success. Every fisherman to whom I spoke upon the subject gave it as his opinion that no fish could be caught on salt bait until the very last thing in the fall, and that it was useless to try it.

As to the question, "Do the fish prefer one kind of fresh bait to another, as, for example, squid to capelin," I cannot say very much. I did not have any opportunity of observing the use of any bait except the squid during my trips. Of the fact of the use of the different kinds of bait I have spoken under the subject of bait. What might be the result if one vessel continued using herring in August, when vessels anchored on every side were fishing with squid, I cannot say; from what I know of fishermen I don't believe that many would care to try the experiment, provided they could have either kind of bait at the same expense and trouble.

d. THE VESSEL AND OUTFIT.

FORECASTLE.—The vessel was a schooner, built at Essex in 1874. Her dimensions were as follows: Length, 76 feet 8 inches; width, 21 feet 8 inches; depth, 8 feet. Her tonnage was 70.91 tons, and she cost, when built, $8,000, but the owner says she could be built to-day probably for $6,000. In the extreme forward part of the vessel was the forecastle or living room of the greater part of the crew. Its shape was that of a triangle with two sides curved, and was the same as the shape of the bow of the vessel. On the sides of the forecastle were berths placed in two tiers, and six in number on the port side. On the starboard side were four, the place of the two farthest aft being used for an upright locker or dish-closet, and for some open shelves. On the inner sides of the bunks ran a board about one foot wide. This, on each side of the apartment, was pierced by a sort of trap-door, which, on being removed, allowed one to see quite an extensive store-room or locker, used for potatoes and other stores of that sort. The ledge forming the top of the locker was at such a height from the forecastle floor as to form a convenient seat, and, indeed was built, I suppose, to serve just that purpose. Passing up through the apartment from the floor through the deck above were the pawl-post and the foremast. Between these was placed a table so devised as to furnish the greatest surface possible, when open, and to occupy the smallest space when closed. In order to accomplish these ends it was made in two parts, the former of these, extending from the pawl-post half-way to the foremast, was fastened securely, and was immovable; the other filled the remaining space from the forward half to the mast. When not in use it was thrown up out of the way and folded around the foremast. The side of the table reached out toward the berths, and parallel to them so far as to allow one sitting upon the lockers to eat from it conveniently; and to prevent dishes from sliding off in a rough sea its edge was protected by a ledge extending all the way around it. The escape of dishes toward the table's center in rough weather was further prevented by a piece fastened along the table parallel to the edge and leaving the dishes in a sort of trough just wide enough to accommodate them.

These three concentric triangles—the berths, the lockers, and the table—occupy the largest part of the forecastle; some other points are, however, worth noticing. The after end of the room

is formed by the bulwark cutting it off from the forehold. Before the center of this stands the companion ladder, which leads to the deck. On the right of the companion the stove was placed; an ordinary large-sized stove, peculiar only in having a low railing placed around its top to prevent pots and kettles from sliding about in a heavy seaway. To the left of the companion was a passage-way into the fore-hold. A sliding door was placed at this gangway, but it was never used, so that I was ignorant of its existence until I had spent two months in the vessel.

For storage room in the forecastle the locker just aft the starboard bunks is used for dishes, knives, forks, spoons, &c. Between this and the fore-hold bulkhead were some open shelves, on which some of the provisions, as beans, peas, tea, and coffee, were kept. The horizontal locker spoken of as passing around inside the bunks was used for vegetables, as potatoes, turnips, &c. On the starboard side aft this ran only as far as the upright locker, and before the shelves was replaced by a low shelf pierced with holes, on which tea and coffee kettles were stood. Finally, one more locker was placed upon the horizontal locker against the bulkhead and beside the doorway into the fore-hold. This rose as high as the deck above, and was used for the temporary storage of the food that had not been eaten at the regular meal. It was usually kept well supplied with bread, cake, or pie, and meat, so as to furnish a lunch to any one who might be hungry between meals.

FORE HOLD.—The gangway from the forecastle passed into the fore-hold. It was not a separate part of the hold, but merely a small space divided from the hold by a tier of barrels reaching one above another nearly to the deck. This little barrier of barrels, containing water, meat, flour, kerosene, &c., left a sort of space clear for the storage of other supplies and for some of the operations of the steward. The right side of this space was occupied by a bin containing coal for the galley stove. Against the port side of the vessel, were shelves for lard and butter tubs and sundry other smaller stores, while barrels of pork, beef, and knuckles stood beneath the shelf. Just in front of one as he passed through the gangway from the forecastle stood a barrel of flour and sugar. A large bread-board placed across the top of one of these furnished him a table for making bread or cake.

MAIN AND AFTER HOLD.—I have spoken of the fore-hold as if it were a distinct part of the vessel. In one sense it is, though its separation from the other parts of the hold is not by any such clear boundary as a bulkhead, but by a mere tier of barrels. The remaining space of the hold was divided into the "main" and "after" hold by an imaginary line, which was not, so far as I ever learned, generally agreed upon, but which practically cut the center of the mainmast. The main-hold, entered from the deck by the main-hatch, was a large space, not subdivided by partitions into compartments, and extending aft from the fore-hold as far as the mainmast or thereabouts. The remaining space of the hold formed the after-hold. In its afterpart this hold was divided up into pens for storage of bait and ice. A few partitions also extended from the sides toward the vessel's center in the remaining part of this hold. These made very convenient little compartments for the storage of salt during the outward voyage and later in the season were filled with fish. These holds in the vessel, as in all the fishing schooners, occupy the largest available space possible, and encroach so much upon the forecastle and cabin as to make them very much cramped up. The hold of our little schooner—one of only 70 tons—could carry with ease one hundred and forty or even one hundred and fifty thousand pounds of fish.

CABIN.—The extreme afterpart of the vessel was occupied by the cabin, an apartment 9 or 10 feet long by about 7 wide. The entrance to the cabin was by a companion ladder in the center of the after end of the room. In the center stood a stove; directly in front of this and against the bulkhead was a locker, used as a receptacle for tools and nails, and its top provided with a leaf

that could be made to serve as a table. On the top of this tool-locker stood the medicine-chest. On each side of the cabin were two bunks, and around the cabin in front of these bunks ran a low locker seat, the interior of which was used as a receptacle for leads, hooks, and other fishing gear. Under the two forward bunks was also a space devoted to the storage of rigging and fishing gear, and still more room was obtained in a small space aft of the cabin, under the vessel's stern. In order to make the cabin higher than would be possible otherwise, its ceiling is a sort of box placed on the quarter-deck, called the house, and too well known in sailing vessels of every description to need further notice. Under the cabin floor was a small coal bin, reached by a hatchway.

The furniture of the cabin was not extensive. Upon the forward bulkhead, in the center, hung an octagonal eight-day clock, and to starboard of this an aneroid barometer. Below the clock was a kerosene lamp depending from a nail, but so contrived that when set upon a table it would swing upon pivots and maintain a vertical position despite the rolling of the vessel. On a couple of hooks above the aneroid usually hung the charts. On either side of the companion way was a large mariner's compass, so placed as to be visible to the man at the wheel through a hole cut in the after-side of the house. One of these was less sensitive than the other and intended for use in heavy weather. The starboard binnacle was the one most commonly used. This was illuminated at night by a lamp, arranged for universal motion by swinging on gimbals.

Four men slept in the cabin, selected by lot. The captain gave up his bunk for my accommodation, and "turned in" in the port bunk with one of the men, while the two after bunks were occupied each by one man. To sleep in the cabin was not regarded as any sign of rank, and, indeed, some even preferred to sleep in the forecastle. The cabin folks went forward to their meals, and those from the forecastle came aft to chat when there was no work to be done and when they couldn't sleep, and the greatest harmony prevailed at all times between the forecastle and the cabin.

THE DECK.—In the extreme forward parts of the vessel's deck are placed the anchors, cables, and windlass. Aft the foremast is the little house that covers the companion-way into the forecastle. On the starboard side of this is the funnel from the galley stove, while on the port side 200 fathoms of the strongest hawser are coiled. Placed on edge on the main deck are thick planks, fencing off shallow compartments, and called "checker-boards." These serve to keep the fish, when thrown on deck, from sliding back and forth with the rolling of the vessel and becoming bruised. Two hatches pierce this deck: one just aft the forecastle companion leads into the fore-hold, and in fine weather is always covered with a grating of wooden bars; the other, the main hatch, leads into the main-hold. These hatches are usually open in order to furnish ventilation, but in wet weather or heavy sea they are closed and made water-tight by tarpaulins fastened securely over them. In the waist of the vessel, on either side, are piled the dories, one inside the other, and the lower one always held in place by lashings fore and aft. Besides these belongings to the main deck, several barrels, containing water or provisions, were placed between the fore and main hatches and securely lashed. A small gun, called by the fishermen a "swivel," was also placed between the main hatch and the starboard dories, and was used in foggy weather to signal to the dories the position of the schooner.

On the quarter-deck was a row of large butts (ordinary molasses hogsheads), called "gurry-butts," fastened in front of the house. These, three in number, were used for storing the fish livers. The center of the quarter deck is taken up with the house, with a narrow space left on each side for a gangway. On the house a very characteristic structure was observable. A thick plank ran around the sides and after ends as far as the companion, scarred as if by innumerable choppings with a knife. It was on this plank that the bait was cut into pieces of the proper size.

On either quarter-rail, just aft the main shrouds, two pieces of joist were fastened. These were supports for the splitting tables. The steering apparatus was a wheel, which, with its box, was placed exactly opposite the cabin companion-way.

ORDINARY FORM OF RIGGING.—In her rigging the vessel did not vary much from other fore-and aft schooners. She carried fore and main sails, one jib, gaff-topsail, and staysail. Besides these sails of ordinary type was a sail devised for keeping the vessel's head to the sea when riding at anchor on the Banks, and hence called a "riding-sail." This riding-sail is triangular in shape, and of the pattern known in some places as a "shoulder-of-mutton-sail." At all times, save when the vessel is fishing, this sail is stowed in the hold. When the vessel is at anchor on the Banks this sail is set in its place. The mainsail is furled in the ordinary manner, and the head of the riding-sail is hoisted to the head of the mainmast. The luff is secured by ropes passing around the mast.

To the fisherman this sail is invaluable. Lying at anchor, as the vessel does, she must have her head brought to the sea and wind in some way or the rolling is extremely inconvenient. While on the Bank the riding-sail was not usually taken down, and, in case the skipper desired to shift a berth, this sail, with the foresail and jib, were enough to give the vessel proper steerage way, and, indeed, a respectable speed. When the mainsail was needed for any long passage the riding-sail was taken down, unbent, folded up, and stowed away. When the vessel is anchored on the Banks with her riding-sail set, she is sometimes said to "have gone to housekeeping."

SEAWORTHINESS AND SPEED.—Builders manage to make their models not slow and sure, but often very fast. The secret of their speed lies in the enormous surface of sail they spread out to the wind. Knowing how stiff a boat he has, the skipper is not afraid to carry sail in a strong breeze, and often can make a record of which no yachting man would feel ashamed. Our sailing last summer was often very exciting. The run from Arichat to Cape Broyle we made in forty hours, and we logged 11 knots an hour during part of the first night; nor was this a very unusual rate of speed, for we attained it on several other passages. I was told, also, of one vessel, which, during the fall of 1877, in a run from Canso home, logged 13 knots an hour during seven consecutive hours. Nor is this high speed unusual among the fishing smacks, so that often they overtake merchant vessels that happen to be running the same course, and leave them to drop out of sight astern. Their best point of sailing, however, is generally by the wind, as they lay very close.

The navigating of the vessel is part of the skipper's duty, and is sometimes a very crude sort of navigation. He has with him one or two charts, a pair of parallel rulers, a log, and sometimes a quadrant. The chart covers the region from Cape Cod to longitude 40° or thereabouts, and, after the plan of the best charts, is spotted with compasses on which the variation of the needle is allowed for. By referring to these, in laying out his course, the skipper is saved all mathematical computation by doing all his reckoning by reference to the magnetic meridian. Our log was a patent one and gave very good results. The skipper always used this in reckoning his distances from land, and made occasional quadrant observations also for determining his position, but these latter did not succeed as well as the log. One cause of the mal-success was, perhaps, that he referred to almanacs, distributed gratis, for his declination.

Yet the skippers, though they run a good deal by guess, have coasted along shore and over the Banks so much that they seem to find their way with comparatively little trouble. As we ran in to Saint Pierre I saw an illustration of this. I was on deck at midnight, and the skipper said the red light of Saint Pierre ought soon to appear. We kept on NW. some time longer, but the light did not heave in sight. Finally, some two or three hours later, since the light did not yet

come in sight, the skipper changed the course to north. In an hour or two after this the light appeared on our starboard bow. A very little longer to NW. and we should have missed it entirely.

DESCRIPTION OF DORY.—The dory may fairly be said to be one of the safest forms of small boats. *It is a flat-bottomed boat*, sharp at the bow, but with the sharp point of the stern truncated, and with very flaring sides. In cross-section it is a flat-bottomed letter V. In longitudinal section it is elliptical, sharp pointed in the bow, and cut square across astern.

They are a lap-streak boat, provided usually with three seats, and having thole-pins in place of stationary row-locks. To the bow and stern are fastened painters, to be used in retaining the dories by the vessel's side or in securing them on deck. The seats are not fastened in, but are merely laid upon ribbands running round inside the dory and nailed to the ribs, in order that they can be easily removed when the dories are to be placed on deck "spoon-fashion." In the bottom of the dory is a plug, kept in the dory by a rope. This rope passes through the plug, and is held from slipping by a large bight in its end. It is manifest that this bight is far more than is necessary to keep the rope from slipping through the plug. It has another and more important purpose than that. When the dory is overturned in the sea and her bottom lies upward, the smooth surface presents nothing to which the struggling fishermen can cling. This bight is the only thing projecting through the bottom of the boat, and while not a very firm support, has doubtless formed the sole dependence of more than one poor fellow. I heard of a narrow escape before this bight was thought of. One dory was overturned in a hard storm; one of the occupants was at once washed away and drowned; the other managed to force the plug out of the hole, and then continued to hang on all night by putting his fingers into the hole. In the morning he was rescued, his fingers worn to the bone from the chafing.

SHIP-CHANDLERY.—In preparing for a voyage every want must be anticipated and prepared for. Although the fishermen are not very distant from land, yet that land is not the place in which to procure supplies at low cost, or, indeed, at times at any cost. All needs of rigging must be supplied. The halyards and sheets must be strong, the sails looked to and their weak spots examined. Spare anchors, cable, extra blocks, ropes of various sizes, bolts, chains, and all the other hundred things that belong to a vessel must be placed on board. The tool-chest must be looked over, and a good supply of nails, screws, &c., taken on board. The medicine-chest must also be overhauled and the medicines ascertained to be present in the proper quantity.

GEAR FOR FISHING.—Besides providing a full set of the various ship-chandlery, all the lines, hooks, and other material necessary for constructing trawls must be taken, and a supply of *the implements used in trawling and in dressing fish. Three kinds of line* were used in the construction of the trawl; also hooks, small iron anchors, and buoys for indicating the end of the trawls. Dories, wood for dory plugs, thole pins, thwarts, and spare oars to supply broken ones, hooks and lines of proper size for catching bait if a chance were offered, knives for bait-cutting, dory knives, splitting knives, and throating knives, gaffs, gob-sticks and pews, tubs for trawls, dressing tubs, splitting tables, nippers, rollers, powder for the swivel, a horn and a bell for fog, are among the thousand things to be looked to before the vessel's departure.

SALT AND ICE.—For the preservation of the fish a large amount of salt was carried—in our case 160 hogsheads—stowed away in the hold, and there being very useful as ballast. This was coarse salt, of the kind known as Trapani salt. This salt, the skipper explained, was of a better quality than Cadiz salt, which is used somewhat, for he claimed it was coarser and stronger.

Besides salt, the vessel's outfit also included ice. This is purchased at home by vessels fishing near Gloucester, but the Grand Bankers generally expect to obtain the ice that they will need either at Nova Scotia or Newfoundland. In the former place we obtained a supply at the rate of $2.50

per ton, but were forced to pay for what we had in Newfoundland at the rate of $4 per ton. The "baiting up" of fishermen has grown into such an enterprise, that in nearly every hamlet some one, or often two, preserve ice to sell during the fishing season. As to the amount of ice used, 4 tons is enough to preserve 40 barrels of bait during a period of from fourteen to eighteen days. The melting of the ice is much hastened by the salt atmosphere in which it is kept, so that it would seem that, were the ice-pen made tighter and so as to allow less ventilation from the hold, the ice, and bait too, could be preserved much longer.

PROVISIONS.—In addition to these supplies were also the provisions, which must last the crew during their entire stay. For, although it would be possible to purchase in Newfoundland any provisions, they would be obtainable only at very great disadvantage. I append a list of the *stores furnished to the vessel as it was given to me by the steward:*

Articles.	Quantity.	Articles.	Quantity.	Articles.	Quantity.
Beef ..... *barrels*	5	*Baking powder*.. *dozen packages*	4	*Dried peas* ..... *bushel*	1
Pork ..... barrel	1	Hops ..... pound	1	Essence lemon ..... dozen bottles	2
Pigs' knuckles ..... do	1	Brown sugar ..... pounds	350	Raisins ..... boxes	4
Butter ..... pounds	200	Molasses ..... barrel	1	Pepper ..... ponnds	2
Lard ..... do	150	Tea ..... pounds	20	Salt ..... bags	3
Flour ..... *barrels*	5	*Coffee* ..... *do*	15	*Mustard* ..... *pounds*	2
Rice ..... bushel	1	Condensed milk ..... dozen cans	4	Cloves ..... pound	1
Oatmeal ..... do	½	Onions ..... bushel	1	Ginger ..... pounds	2
Indian meal ..... pounds	20	Potatoes ..... bushels	10	Cassia ..... pound	1
Hardtack crackers ..... barrel	½	Beans ..... barrel	1	Sage ..... boxes	4
Corn starch ..... papers	12	Dried apples ..... do	1	Nutmegs ..... pound	½
Saleratus ..... pounds	5				

From a glance at this list one can see that a good cook could prepare excellent fare for our men. Their fare was very good indeed, far better than I ever saw among the Newfoundlanders, or even the Nova Scotians. Some fresh provisions were, of course, wanting, that landsmen could have, but our bread and butter, and, indeed all our fare, was very much better than that of the folks ashore. I was surprised to find our men living so well and spoke of it, asking if all the fishermen *fared as well as they. In answer to this I was assured that in our vessel the living was only* average, and that some lived even far better, because, being more inshore, they had more frequent chances to obtain fresh provisions.

In addition to having the care of providing these provisions, the cook was also responsible for securing an abundant supply of wood and coal and the further light stores included in the following list, viz: Kerosene, 1 barrel; burners for lamps, ½ dozen; burners for lamps to be used without chimneys, ½ dozen; wicks, 2 bunches; stove-polish; matches.

WATER.—By far the most important store carried in the vessel is water. This is usually carried in barrels stowed about the deck and in the hold, though in some cases a tank is built in the vessel for its reception. On departing from home a vessel takes on board a supply large enough to last several days, relying on Newfoundland for a general filling up. *In Gloucester the water is purchased* from an *aquarius*, who plies about the harbor in a boat called the *Aqua pura*. The hold of this boat is one immense tank, filled from the city hydrants, and from it the water is pumped into the barrels of the schooner. Judging from the taste of the water and the untidy appearance of the *Aqua pura*, one might think that the waterman was not quite as neat about his water-tanks as could be desired. In fact, to a landsman the water he supplied was absolutely disgusting, so that the thought occurred to me that some arrangement in Gloucester for supplying that enormous fleet of fishermen with good, pure, fresh water, and that, too, conveniently, was an imperative demand.

In Newfoundland the water is obtained directly from mountain streams that everywhere run down over the rocks into the sea. The process of filling, which is somewhat interesting, is described elsewhere.

c. APPARATUS AND MODE OF USE.

GANGING HOOKS.—In the early days of this fishery, and down to quite recent times, the modes of fishing were very different from those in vogue at present. Trawling, the method now most universally followed, was not till recently introduced, and the old fashion of hand-lining prevailed. Of late, however, the idea of connecting a large number of hooks into one string and letting these all fish at once has superseded the old method of one line, or at most two, to each man, and with the best results. In preparing the trawl the crew usually worked together, sitting on the deck in any convenient place during our beautiful July days in the Gulf of Maine. The helmsman at such times lolled on the wheelbox and watched the busy fellows, lending a voice now and then to the small talk and often spinning a yarn for the others' benefit. The first operation in trawl-making was "ganging hooks." The day after our departure was Sunday, and the men abstained from work, but early on Monday morning they brought out the "gear" and prepared for work. The "ganging line" was first cut into pieces 3 feet in length. Provided with a supply of these gangings, and with a stock of No. 14 cod hooks, each man began fastening a hook to the end of the line.*

The hooks, after being ganged, are "moused," to prevent them from catching into one another, and then laid in a pile until the pile contains 300 hooks. They are then fastened in a bunch and another pile is commenced. By mousing the hooks is meant winding the ganging line two or three times round the hook toward its point.

FASTENING GANGINGS TO THE GROUND-LINE.—The share of each man in the ganging of hooks was 750 hooks. This number most of the crew finished in a single day. On the following day, which was Tuesday, the work of the crew consisted in fastening the ganged hooks to the ground line. This was strong tarred cotton line. At intervals of every fathom the free end of a ganging was joined to this ground-line. They parted the strands with a sort of small marline-spike, called a "pricker," passed the ganging through the hole and then made the knot.

Though this method of attaching the gangings to the ground-line was used altogether by our crew, they told me of another knot not unknown among cod-fishermen, but in common use among "haddockers." In making this a bight is first formed in the end of the ganging and laid upon the ground-line. The short end is then wound two or three times around both ganging and ground-line and passed through the bight. Finally, a heavy pull on the long end of the ganging draws the bight tightly over the short end and keeps the whole knot firmly in position. I was told that the knot first mentioned was usually preferred, because it was impossible for this to slip along the ground-line, while the latter knot at times gave trouble in that manner.

The ground-line was in sections, each three hundred fathoms in length, and each dory was expected to prepare as its equipment five of these "strings." For convenience, each one of these sections was kept in a tub, made by sawing off a barrel at the first hoops above the middle. In some cases two tubs were made from one barrel, when barrels were scarce, but it is the fashion to make only one good, "high-toned" one from one barrel. From the fact of one section being always coiled away in one tub, the terms "tub-o'-trawl" and "three hundred fathoms of trawl" mean the same thing. Very often the fishermen used the term "tub-o'-trawl" as a unit of linear measurement, estimating objects as distant "six tubs o'-trawl," &c.

* The method of ganging hooks for cod trawls is described in the chapter on Apparatus.

ANCHORS, BUOYS, &C.—In order to make the trawl complete it was now provided with an anchor for each end, with a line running from the anchor to the surface, and with a buoy to float there and mark the position of this line. The anchor was of iron one inch in diameter, and provided with two flukes and the ordinary stock of iron belonging to small anchors. The buoy-line, of strong tarred manila, was usually 10 or 20 fathoms longer than the depth of water in which they were fishing, or from 40 to 50 fathoms in length. The buoys, of which there was one for each end of the trawl, were kegs made for the purpose, of small size, and pierced by a staff that extended two or three feet beyond the buoy on each side. To one end of the staff was usually attached either a small flag of canvas or a "black ball," made of a circular hoop of iron or wood, covered with canvas and painted black. Each trawl had one buoy thus marked with a black ball, and this was called the outside buoy. The other, furnished with a flag, was called the inside buoy. Of this trawl the crew, by industriously working, prepared in two or three days 7,500 fathoms, or over 8 miles of trawl-lines.

MODE OF SETTING TRAWL.—The trawls were set in the evening, provided the sea was not excessively rough, and left during the night to catch what fish they could. In addition to the night set, the fishermen, when fish are plenty and the supply of bait good, often make a set during the day-time, or some times, too, by a process called underrunning. In our case, however, lack of bait and scarcity of fish prevented day sets from being feasible oftener than on one or two occasions.

Every night, immediately after all hands had finished their suppers, the dories were loosed from the davits, whence they had been towing astern, and hauled alongside. They were held there by the cook and skipper, while the two men belonging to each dory put into it the five tubs of trawl, the anchors, buoys, and buoy-lines. Then, watching their chance, for the schooner and dory both rock, and in opposite directions—one rising as the other falls—they tumbled into the dory and grasped their oars. They now pulled straight away from the vessel, each one in a given "berth," which he draws by lot. These berths were in lines running from the vessel as a center in five different directions. When they had pulled a certain distance, far enough, they said, so that their buoy-line wouldn't get "afoul of the cable," one man, the one in the after part of the dory, shipped in his oars and fastened the line of the inside buoy to its buoy, then threw the buoy overboard into the sea. The bowman rowed steadily away from the vessel, directing his course by the direction of the wind or sun if it were clear, or in a fog by an instinct, or a knowledge gained by long experience, which seems to guide the fishermen on the sea as a hunter is guided on the prairie. The buoy-line is now thrown over as fast as possible, but at the same time carefully overhauled to guard against any "snarls" that might be in it. The end of this line was fastened to an anchor, and the end of one tub of trawl was at the same time "bent on" the anchor. The anchor was now thrown over and the trawl overhauled hook by hook and thrown after it. No two hooks were allowed to "foul" or to catch into one another, and if they did they were hauled aboard and separated. I was told that this was to prevent the ground-line from being parted. Two hooks so caught must lie against the ground-line, and any shark or other animal in biting at the hooks would be almost certain of snapping the trawl in two. At the end of each tub another tub was bent on and finally the anchor and buoy-line. Last of all the black ball was fastened to the staff of the outside buoy and then the buoy thrown over to mark the outer end of the trawl.

By the time all this had been done the dory was about two miles distant from the vessel. If the night were a clear one the vessel could be seen low down in the horizon, her hull almost out of sight. In this case the row would be a delightful one. Very often I used to lie in the dory's stern and watch the tossing blue water, and the play of colors reflected from the sunset on the

spray from our oars, for it was my habit to go out with the dories nearly always in order to watch the men, to hear their talk, and to enjoy the excitement of a row in the little dory so far from any vessel and from land. In case of fog, however, and this was very often the case, the prospect was vastly different. At that distance nothing could be seen and nothing could be heard, but the men seemed to know just where they were, *and, in the most perfect confidence, pulled lustily into* the thick fog-bank. During this time the skipper, on board, has been ringing a huge fog-bell. As the dory drew near the vessel, within a distance of one or two tubs of trawl, this was heard as a dull and very distant muffled sound; by degrees, as they drew nearer, the sound became better defined, and finally the outlines of the vessel loomed dimly upward. At the first hearing of the fog-bell the men were much puzzled to know from what point the sound proceeded, but by listening intently they were finally able to guess nearly, and by further rowing to take the right direction. When once alongside, the dory was hauled on board by tackles, hooked at each end, and deposited in its place for the night. After this had been done the men took the bearing of the outside buoy, not by seeing where it was, for at that distance the black ball was absolutely invisible, but by an inference from the direction in which they had returned to the vessel. The necessity of this is apparent, as during the night, with changes of wind and tide, the vessel may alter her position and by morning point to some other quarter. Then he, who on the evening previous pulled away from the bow to set his trawl, may in the morning have to pull out from the stern in order to find it.

The time spent in setting the trawl and getting back to the schooner was usually one hour, and on clear nights the dories came in and were hauled on board just as the sun was dropping out of sight in the western ocean.

METHOD OF UNDERRUNNING.—In the Report of the U. S. Fish Commission for 1871–'72 a method of trawling is described which is not the one ordinarily followed on the Grand Bank, but a variation from it used because of its convenience in certain cases. This method is termed "*under-running*," and its advantage is that it permits the removal of the fish from the hooks and the baiting up of the hooks in a single operation, thus saving a good deal of labor. But a very slight change in the form of the apparatus is necessary for use in underrunning, and the set is made in the same way as the set for hauling. Instead of fastening the ground-line to the anchor-ring the fisherman fastens it to a stone and this stone to a line running some distance and then joined to the buoy-line. In hauling, the buoy-line is pulled up until this line running to the stone is reached. This is then pulled and the anchor is not disturbed. Finally, when the trawl begins to come in *it is hauled over the side of the dory* by one man who removes the fish and the hooks baited up and thrown over by the other man. In this way they haul, bait up, and set the trawl in one single operation. Underrunning is used when the fish are abundant, but as this was not the case during any part of the trip last summer, I never saw it employed and describe it only from hearsay.

MODE OF HAULING THE TRAWL.—At an early hour in the morning the men turned out to their breakfast and at sunrise hoisted their dories over the side and prepared for hauling. The thwarts were fixed and the oars laid across them, the five empty tubs were *placed in the stern, the* dory-knife and the roller and the nippers were looked to, also the gaff, the gob-stick, and the bailer, and when all these were found to be present the men tumbled into their dories and pulled away in various directions, according to the bearings of their outer buoys. After pulling about one mile they usually began to look for the black ball, on a clear day, yet, even if it did not appear, they continued to row in the same direction until it came in sight. Having reached the buoy the bowman hauled it in, and, catching the buoy-line, allowed the buoy to tow alongside. Throwing the

buoy-line over the roller, a large wooden spool, that allowed the trawl to be rolled over it with very little friction, it is hauled in steadily hand-over-hand and coiled up by the dorymate. During this and all his other hauling the fishermen protected their hands by nippers, a sort of woolen ring, covering the palm of the hand and creased in the center to allow a firm grip on the line. The anchor finally came up, was unbent, and then the trawl began to come in. This was now coiled away in the tubs as fast as it was hauled and the fish taken off at the same time by the dorymate. As fast as the fish came in they were disengaged from the hooks and taken into the dory. The manner of loosing them from the hooks was very simple and easy enough for the fishermen, though somewhat uncomfortable for the captives, I should imagine. The fish was dropped into the boat and brought up short with a sudden jerk, which in most cases tore the hook out of the mouth. In some cases, however, the hook was swallowed and caught so that no amount of pulling loosened it. In this case a "gob-stick" was brought into service. The cut in the end of the stick was placed over the hook and the hook pressed downward and easily withdrawn. In some cases fish were so loosely hooked that they escaped as they were drawn up to the surface. At such times the fishermen seized the gaff in great haste and often succeeded in hooking it into the fish's body and drawing him on board before he had escaped.

Of useful fish, the catch of the trawls was mainly cod, though haddock and halibut were occasionally taken. The haddock were sometimes made into a chowder, but save in this manner no use was made of them. The halibut were usually salted down with the other fish, and of the small ones some were cooked for our meals. I know scarcely any fish more delicious than a chicken-halibut fresh from the water, and when we were fishing I consumed a couple of fine steaks every morning for my breakfast. In addition to useful fish we caught also large numbers of skates and "sand-stars." All these were objects of execration as often as they appeared on the hooks, and were usually unceremoniously loosened from the hook by an angry slat against the dory's gunwale.

Besides the fish observed, numerous invertebrates were also brought up from the bottom upon the hooks. Of all these I made collections, which have since been studied, and the results will be published in another place.

In case the fishing was good the dory would not be able to carry in at a single trip all the fish that her trawls had captured. At such times of good fortune an anchor buoy-line and buoy were bent on when the dory was loaded and left to mark the trawl, while the dory returned to the vessel to unload.

When finally the dory had taken in her last fish and hauled in the inside anchor and buoy she was pulled alongside the vessel. The cry of "Dory!" summoned the cook and skipper on deck, one to hold each painter while the fish were thrown on deck. The men first unloaded their tubs and other trawl gear, handing them aboard to the skipper at the stern, who slides them down the quarter in a row against the rail. The men then pitch the fish on board with a "pew," a sort of one-tined pitch-fork. This was stabbed into the body of the fish, which were pitched on board much as a farmer would toss hay, and with fully as much unconcern on the part of the fisherman. After the fish were thrown on deck the dory was fastened astern, or, in rough weather, hauled on board, to prevent its getting adrift.

It was the rule to haul from the outer buoy inward toward the vessel, and this rule was followed when possible. The reason for this is evident. In some instances, however, the men failed to find their outside buoy in the dense fog. These rowed back to the vessel and then began to haul from their inside buoy. It was not often that this occurred—a really surprising thing when one recalls how very small an object the black ball is to row for and how very easily missed in a dense fog.

After the evening set the dories were invariably hoisted on board and stowed in nests, one inside the other. The dories were hoisted on board by tackles, the hook at one end being caught into the bow-painter of the dory, while at the other end it was hooked into the stern becket. During the daytime, in fine weather, the dories were allowed to tow astern, in order to save the trouble of hoisting them aboard twice during the day.

ACCIDENTS TO THE TRAWL.—There are several ways whereby the trawl may receive injury, and sometimes injury severe enough to compel the owner of it to make a new string. Of these accidents one of the most common is to get the trawl "hung up." During a rough and stormy night the trawl may be swayed about enough to entangle itself in the rocks on the bottom and to resist all attempts at tearing it loose. In this case, the most common practice is to begin hauling from the other end, in the hope that from the opposite side the trawl may be pulled clear from its obstruction. This is occasionally successful. Sometimes, however, the trawl is caught in two places, and when this occurs the part between the obstructions cannot be easily reached. When the trawl is thus hung up the fisherman is compelled to part it, which is done by pulling until it parts or by a hack with the dory-knife.

If the trawl be out during a heavy storm, so that it is dragged about by the roughness of the sea, it is frequently chafed badly, and in some cases actually broken, by the grinding upon the sharp rocks. This happened to our trawls during our last baiting. The trawls were left out all one stormy night and day. The sea was very rough, so that the trawls were washed about very badly, and when they were finally hauled every dory found the trawls parted, and some had lost two or three tubs.

Besides being cut up in these ways, the trawls also sometimes suffer from the attacks of sharks or dogfish, which snap it in two with a bite of their sharp-teeth. To guard against any temptation to this, the men never allow the hooks to go down fouled so as to lie upon the ground-line, lest the fish, in taking the bait, cut the ground-line. Sometimes, where several vessels are fishing near one another, one trawl will happen to lie directly across one from another vessel. If then the owner of the under one should haul first he would bring up the upper trawl lying across his own. When this happens he is very liable to take his knife and cut his neighbor's ground-line, unless he be an extremely kind-natured fisherman.

Sometimes the vessel, in swinging around, gets the cable around the buoy-line. As she farther swings around something must give, and if the trawl be fast on the bottom in any way the buoy-line is broken in two. To avoid this, the trawls are seldom set close to the vessel, the inner buoys not being dropped till the dory is well clear of any place the cable can reach.

The men would always venture out in worse weather to haul their trawls than to set them, for they feared in bad weather that the vessel might get adrift in some way, and then they might lose the trawls entirely. I remember of one case where a vessel broke her cable and drifted some distance before the crew became aware of it. These men tried to find their old anchorage, but, though they spent several days in cruising over the spot, they lost the whole of their gear.

f. THE CARE OF THE FISH.

UNLOADING THE DORIES.—Usually between 8 and 9 o'clock in the morning the loud cry of "Dory!" brought the skipper and the crew from the interior of the vessel, often interrupting a pleasant morning snooze. The dory from which this cry had proceeded was pulled alongside the vessel amidships, and there kept in place by the cook's hold upon the forward painter and the skipper's on the stern painter. Meanwhile the fish were thrown upon the vessel's deck by the two men in the dories; pitched up heartlessly over the side by a pew, and often falling heavily

upon the upturned edge of the plank forming the checker-boards. As a rule, most of the dories reached the vessel at about the same time, and unloaded their cargoes as fast as there was a place for them to haul alongside. In some instances, however, one dory, or two, might be unusually delayed by a larger haul, or missing the buoy, or various other causes of detention. When a dory was unloaded it was allowed to float astern, being made fast by a hitch of the painter around the davit.

APPARATUS.—The operation of dressing began after all the men had returned to the vessel, excepting, occasionally, when one dory might be unusually delayed. In dressing the fish the crew were divided into two parts, each of which performed similar operations. Their apparatus was extremely simple, consisting of a large tub and a table; also the requisite supply of knives to be used in cutting up the fish. The tub was a large hogshead sawed off somewhat above the middle. The table, which was capable of being removed at any time, was composed of several boards held together by cleats upon the lower side. This table, as well as the tub, was placed by the vessel's side. At one end it was supported by the rail of the vessel, confined there by a piece of joist nailed to the rail and fitting between two flat pieces of board securely fastened to the table, and separated from one another by the width of the joist. The inner end of this table was supported by a board which ran from its under side to the angle of the deck and the vessel's bulwark. On the side of the table on which the tub was placed was a cleat, standing two inches high, which served to prevent the fish and the viscera from falling while the dressing was being performed, and in the center, toward the inner end, was a second cleat used to hold the fish during the work of the splitter.

In order to escape the inconvenience of left-handed movements the relative positions of the tub and table, and positions of the men in splitting, were on one side the reverse of those on the other. On the starboard side the two stood between the house and the bulwarks, the table just aft the main rigging. On the port side the table occupied the same position, and the tub stood just under the main rigging.

Two kinds of knives were used for the different operations. The throater was provided with a sharp-pointed and strong keen-edged knife of fine steel. The splitter had a knife rounded on the end with curved blade and of very fine steel. These knives were different from the bait-knives, the latter being of more varying kinds.

THE PROCESS OF SPLITTING.—When all hands are in readiness to dress the fish, the splitting tables are taken from their perch on the liver-butts and fastened up in their places. The tub is also put in its place ready for the header. One man, called the "idler," now fills the tubs, and then active work begins. The "throater," standing by the side of the tub farthest from the table, now takes a cod from the tub, seizing the fish's jaw in his left hand. He lifts the fish up to the edge of the tub and poises him there, belly upward, on the supra-occipital bone. With the well sharpened and pointed knife in his right hand, he makes a transverse cut across the throat, just behind the gills. Introducing the knife at this opening he cuts down the belly, laying open the abdominal cavity, and making also one cut on each side downward he separates the head from the sides, and, with another, separates all the viscera of the belly from those of the head. Finally, still holding the fish thus poised, he presses with his right hand upon the fish's belly, and breaks off the body from the head at the first vertebra. The fish then falls into the tub, and the fisherman cuts the skin of the head through, when it does not break off of itself, and then throws it into the sea. The first is followed by a second and a third, till all the fish in the tub have been beheaded and opened.

On the opposite side of the tub, between it and the table and close to the vessel's side, stands the "gutter." He, taking the headless fish from the tub, hauls them upon the splitting-table. With his left hand he opens the abdominal cavity and with the other tears loose all the organs contained

therein. The livers he throws into a basket placed to catch them and the stomach and reproductive organs quickly find their way into the ocean.

The fish is next pushed across the table and laid hold of by the splitter. He is armed with a very sharp and somewhat peculiar shaped knife. The blade, which is of very well tempered steel, is somewhat curved flatwise. With the back of the fish braced *against the cleat in the center of* the table he makes a long incision down the ventral surface, continuing the opening made by the throater, and splitting the flesh close by the side of the backbone almost to the tail. The fish is then opened as the leaves of a book, and the tail allowed to hang over the inner edge of the table; *with a sharp stroke he* then cuts under the backbone and loosens it so that he can catch the end in his fingers. Seizing this with his left hand he cuts under it toward the head of the fish, and with a few strokes separates the backbone from the body, allowing the latter to drop to the deck and throwing the former into a pile that is collecting for the cook.

SALTING DOWN.—When the idlers have collected a couple of dozen of dressed fish in the checker-boards they wash them thoroughly by sousing pails of sea-water over them, and when they have finished this heave them with their pews into the hold. Here they are seized by the salter, who, grasping a fish by the tail, *throws it dexterously upon the pile or kench flesh side uppermost*, and then sprinkles over it a layer of salt from a scoop in his other hand. The fish are built up in very regular kenches, laid head to tail, always with the skin down and spread out flat. In our vessel two men were in charge of salting—the skipper and one of the crew. Their business requires considerable skill, for many a cargo has rotted from insufficient salting, and by too much salting the flesh deteriorates greatly in flavor.

FURTHER CARE OF THE FISH.—Thus split and salted, the fish lie spread in *kenches in the* hold until the vessel reaches home. While there they must be carefully guarded lest any water should get upon them and injure them. The utmost caution was always used to shut the hatch when any danger of rain menaced, and during a heavy sea, too, because the sea-water was not *briny enough to prevent injury*. *During* the time the fish remain in the hold they are constantly drying, the moisture being driven from those in the middle and lower part of the kenches by the pressure from those above. The water thus pressed out ran down into the hold in such large quantities that when the fish were being taken in any numbers it was necessary that the vessel be often pumped out. It was for this reason that every man was expected, at the end of his watch, to pump out the vessel.

The work of splitting kept the men busy until nearly eleven o'clock. The talk then was of the number of tubs split that day, *which was added to the count kept by some member of the crew*. The amount of fish on board at any given time was reckoned in units of tubs. Three tubs held about 1,000 pounds of dressed fish, and thus our cargo, which by count contained 255 tubs, weighed off at Gloucester 78,000 pounds. By induction they could tell how large their cargo was at any time, *though* they did not often reduce it, since by long use the amount in tubs has as definite a meaning as the amount in pounds.

COD LIVERS.—Of the various viscera of the cod that are saved and preserved for sale at home the livers are perhaps the most important. These are separated by the gutter from the *intestines*, and while the latter are cast overboard, these are collected and placed in the liver-butts. These liver-butts are characteristic of a fishing vessel engaged in this branch of the fisheries. They are huge casks mounted on skids, lashed down by strong ropes, and always placed in front of the house. They are open at the top by a large square opening, covered usually with a piece of tarpaulin a little larger than the hole, and fastened down securely at one end. After a time these butts become filled with livers, and the livers by this time, through their constant churnings with the vessel's

rolling, have partially "tried out" their oil. To make more room in the cask the oil is partially drawn off and stowed in barrels. If the skipper finds that he can get a good price for his oil at Newfoundland or Saint Pierre, he will turn it into money at those places; otherwise it is carried home and disposed of there. Oil from the "bankers" is not pure enough to be used as the great "lung-strengthener," inasmuch as it is not nicely taken care of on board the vessel. It is made into what is known as "tanner's oil," and is sold at the average rate of 38 cents per gallon.

SOUNDS.—*The sounds of the fish are, on many vessels, regarded as one of the cook's perquisites.* These, the swim-bladders, lying just under the backbone and in the roof of the general cavity of the body, are of large size in the cod and well stocked with gelatine, though by no means approaching the value of the sounds of the hake (*Phycis*) in this particular. The cook, who was not expected to take part in the operations of dressing fish, usually spent the time when the crew were occupied in that work in cutting the sounds out from the backbones. As fast as he obtained these he threw them into a pail of salt water, where they might soak until he was ready for the further operation of scraping them. This he did most frequently at evening, when the dories were distant from the vessel setting their trawls. In scraping sounds a bait-knife is used, and blood and other dirty matters are scraped off, and the sounds are then put to soak in strong brine for a few days. From the brine they are transferred to a barrel for permanent stowage, and then they *are heavily salted. At the time of final packing the sounds look white and clean, quite unlike the* bloody mass they were at first. On his reaching port the cook sells the sounds, commanding for *them a price varying from 2 to 6 cents per pound. Like the Grand Bank livers, Grand Bank* sounds are not regarded as first class; they are made very largely into a preparation called ribbon isinglass, used chiefly for settling beer. The best sounds, obtained from the off-shore fisheries and the fresh fishermen, are made into the better grades of isinglass for refining and sizing purposes, and are also used for food.

COD TONGUES.—In addition to livers and sounds the tongues of the cod are also often cut out and saved by the fishermen, these being likewise the normal perquisite of the cook. On the Victor no tongues were saved, but I was informed that they are often taken and preserved in salt. They are sold at home, and find their way into the market as a great delicacy.

OTHER VISCERA.—*I am not aware that any other viscera of the cod are saved for sale, though* in the halibut the fins are often saved, but the pea and the stomach, too, sometimes are saved to be used as bait when other sorts of bait are scarce. This sort of bait was formerly very extensively used in cod fishing, but of late years the fishermen believe they must have fresh bait, and, to obtain it, will sacrifice a great deal. On the subject of "gurry fishing" I have spoken at greater length in other places.

g. BAIT AND BAITING.

VARYING KINDS WITH SUCCESSIVE SEASONS.—During recent years a practice has been in vogue among most of the Grand Bankers, and, in fact, among all other cod-fishing vessels, of using fresh bait. Until the past decade, at most, fish were often captured with bait which had been brought *from home preserved by salt, or with the entrails and flesh of the cod itself, called in fisherman* phraseology "gurry." It seems, however, now to be the a common opinion that during the summer months the fish will not bite at all at salt bait or gurry, and it is a very general practice to use some form of fresh bait. This bait is obtained from the land most conveniently accessible, which, in the case of Grand Bankers, is Newfoundland. This baiting business has come to be at that island a very important trade, and in the smaller hamlets, which are scattered along

the entire coast, forms almost the sole occupation of nearly all the male inhabitants. When her supply of bait is exhausted, the vessel, anchored on the Grand Bank 100 or 200 miles from the land, runs for the nearest harbor for a replenishing. Should bait be wanting there at that time the vessel would probably run to some other harbor, selecting one from which rumors of plenty were gone out. In this way the bankers visit the island in large numbers, and bring into it a by no means small amount of business. A vessel may take several baitings. If she has good fortune two baitings will be enough to fill her, but she may have to take three, or even four or five. The stay on the Bank during which a vessel is using up her bait is known as a baiting. Thus the question is very often heard, "Where did you use up your second baiting? How much did you get on your second baiting?" The word is also very often used for a supply of bait, a sense in which I have employed it just above.

FROZEN HERRING.—The kind of bait does not remain the same throughout the year. As the year opens, one kind is employed; this is later followed by bait of another sort, and finally, at the close of the season, still others are used. Those vessels which seek the Banks very early in the year, or as late as the latter part of March or first of April, take for their first baiting the herring (*Clupea harengus*, Lin.). These they can obtain in Fortune Bay during the early part of the year more readily than at any other portion of Newfoundland. The herring are taken in seines. The natives ("liviers," as they are called) watch for a school to make its appearance in their harbor. When seen they put out in their punts and surround the school with a net, and then take them out with dip-nets. The herring are then sold to the bankers at a price varying from twenty-five to sixty cents per hundred. While the weather is very cold the bait may be preserved fresh a long while. This is done by freezing the herring and then keeping them in a vessel's hold, from exposure to the air, so that they cannot thaw. In this way they are kept for three or four weeks, until the weather has grown so warm that this method of preservation is no longer practicable. From the fact that the herring are thus preserved frozen, this baiting is always known among fishermen as a "baitin' o' frozen herrin'." I have spoken as though it was common for such a baiting to be used on the Grand Bank. Such, however, is by no means the case. As a rule, very few vessels visit the Bank during the early part of the year, but make their first inroad upon the codfish on the Western Bank or on Banquereau. In that case they quite as frequently obtain their bait in some Nova Scotia harbor in the Bay of Fundy as in Fortune Bay, Newfoundland.

ICED HERRING.—As the season advances, however, a large fleet of cod-fishermen from all the various fishing ports of our coast run for the Grand Bank. These are very likely to visit Fortune Bay or some harbor along the southern coast of Newfoundland for their baiting. This is composed again of herring, but preserved differently, owing to the increased temperature on the Bank during April and the succeeding months. The herring are now kept in ice in the bait-pens. Ice bought at some harbor on the way from home, or obtained in the harbor where the bait is bought, is cracked up quite small in the huge splitting tubs. A layer of the fine ice is then spread over the floor of the bait-pen. Over this layer is spread a layer of fish; then a layer of ice follows, and a second layer of fish. In this way the fish and the ice are sandwiched in until the pen is filled. This, which is termed "a baiting of herring," will in this way be preserved from fifteen to eighteen days. For the baiting, the skipper pays about $25 or $30 and receives 40 barrels of the herring.

CAPELIN.—By the time two baitings are consumed, or by about the middle of June, the next kind of bait begins to appear on the coast of Newfoundland. This is the capelin, a small boreal fish (*Mallotus villosus* Cuv.), and quite closely resembling our well-known smelt (*Osmerus mordax*

Gill). The method of their capture I had no opportunity of observing.* They are taken in immense numbers by the "liviers" and furnished to the bankers. They are generally sold at a certain price for the baiting, and for $16, 10 to 20 or 25 barrels are supplied. They are stowed away in the bait-pens in the same manner as the herring, and can generally be preserved about the same length of time.

SQUID.—Of all the different forms of bait that are sought by the American bankers none are so popular as the squid (*Ommastrephes illecebrosa*), and none so interesting in its capture. Their first approach is watched by thousands of anxious "liviers," and news of the first capture is heralded in a way that makes the man who sees the first one in any season quite a public character, and confers considerable renown upon the hamlet where they are first captured. It is usually during the latter part of July that the excitement begins, and from that time till their disappearance in October they form the principal topic of conversation in many a hamlet on the coast. Armed with his squid jig the native fisherman leaves his home in the "wee sma' hours" of the morning and putting out in his punt into the harbor stealthily lets his jig descend into the silent water and dreamily awaits a bite. The squid jig is so entirely unlike any other form of hook that I will briefly describe it: To one end of a cylinder of lead, 3 inches long, are fastened pins bent upward. No bait is used with it, but it is simply let down among the squid, and kept in constant motion to imitate the movements of a small fish and thus attract the squid. When one grasps it with its long tentacular arms the jig is quickly pulled in, and the squid thus entangled in the pins is secured. When they are in the humor, or, in Newfoundland dialect, when the squid have "struck," they can be caught very fast indeed. When once the squid strike in a harbor, if the punts are not all out, anchored side by side, the news is communicated to those ashore by the sight of activity among those in the punts. In an instant the word, "the squid's struck," flies through the village like wild-fire, and in an incredibly short time all the men folks of the village are anxiously waiting for a bite. During our second baiting, while we were anchored at Open Hall, a very amusing instance of this sort of thing occurred. As a rule all the punts in the village are anchored in the harbor during the whole day, but on this occasion the day was exceedingly blowy, and, the squid not biting, the "liviers" had all sought their own warm firesides. During the early part of the afternoon one man on board one vessel, in sheer lack of any better occupation, threw a jig over the side and had a bite instantly. He hauled up and threw in again and found that the "squid had struck solid." "Then there was mounting in hot haste," and in less than a minute every man on board was actively running a squid jig and pulling the squid in in a very lively manner. Hardly two minutes had passed when we saw a boat put out from the shore. This was instantly followed by four, and in less than ten minutes twenty-eight punts were strung along from us as a center, and all hands excitedly "jigging squid." Like all other things, squid-jigging is by no means all sunshine. The squid has one or two confirmed habits which often lead to remarkably unpleasant consequences. As it is drawn from the water the squid first discharges from his siphon a jet of salt water, which is very likely to strike the fisherman in the face. Almost instantly the squid follows this by a second jet of dirty black ink. Unless he be very quick and gets the squid off the jig and safely lodged among others of his kind this second less pleasant stream will strike the fisherman. I had, during the summer, the opportunity of seeing men served in that way, and judge from hearsay that it is not at all delightful.

Squid are taken in enormous numbers in all the harbors of the island. During the first few days they seem to abound most plentifully in the more southern harbors, while during the

* They are taken in small drag-seines, made specially for the purpose, and called "capelin seines." The fish are inclosed in a semicircle of netting and drawn to the shore, where they are bailed into boats with a dip-net.—J. W. C.

last of the season they are generally sought in the northern ports. Often so many are caught in a single day that a vessel can secure an entire baiting of 30,000 or 40,000 squid without even stopping in the harbor long enough to make it necessary to haul down her sails. They are generally sold by the natives at prices varying between 15 and 40 cents per 100, and when possible 30,000 or 40,000 are purchased. They are preserved in ice in the same manner as the capelin and the herring, and may be kept fit for use during a period of from 18 to 25 days.

In former years, I am told, squid have been captured on the Banks by the vessel's side, and made use of as bait. The giant squid of this same species, of which an arm or a beak are now and then found, were also reported to me by one of the men to have been seen by him in previous years; and he further states that from the body of such a one his own vessel and another had been fully supplied with bait.

SALT BAIT AND GURRY.—After the disappearance of the squid, which occurs during October, most of the fishermen leave the Banks and start for home. The few that remain use for bait salt squid or other forms of salt bait, as menhaden slivers. These are brought, pickled, from home. Besides these, gurry, or the viscera are also used for bait. Of these viscera the reproductive organs appear to furnish the best forms of bait. In former times it is known that salt bait and gurry were alone used. From experiments made repeatedly in these present years, such bait will not catch fish till very late in the season. The cause of this change I cannot tell.

BAITING THE TRAWLS.—In regard to the manner of using the bait, very little need be said. When the time for baiting up the trawls arrives the men, with baskets in hand, go down into the hold and bring up from the bait-pen such an amount of bait as they think sufficient. This is thrown on the roof of the "house." The men then stand in a row around the house, and with knives made for the purpose cut up the bait into pieces that are about 2 inches square. The trawl is then turned out of the tub on the house, and hook after hook is baited and coiled back again with the ground-line into the tub. When salt bait is being used, as happens during the latter part of the season, it is soaked for a time in water in order to remove the salt somewhat.

METHODS OF OBTAINING AND PRESERVING BAIT.—One thing of which my summer's experience among the codmen most strongly convinced me was the enormous waste of time necessitated by the present method of procuring bait and the loss from the present mode of preservation. From the rugged condition of the island of Newfoundland and the primitive habits of the people, any communication between hamlets not immediately contiguous is excessively difficult. It must be for the most part extremely uncertain, because depending on chance vessels which may have visited other ports. Owing to this fact, the banker is compelled to visit harbor after harbor in search of bait, learning for himself where a supply may be had and not in any way being able to know if bait is abundant at any place. The result of this is that of the hundreds of bankers which annually visit Newfoundland for bait, each one of them spends from six days to three weeks in entire idleness while on the lookout for herring or squid. At each place they visit they may hear that the bait has been more or less abundant a few days before, but no vessels were in then, and now the school cannot be seen. As may be seen by reference to the "Calendar of the Cruise," our vessel spent thirty days in Newfoundland harbors, an arrangement which to me personally was extremely grateful, but which, as any one can see, does not pay owners or men financially.

This waste time could be almost or entirely saved by either of two plans—a telegraphic communication between the harbors, or some central office run by enterprising men as storehouse for the bait and centers of purchase for the fishermen. In the former case the "banker" could learn where to direct his course with certainty of success; in the latter case he could at once seek the central office and there purchase his supply. But giving the island and its people, as they are at pres-

ent, the thought of their forming any such scheme seems useless, for the people are, as a rule, too conservative to improve any on their present system. The only possible hope of improvement is from some enterprising American. I feel confident that, with ice for the trawlers in the winter and labor cheap, a person could preserve and sell in a single season enough bait to pay for his buildings, and that he could after that make money rapidly. If he had such a depot, the fishing vessels would soon learn where bait could be procured, natives would also know where they could have a steady cash market for their catches, and the owner would doubtless both obtain and dispose of all the bait he was able to handle. To me it seems remarkable that the Gloucester fishermen have not long ago provided some better method of bait procuring, or that the vessel owners have not themselves instituted improved methods.

But not only do the fishermen lose a vast amount of time in bait-hunting, they also lose a good deal of their bait from defective methods of preserving it. I have elsewhere described the present method of preserving the bait in ice. Under this treatment the result is the almost utter worthlessness of the two or three bottom layers and the greatly deteriorated quality of much more. The weight of ice and squid from above pressing down the lower layers and the melting of the substratum of ice, with also the water and filth from the upper layers added to the lower ones, make in the course of ten or twelve days the undermost bait utterly unallaring to the fish. As a result of this the vessel can not take a large supply of bait and then remain fishing on the Banks, but must after a brief interval seek the land for *fresh* bait.

Now it seems to me that this defect could be profitably remedied by the introduction of some inexpensive refrigerators in which forty or fifty thousand squid could be kept frozen during one whole month or more if necessary. Such refrigerators, built into the places now occupied by the bait-pens, would undoubtedly save enough in the time of the crew and in the waste of bait to pay for themselves in a single year, or two at furthest. In our cruise we made three trips for bait, spent thirty days, and obtained in total about 70,000 squid; by having refrigerators and arrangements for preserving nearly this entire number at one time the vessel could have been saved at least twenty-five days on her trip and several thousands of ruined squid.*

One of the most unpleasant and often most disastrous hindrances in the way of the fishermen, when they are in search of bait, arises from the hostile feelings often entertained by the bait-catchers. These, instigated by jealousy or by fears lest their own rights are to be infringed on, have at many different times come to blows with the American fishermen, and by mere force of numbers overcome them and driven them away from their shores.

The Fortune Bay people, during 1876, made an attack upon the American fishermen so violent as to draw considerable attention to the incidents in the newspapers at that time. In 1878 the schooner Concord, from Gloucester, entered Tor Bay in search of bait. She had scarcely come to anchor when a squad of shoresmen boarded her, and threatened if she did not leave at once to cut her cables. The captain, who was a man of considerable pluck, told the men that he had no intention of quitting the harbor with his vessel until he was ready. He then left the vessel with the angry

* Several years ago the question of freezing bait on fishing-vessels by such a system of refrigeration as that suggested by Mr. Osborn, was pretty thoroughly tested on the Gloucester schooners It was found impracticable, even for the vessels fishing on George's, and was abandoned by the fishermen, who, in many cases, had expended considerable sums of money to try the experiment. One of the chief difficulties in the way of using such a system on board of a cod-fishing vessel on the Grand Bank is the fact that the refrigerator, if large enough to hold and preserve 70 or 80 barrels of bait, would occupy so much room that there would be insufficient space left for fish and the requisite salt to put on them. Then, too, the experiments tried by the Gloucester fishermen convinced them that bait frozen on board of the vessels by refrigeration was not nearly so attractive to the cod as that iced in the ordinary manner—a result which must always be a serious objection to the introduction of a method that otherwise might seem to have many advantages, particularly to one not very familiar with the fishery and its varied requirements.—J. W. COLLINS.

natives still on board, and hastened to Saint John's for officers of the law. Saint John's is 6 miles distant from Tor Bay. When the skipper finally reached his vessel with officers the invaders were forced to go ashore. Beyond binding them to promises of no further violence their action was not noticed by the Newfoundland authorities. The skipper could not obtain his bait from the people of that harbor, but he had escaped without any further injuries. This man I met, and heard his story from his own lips.

Nor is the feeling of malice and hostility ended yet, for even this present year of 1880 has furnished new instances. On August 4 the schooner and many of the crew with whom I had passed the previous summer entered Conception Bay in search of bait. In the harbor 200(?) natives boarded the vessel, prevented by violence their taking squid, and finally compelled them to get under way and leave the cove where they had anchored.

I will not say that the fishermen are not in part responsible for the temper of mind of the natives toward them. Some of the more slippery fellows have, I doubt not, in past times dealt unfairly with the Newfoundlanders. I have heard of some who obtained unfair measure, or who slipped their cables before the bills had been settled. The younger men among the bait-catchers are also somewhat actuated by jealousy toward the fishermen, since the latter are great gallants ashore among the young women, and the latter turn from their native beaux to the Americans, to the infinite disgust and chagrin of the former and the ill-concealed and often unconcealed satisfaction of the latter.

A further discussion of the manner of obtaining and preserving bait is given by Mr. Osborn, in Section IV of this report, under the head of "Life of Fishermen on Shipboard."

4.—THE GEORGE'S BANK COD FISHERY.

By G. Brown Goode and J. W. Collins.

1. ORIGIN AND PRESENT IMPORTANCE.

The George's Bank cod fishery, or, as commonly called, the George's fishery, was carried on to some extent by vessels from Marblehead as early as the middle of the last century,* but there is no record to show that it was long continued, nor is there any one now living who remembers fishing vessels going there prior to about 1821.

This fishery is now carried on almost exclusively from Gloucester. Vessels from this port first visited George's Bank in search of halibut about the year 1830, and in connection with the halibut took considerable quantities of codfish. Since the decrease of halibut in that region there has been a constant fishery there for cod. The George's fishery has not yet shown a tendency to

* William Douglass, in Vol. I, page 302, of his History and Political Summary of British Settlements in North America, printed at London in 1760, says:

"Marblehead, in New England, ships off more dried cod than all the rest of New England besides; anno 1732, a good fish year, and in profound peace, Marblehead had about one hundred and twenty schooners of about 50 tons burthen; seven men aboard, and man ashore to make the fish, is about one thousand men employed from that town, besides the seamen who carry the fish to market; if they had all been well fished, that is, 200 quintals to a fare, would have made 120,000 quintals. At present, anno 1747, they have not exceeding seventy schooners, and make five fares yearly; first to the Isle of Sable; the codfish set in there early in the spring, and this fare is full of spawn: formerly, they fitted out in February, but by stormy weather having lost some vessels and many anchors, cables, and other gear, they do not fit out until March. Their second fare is in May to Brown's Bank and the other Banks near the Cape Sable coast; these are also called spring fish. Their third and fourth fares are to Saint George's Bank, called summer fish. Their fifth and last fare is in autumn to the Isle of Sables; these are called winter fish."

decline, being carried on quite as vigorously and as successfully at the present time as ever in its history. Although Gloucester is the only port which has extensively engaged in this fishery, a few vessels from other New England ports have from time to time participated in it. From 1859 to 1862 Southport sent several vessels; and Vinal Haven, Me., Marblehead, Rockport, and other Massachusetts ports have also had vessels engaged in it. Concerning the history of the George's fishery from Southport, Mr. R. E. Earll obtained the following information of Mr. D. Cameron and Mr. B. F. Jewett:

Hearing the favorable reports of the George's fishermen of Gloucester from time to time, the owners of vessels in Southport decided to send their vessels instead of keeping them so long idle. The first vessels started in February, 1859, and as there was some difficulty about finding men to go at that season of the year, the crews were picked up not wholly from the island, but from Westport and other towns in the vicinity. Schooner Mazeppa, Capt. W. E. Wells, was sent out by Cameron & Orne about the 1st of February, and two others, the Atlantic and S. H. Cameron, started shortly after. They provided themselves with ice for keeping their halibut fresh for the Portland market. The fish seemed very scarce and the weather very stormy, so that their trips were not profitable, but they continued in the business until about the 1st of July, and finally abandoned it. In 1861 or 1862 the schooner Humboldt went during the greater part of the year, but the rough weather and poor fishing caused them to discontinue. About this time William Decker sent two vessels, the Willie G. and Archer, one season with same results. They were the last.

In 1879 there were one hundred and four Gloucester vessels constantly employed in the George's fishery, many of them making over a dozen trips each, and forty-eight other Gloucester vessels followed the fishery a part of the season, the entire fleet aggregating one thousand trips and landing 23,144,000 pounds of codfish and 995,000 pounds of fresh halibut.

In 1880 the Gloucester George's fleet aggregated one hundred and sixty-three vessels, one hundred and seven of them engaging exclusively in that fishery, while the others were employed for a part of the year in other fisheries. The fleet made one thousand four hundred and thirty trips, and landed 27,000,511 pounds of codfish and 1,125,450 pounds of fresh halibut.

In 1881 the fleet was the same size as in 1880, the catch aggregating 22,510,000 pounds of cod and 1,087,400 pounds of fresh halibut.

The dangers and hardships of this fishery are so great that only the most daring and hardy of fishermen care to continue in its prosecution. The system of mutual insurance, which has been so successful in Gloucester, enables the owners to face the great risks of the George's fishery with less apprehension than can be done by those of any other ports.

Like the fresh-halibut fishery, the George's fishery is carried on throughout the entire year. Until within a few years it was the practice of the Gloucester vessels to "haul up" in harbor from November to the 1st of February, since they could not be insured until that date, but at present they can be insured at all seasons, and the competition which exists has now compelled almost all of them to keep at work twelve months in the year. The fresh-halibut, haddock, and the George's fisheries are the only fisheries carried on continuously winter and summer.*

The haddock fishery is carried on to a comparatively limited extent in summer, but it is prosecuted upon a large scale in winter.

The Gloucester Telegraph of January 4, 1859, contains the remark that "at one time the

*In 1874, at Christmas time, only four vessels were engaged in this fishery. The W. H. Raymond arrived December 22 with 30,000 pounds of fish—a good fare, though the weather was rough. (Cape Ann Advertiser, December 25, 1874.)

vessels were hauled up six months in the year, but that in 1859 some were not hauled up at all, except when repairs were required. There was one arrival, January 2, from George's, and several were at that time on the fishing grounds."

For twenty years or more it has been customary for the George's fleet to set out for the Banks as early as the 20th or 25th of January; at present many vessels go as early as the 15th. They start thus early with the idea of getting on the Banks before the first schools of codfish strike there. They very often have to return before getting a full fare on account of the bait giving out. Some seasons a single vessel will strike the fish early; the others then think they can do the same. Vessels very seldom start before the 15th of January, and many of the best skippers rarely go before February 1, by which date the main body of the fleet is usually prepared to sail.

In 1874 the early start of the fleet was delayed by the action of the Mutual Fishing Insurance Company, which refused to insure vessels leaving for the Banks before the middle of March. A new company was formed that year, which insured vessels wishing to go in February, and some forty sail started soon after the 1st of that month. The George's-men began to arrive from their first trip before the 27th of February, and by the middle of March were coming in from their second trip.

2. THE FISHING GROUNDS.

The George's fishery is carried on for the most part upon George's Bank, though in December and January a large part of the vessels fish upon Brown's Bank and La Have; a few, however, go to George's in January. The best time for fishing upon George's is in February, March, and April, when the spring spawning schools of codfish appear on the Bank. During these months the favorite fishing ground is upon that portion of the Bank which lies east of the shoals, at a depth of 25 to 35 fathoms, this being called the "winter fishing ground." At other seasons of the year the vessels resort to the western part, or what is called "Clark's Bank" and "South Channel," and also to the southeast part of George's Bank. In the fall they frequent the northern edge of the Bank. Many of the vessels in summer and fall fish on Brown's Bank, Seal Island Ground, and occasionally make trips to German Bank and other small grounds in the Bay of Fundy. Trips have sometimes, though rarely, been made in winter to Sable Island or Western Bank, and in summer to the south shoal of Nantucket and off No Man's Land.

After the spawning season of the cod, in February and early March, is fairly over there is a great breaking up of the schools of cod and a scattering of the fishing fleet on the middle part of George's Bank in 35 fathoms. Says Captain Martin: "You'll see 60 sail of vessels fishing on George's in February and catching 30,000, 40,000, 60,000, and sometimes as much as 100,000 weight of fish, and they'll go back in March; and it's like heaving your line into a well; there are no fish anywhere." The vessels then scatter over the Bank to the South Channel, to the southeastern or eastern parts of the Bank, or go off on Seal Island Ground or Brown's Bank.

In sailing from Gloucester for George's Bank vessels steer an east-southeast course, striking the edge of the Bank to the northeast of the "North Shoal." Many vessels fish in midsummer in 25 to 40 fathoms east of the main George's Shoal, gradually working out into deeper water.

3. THE FISHERMEN.

The crew of a George's-man consists of eight to twelve men. About twelve hundred fishermen of Gloucester are employed in this fishery. About one third of the men are British Provincials, one third Americans, and the other third about equally divided between Swedes and Portuguese, with a few Frenchmen and other nationalities.

In early days, when the George's vessels were smaller, the crew consisted of six to eight men. The vessels now in the fleet carry ten or twelve, occasionally thirteen, though not more than twelve or fifteen vessels carry so large a number as that last mentioned. In summer, when it is often *hard to obtain men, vessels sometimes go out with smaller crews.*

The successful result of a trip to George's Bank for codfish is largely dependent upon the exertions of each individual; men are, therefore, required for that fishery in whose natures is combined hardihood, doggedness of purpose, and bravery. Owing to the fact that each man's success depends in a great part on his individual efforts, the Portuguese and Irish have a special fondness for this fishery, though many others engage in it.

Many of the best fishermen and most capable skippers follow the George's fishery; but, as a rule, the crews are considered intellectually inferior to those employed in the mackerel and halibut fisheries. The results obtained depending so much on the individual efforts of the men, a vessel may make a successful trip under the control of a skipper who would be totally incapable of commanding a halibut schooner or one employed in the Grand Bank cod fisheries.

4. THE VESSELS.

The George's vessels, like those in the fresh-halibut fishery, are the stanchest and best of the Gloucester fleet.*

Their size is smaller, however, the average George's-man registering about 60 tons. In the fleet there are some vessels of 45 tons to 50 tons and a few of 80 tons and more. In the winter, as a rule, the George's-men carry no main-topmast and jib-boom, being rigged "snug." In summer the regular George's-men carry main-topmast and staysail, but rarely, if ever, a flying-jib.

Until within a few years a peculiarity of the vessels of this fleet was, that when riding at anchor they set a "balance-reefed mainsail" to steady the vessel and keep her as nearly head to the wind as the tide would permit. When the mainsail was "balance reefed" only a small portion—perhaps a fourth or fifth of its area—was exposed, and it then answered the same purpose as the riding-sail used at the present time.†

The average outfit of charts and instruments is less complete than on board of a halibut schooner.

The outfit of a George's schooner is in many respects very different from that of a halibut schooner. The cable is shorter, since the vessels fish in shallower water, its ordinary length being about 225 fathoms; the cable is generally also smaller, usually about 8¼ inches in circumference, though some are 7¾, 8, 8½, or even, though rarely, 9 inches. The cable is stowed in the same manner as on the halibut schooner, but of course occupies somewhat less space. The anchors, of which there are three, are of the same type, but usually lighter, weighing from 400 to 500 pounds.

There are no checker-boards on the deck, but instead two or three oblong bins, which are called gurry-pens. These are made of 1½-inch to 2-inch plank, and are about 3 feet in height. They are *divided by transverse partitions into* two or three compartments, and small sliding doors are placed

* No class of vessels are better calculated for a battle with the storm-king and no braver souls tread the deck, but the contest is an unequal one, and many a stanch craft and gallant crew go down in the conflict. In a single storm, on the night of February 24, 1862, 15 Gloucester vessels and 120 men were lost, leaving 70 widows and 140 fatherless children to mourn for the loved ones who would return no more. Last year 200 vessels were engaged in the George's fishery at some time during the year; a large fleet followed the business the greater part of the year, and a total of 1,348 fares were landed at Gloucester. (Gloucester and its Fisheries.)

† The peculiarity of a "balance reef" is this, that when the mainsail is "balance-reefed," the foot-stops are cast off and the foot of the sail raised from the boom, being attached to the boom only at the clew and tack, and by a reef-strap passing through the reef-crinkle. In other respects it is like a three-reefed mainsail.

in the corners of these, so that water can run from one to the other or out upon the deck. These gurry-pens are fastened to the deck by lashings, the surface of the deck forming the bottom.

The gurry-pen forward of the house is usually the largest. Another is placed between the main and fore hatches, while in the larger vessels a third is generally fastened forward of the break of the quarter and between that and the main hatch. Planks placed on their edges run between the gurry-pens, dividing that portion of the deck into little pens for the reception of fish.

Bait-boards are arranged on the side of the house as in the halibut schooner, also upon the ends of the gurry-pens.

The George's-men carry no dories upon the deck, but a single dory hoisted to the davits at the stern. Formerly they carried square-sterned yawl-boats, but this custom is no longer in vogue, though occasionally boats of this class are taken. The reefing-plank is arranged as on the halibut schooner.

These vessels also carry a peculiar arrangement upon their vessels by which they are distinguishable from other vessels. These are the fishing-rails, consisting of joists, 3 by 4, nailed upon the rail of the vessel, and extending from the fore rigging to the quarter-rail and from the after side of the main rigging to the davit on each side. Holes are bored at intervals of about 4 feet in the fishing-rails, and in these are set hard-wood pins three-quarters of an inch to an inch in diameter and 5 or 6 inches high, called "sogers," and used by the fishermen to prevent their lines from slipping on the rail when the tide is running strong.

The arrangement in the hold is as follows: The quantity of ballast carried is usually large, about 20 or 30 tons of stone or iron* for a vessel of 60 tons in burden. This ballast is planked over as on the halibut schooner. The forward part of the hold is occupied, as usual, by the store-room, and separated by a bulkhead from the ice-house. The ice-house is smaller than in the halibut schooners, generally consisting of two pens on each side and a double compartment in the "slaughter-house," which is in the middle, and arranged to carry 12 to 15 tons of ice, though vessels ordinarily carry only from 7 to 10 tons in the summer season and in winter not more than 3 or 4 tons. The ice-house is accessible from the main hatch. The after hold, which is reached through the after hatch, contains the salt-pen—a bin placed against the cabin bulkhead and extending from side to side the whole width of the vessel. This bin occupies about 4 or 5 feet of the length of the vessel and reaches nearly up to the deck. It is divided into two parts by longitudinal partitions in the middle, and is sometimes still further subdivided. Doors from the after hold upon either side of the center partition are closed by planks, which slide in grooves, and are removed as the supply of salt diminishes. The salt-bin will hold from 300 to 400 bushels of salt. The remainder of the after hold is left free for the packing of fish, which are also stowed in the compartments of the ice-house. The after hold is first partially filled, then fish are salted away in the ice-house to keep the vessel in trim, and as a last resort, if the catch is a large one, the salt-pen is also filled with salted fish.

5. APPARATUS AND METHODS OF FISHING.

FISHING GEAR.—The George's fishermen always fish with hand-lines from the vessel's deck, one line to each man. Consequently no boats are carried, except the dory at the stern, and no trawls are used.

The George's hand-line, with its appliances of sinkers and hooks, is peculiar to this fishery. It may be described as follows: The line is 900 feet in length, composed of six 25-fathom lines,

*But comparatively little iron is used, the ballast generally being cobble-stones and shingle.

which are spliced together. The lines are of steam-tarred cotton, and weigh 18 pounds to the dozen.*

The line is coiled in a tub, which is a flour-barrel sawed off an inch or two above the lower quarter hoops, having holes in the bottom to let the water out. It is called a line-tub. The end of the line is fastened through two of these holes to prevent its escape. The line-tub is about half filled by the line when it is coiled.

The hooks are fastened to the line by means of a peculiar contrivance, which, together with the lead, is called the "George's gear." This consists of (*a*) the "tail," which is an iron or brass rod 12 or 15 inches long or more, three-eighths to half an inch in diameter, with an eye in one end, to which the hauling-line is attached by a common hitch. Around the other end of the "tail" is cast (*b*) the "lead," a long conical plummet of lead weighing 8 pounds, about 2 inches in diameter at the bottom end, and about 8 inches in height, its apex embracing the lower end of the tail, the shank of which projects above it 8 or 10 inches. From the front lower end of the lead, which is obliquely truncated, emerges (*c*) the "horse," which is, in fact, sometimes a continuation of the tail. When of metal, the horse is of the same diameter as the tail and projects from the lead 10 or 12 inches, at an angle of 110 degrees with its axis. The horse is sometimes made of wood or, according to a custom formerly universal, of several pieces of line tightly wound with smaller line. An improved form of George's gear has lately been devised by L. D. Lothrop, of Gloucester, which is very popular among the fishermen. It is in the main precisely like the one here described, except that it is more neatly made and the lead has a rounded base and an attachment of brass on its lower end to prevent it from being bruised by the bottom. In the end of the horse just mentioned is an eye, to which is usually attached (*d*) a swivel of brass; to the swivel is fastened either (*e*) the "sling-ding gear" or (*f*) the "spreader gear." The sling-ding (*e*) consists of a galvanized-iron rod about three-eighths of an inch in diameter and from 15 to 20 inches in length, with an eye at each end. The "sling-ding gear," when properly rigged, is provided with a piece of line, generally the same size as the fishing-line, and about twice the length of the sling-ding, the two ends of which are fastened to the eyes in the end of the sling-ding, and the bight is made fast to the swivel in the horse. The sling-ding gear is then an almost equilateral triangle, two sides of which are composed of the line and the base of the sling-ding, the object of which is to separate the snoods and prevent them from fouling. The ends of this line, which forms the two sides of the triangle, are provided with eye-splices or attached to swivels into which the snoods are bent. The spreader gear (*f*), the office of which is the same as the sling-ding gear, consists of a flexible rod of metal, bow-shaped, and about 15 or 18 inches long, the center of which is fastened to the swivel in the end of the horse, the ends being provided, like those of the sling-ding gear, with eyes for the reception of the snoods. Until within the past 10 or 15 years these spreaders were often made of two to four parts of cod-line tightly wound around with stout salmon twine. The snoods (*g*), of which there are two, are pieces of line smaller than the hauling-line,† one of them about 9 feet, the other about 10 feet long. These are bent in the eyes of the sling-ding gear, and at the lower end are spliced into swivels (*h*), which may be called "snood swivels." These are patented, and are made by L. D. Lothrop, of Gloucester. These swivels are so contrived, by means of a slot with a large opening at one end, that the gangings of the hooks may be slipped into them and held in place by means of a simple knot at the end. The gangings (*h*) are usually made of hemp line, though sometimes of cotton line, varying in size from that of the snood to that of the hauling-line. They are about a foot in length, and at one end have a simple wall-knot, by which they are held in the snood swivel; at the other

* A dozen of these lines fastened together and sold in a bunch. The weight designates the size.

† A dozen of these snood-lines, each 25 fathoms long, will weigh from 10 to 14 pounds.

end the hook is made fast, or ganged, in a very peculiar manner, which cannot well be described except in technical phrase.* The hooks (*i*) are No. 10 center-draft hooks.

The object of the snood swivels, in which the gangings are so easily adjustable, is to save time in removing the fish and in baiting the hooks. When a line with one or more fish has been brought on deck the gangings are slipped from their swivels and are replaced by a pair of new gangings with fresh-baited hooks. While the lead is going to the bottom the hooks are taken from the fish, and are rebaited and ready for use the next time.

Each vessel usually carries a considerable amount of spare gear, and especially a large supply of gangings.

BAIT.—The bait used by the George's fishermen is, in winter time, frozen herring, and in spring, summer, and autumn, fresh herring, mackerel, alewives, and menhaden. In former days these fishermen were accustomed to catch their bait upon the Banks by setting gill-nets from the stern as the vessel rode at anchor, or from the side when the vessel was lying to or drifting.† At present this custom is abandoned, and supplies of bait are taken from Gloucester when frozen herring can be obtained, and at other times it is sought here and there along the coast wherever there are weir or net fishermen, from Greenport, L. I., to Eastport, Me., and even, in exceptional instances, as far east as Western Nova Scotia.‡ When frozen herring were first brought from Newfoundland, in 1854, 500 to 1,000 of these fish were considered an ample supply of bait for a trip to George's, but the custom of carrying a far more liberal supply is now in vogue. Longer trips are also made, and the amount carried has increased, until now many of the vessels take on board 18,000 or 20,000 for a trip of two or three weeks. A somewhat smaller number of menhaden or fresh herring is carried in summer, it being impossible to keep fresh so large a quantity as that until it is used. From 15 to 25 barrels of fresh bait are usually iced in summer; these are placed in the ice-houses. The price of herring varies from 75 cents to $1.25 per barrel. Twenty-one days is considered the outside limit for which iced bait is available, though the vessels of the New York fleet, by a more careful system of cleaning and packing the fish, are able to keep a supply for thirty days or more. There was formerly a difference of opinion between the Gloucester and New York fishermen as to the value of the bait preserved by the New York method, the former claiming that it is comparatively worthless. This claim has been practically conceded by the New York fishermen, who have adopted New England methods.

In baiting the hooks the fish are slivered, steaks being cut from each side of the backbone; these are cut into three-cornered or square pieces, eight or ten to a fish, and are strung upon the hooks. Six to eight of these are put upon each hook.

Many halibut are caught by the George's men, and in fishing for these "gurry-bait" is used, this being the flesh of haddock or sometimes codfish. In baiting for halibut a long piece of the side of the haddock is put on the hook, the end of it being usually split into two flaps, which flutter in the current. On the top of these the ordinary bait of herring is placed.

METHOD OF FISHING.—Fishing on George's is carried on principally in the daytime, but on some occasions both night and day. The custom of night fishing has been introduced within the last

* Take one strand of the line and hitch the bight of it round the shank of the hook; then lay the two parts together, taking a wall-knot in the end.

† The vessels that now sail for George's are supplied with nets for the purpose of catching their own bait. (Cape Ann Advertiser, April 1, 1859.)

‡ The scarcity of bait has been a great drawback to the success of the George's fleet, a large part of the fleet having been detained a fortnight at Cape Cod waiting for a supply, thus losing a trip in the best season. The weather has been unfavorable for curing most of the season, and the last few pleasant days have given an impetus to the business, and large quantities have been shipped. The market continues firm at $6 per quintal, with an active market. (Cape Ann Light and Gloucester Telegraph, April 25, 1873.)

ten years. When fish are plenty the hardiest of the crew will fish night and day for three and four days, being ambitious to be "high line," or to catch more than any of their mates; and when fish will bite freely the men on watch at night usually pass their time in fishing. The greater part of the work is, however, done in the day-time. The day's labor begins at daylight and lasts until dark, the fish usually being dressed in the evening. When the tides run too strong for fishing the fish are dressed in the day-time. The monotony of fishing is broken by breakfast at daylight, dinner at 9.30 to 11 a. m., supper at 3 to 4 p. m., and a lunch in the evening.

The strong tides which prevail upon George's Bank and other grounds visited by these vessels have necessitated the adoption of peculiar methods, such as are not practiced in any other fishery. It is only by the use of extremely heavy leads that it is possible to keep the hooks near the bottom. Fishing with these leads and the long lines is extremely laborious. As the vessel rides at anchor the helm is put down and she sheers across the tide, so that the lines stray out from the side at a considerable angle with the rail. The men take their position at the rail all upon the side opposite to that upon which the tide current strikes. When the tide is running dead to leeward, or in the same direction with the wind, it is impossible to sheer the vessel, and then the lines all stray out directly astern. While they are fishing the course of the tide is constantly changing and the vessel is veering in every direction, and it is frequently necessary to change from one side of the vessel to the other in order to keep the lines clear from the side.

The best opportunity for fishing is on the slack tides. While the tides are running at the greatest speed, or at the rate of about two miles or more an hour, the lines with their heavy weights are carried out so that it is impossible to keep the hooks on the bottom. When fishing at slack-water only a small portion of the line is used, while on the strength of the tide it is sometimes necessary to use the whole 900 feet of the line. The fishing is then carried on by "sounding." The line is slacked out as rapidly as possible until the lead touches the bottom; it is then held for a few minutes until the force of the current has raised it, and then it is again slacked out and allowed to touch, and this operation is continued until a bite is felt. This is called "tending the bottom." When the tide is flowing at a moderate rate, and there is no reason to believe that the bait has been lost, the whole length of the line is let out before being pulled in on deck; and when the tide is running moderately sometimes from seven to ten "sounds" are made. When the fish are not biting and the tide is at half slack or running at a comparatively moderate rate, as happens in the low course of tides, fishing in water 30 to 35 fathoms deep, it takes about twenty to thirty minutes to run out the whole line, and fifteen or twenty minutes to haul it in if there is no fish on it. Pulling up a pair of cod at the end of a whole line takes five or ten minutes longer, while to pull up a halibut usually takes much longer still. In fishing with the tide running at a rapid rate, making one or two sounds, the line will run out in ten or fifteen minutes.

When fish are very plenty it is a common occurrence to catch a pair, one on each hook, and the men will catch from one hundred to one hundred and fifty, and sometimes nearly two hundred cod, in a day; at other times a man may fish all day long and only get three or four. When fish are plenty a man may throw out and haul his line over the side seventy-five or one hundred times in the course of the day; when scarce, not nearly so often, perhaps not more than ten or twelve times.

The bite of the fish is quickly detected by the practiced hand of the fishermen, and he, when hauling in, can usually tell whether he has hooked one or a pair. Expert fishermen often know when they begin to haul in that there is only one, and they haul slowly, in order to give another a chance to bite at the free hook. When the heads of the fish appear at the surface, if they are not well hooked or are too large to lift over the rail with the ganging, the gaff is used; when brought on

the deck the gangings are detached, as previously described, and their place is supplied by a new pair, the line being immediately thrown over again. The fish are then unhooked, the hooks rebaited for future use, and the tongues are cut out and thrown into a compartment in the line tub; in this manner the number of fish caught by each man is recorded; the tongues are counted out at night, and the captain notes the record of each man's count on a slate or in a book, as will be explained elsewhere. Each man marks the halibut he catches with some peculiar mark of his own. The proceeds for each man depends upon the number of fish he catches. The George's fisherman, however, rarely speaks of the number of fish he catches, but the number of tongues he has caught. After the fish are unhooked they are thrown into the gurry-pens, where they remain until a strong tide or nightfall gives the men an opportunity to dress them. A skillful crew, when there is good fishing and other favoring circumstances, may catch from 20,000 to 30,000 pounds of round-fish in a day. Seventy-five thousand to ninety thousand pounds of round-fish is considered an excellent fare, while 40,000 to 60,000 pounds of split-fish is also a good fare.

A round-fish is one which has simply been eviscerated, while a split-fish has its head and backbone removed and is salted.

Larger fares of fish have been obtained. In one instance 124,000 pounds of round-fish were brought in by the schooner S. R. *Lane*. In the Fishermen's Memorial and Record Book and on the files of the Cape Ann Advertiser may be found instances of extremely large fares of fish, many of them, too, the result of only a few days' fishing.

6. CARE OF THE FISH.

At the present time the fish are usually brought in from George's split and salted, both in summer and winter. Before 1875 it was generally customary to bring in the fish round in the winter, splitting and salting them on the shore, but this custom has gradually been discontinued, and but few trips of round-fish are now landed. When brought in round the fish are gutted without splitting them, a handful of salt being put inside of each. A few of those last caught are iced.

The process of salting and dressing is precisely the same as that upon the Grand Bank, and is described in the chapter referring to that fishery. The George's-men use less salt in curing than the Grand Bankers, since it is necessary to keep the fish for a much less time on the vessel. The gurry is kept in the middle compartment of the gurry-kid. It is thrown overboard as soon as the vessel gets under way to shift her position or to leave the Bank.

The total amount of ice carried by fifty-eight schooners exclusively employed in the George's fishery in 1870 was 3,478 tons. This gives an average of about 60 tons for each vessel, and, assuming that the average number of trips would be ten, it would therefore appear that 6 tons of ice is carried to a trip. The amount varies greatly with the season; a vessel that would carry 3 or 4 tons in winter would require 10 or 12 tons, possibly more, in summer, since in the latter season the ice not only melts more rapidly, but is used for preserving bait as well as fish. As the total number of vessels engaged in the George's fishery was upwards of one hundred, it will be seen that 6,000 tons or more of ice were consumed in this fishery for the year named above.

The return to port and the disposition of the cargo is in every respect similar to that of the Grand Bankers. The vessels are in no special haste to gain the market, and consequently are not obliged to take such risks as the halibut schooners and haddock catchers. The peculiar dangers of this fishery have been described in the chapter on disasters. The lay in use in the George's fishery and the manner of fitting out the vessels will be described elsewhere. From nine to thirteen trips are usually made in the course of a year. The average number is perhaps eleven.

7. FINANCIAL PROFITS.

The George's cod fishery generally yields good returns to the fishermen and vessel owners, though terrible disasters sometimes result from the winter storms and eat up most of the profits. The most notable George's fare was 123,115 pounds round cod and 862 pounds halibut, by schooner S. R. Lane, Capt. Solomon Jacobs, in 1875. The vessel stocked on this trip $2,554, and the crew shared $90.81. Another large fare was brought home by the schooner Triton, aggregating 54,000 pounds split and 30,000 pounds round cod. On five George's trips in a recent year the crew of the schooner Procter Brothers took 21,544 codfish in number. Of her crew of eleven men Mr. George Williamson was "high line," taking 2,417 fish, while the "low line" caught 1,431. The schooner Montana a number of years ago landed 100,162 pounds cod from a fourteen days' *trip, and in two trips secured 183,362 pounds, making a gross stock of $3,417.32. One of the most* valuable single fares was by the schooner Madame Roland, in 1865, when $2,833.29 was stocked. Eight vessels owned by Mr. George Steele, between January 12 and March 24, 1863, stocked $17,237.17.

8. THE FITTING OUT OF THE GEORGE'S FLEET AT THE CLOSE OF THE WINTER.

The Cape Ann Weekly Advertiser, of January 29, 1875, gives this graphic sketch of the peculiar characteristics of the George's fishery on the occasion of the fitting out of the fleet at the beginning of the year:

"The season is again at hand when the fish are about schooling on George's Banks, and the fishermen are anxious to drop them a line and thereby obtain some returns which will relieve the pressing necessities of themselves and families.

"To this end some fifty sail are now fitting away, and in another fortnight another fifty, and perhaps more will follow. The crafts are being put in the best possible condition to stand the rough weather which is almost certain to be met with at this season on these perilous fishing grounds. Down on the wharves you will witness busy scenes. On board the stanch crafts the carpenters have put in the ice-houses and arranged the pens for the fish. The best suit of sails *have been bent; the rigging, cables, and anchors thoroughly overhauled and made as strong* as wood, iron, and rope can make them. The topmasts have been sent down, the vessels put in thorough order below and aloft for the important part they are to take in the work of prosecuting mid-winter fishing.

"The steward, who occupies a most responsible position, is getting his stores on board, not forgetting a goodly quantity of fuel, and he will see to it that the fishermen, after their daily toil in pulling cod and halibut from so many fathoms down, have plenty of well-cooked victuals to eat and a cup of hot coffee whenever they want it. They carry excellent provisions and live well on board the George's-men, and a first-class steward prides himself on having a good quantity of *'grub' on hand.*

"Now, all is ready. The good-byes have been said at home, the wife and little ones kissed, the 'God bless and return you safe,' whispered into ears which will remember it through the howling gale when danger is nigh, and the trim schooners, strong and saucy-looking, feel the northwest wind on their sails, and dashing boldly out by Eastern Point, the skippers shape their course ESE., and with a whole sail breeze they arrive on the Banks after a run of some twenty hours. Then they take their bearings, and choose what they think will be a good berth; down goes the anchor, everything is made snug, and as soon as possible they give the fish a try. The piercing cold and flying spray does not deter the fishermen; it is a matter of business with them.

They are used to exposure, and are warmly clad and well protected with their oil-clothes. A landsman would not like the position, with the vessel pitching up and down, and it would be difficult for him to keep on his legs; but the fishermen seem to take to it naturally. There they stand at the rail, hour after hour, pulling in the fish—halibut and cod—each anxious to do his best and to be the 'high-line' man.

"So long as the weather is pleasant they pursue the even tenor of their way, each day adding to the catch, and at night they are rocked to sleep in the cradle of the mighty deep. A feeling of uneasiness pervades their hearts if the fleet draws near; in the excitement of getting a trip they are apt to anchor near each other. There is danger in this, as the sad record of the past bears mournful evidence; or in case of a sudden storm, and the breaking adrift of one or more of the vessels, which may always be expected, these drifting vessels become terrible messengers of danger, coming in contact with others of the fleet, and they go crashing on their work of destruction in the darkness and the storm. This it is which has made the George's business so very disastrous, and now there has been awakened in the minds of the skippers a sense of the fearful risks they run by so many anchoring together, and they are more cautious concerning it. If they will remember this and continue to exercise prudence in this respect, the losses will be few in comparison with those of the years gone by. Last year not a vessel was lost in the George's fishery, and we hope that 1875 will result as fortunately.

"A week or ten days' fishing in the best of the season, when the fish bite sharp, will give them a trip, and then homeward they come, and the fruits of the fishermen's daring gives an impetus to business which is felt throughout the city. Coming as it does at a dull time, it is particularly welcome, and all with one accord unite in giving their best wishes to the George's fishermen for short trips and lucky ones."

9. HISTORY OF THE GEORGE'S FISHERY FROM GLOUCESTER.

Capt. Epes W. Merchant tells us that the first vessels went to George's after codfish in 1821; these were three pinkies, commanded by Elisha Oakes, Robert Marston, and Samuel Wonson. "Fish were very scarce that year. Several of the vessels went to the bay cod fishing. Some of the others left off entirely. These three pinkies ran off to George's in June. The fishermen were very timid about the trip, for they had an idea that there were very strong currents on the Bank, and that they would risk drawing their vessels under if they were to anchor. One very fine day the three vessels were alongside, and one of the skippers proposed: 'Let's anchor and try it.' They made up their minds to double the crew on one of the vessels, taking two or three men out of each of the others, and anchor. Well, after they had anchored and bit up, the tide commenced running and she began to go through the water. They didn't know how fast the current would go, got frightened, hove up, and came home without a fish. Nobody then went there after codfish until after the halibut fishing was tried. The halibut vessels were the first to anchor. Mackerel vessels began to go to George's in 1825 and have continued to cruise there ever since."

Capt. Chester Marr, one of the oldest skippers of Gloucester, claims to have been one of the first to make a trip to George's Bank after cod in the month of February; this was about 1835. Describing the abundance of cod, he remarks in his quaint way that they were "solid from top to bottom." In one night he caught 75 tubs of codfish and 15,000 pounds of halibut. This was on the south side of the Bank, south and east of the North Shoal, in 33 fathoms of water. It was a bright moonlight night, and the fish could be seen swimming along the side of the vessel "as thick as mackerel." Before that time the vessels had never succeeded in getting fares of cod, because the halibut were so thick. Some vessels had gone for halibut, but none for cod.

Capt. W. H. Oakes, of Gloucester, tells us that he made a trip to George's Bank for cod in 1835, in the schooner Accumulator. "This was one of the earliest trips for cod to those fishing grounds. If there was a previous trip it must have been made by Capt. George Watson, who entered the George's cod fishery at about the same time."

When Captain Oakes first went to George's Bank, in 1835, it was considered dangerous for vessels to lie at anchor. They were accustomed to heave up anchor with every fresh breeze.

As early as 1840, vessels went to George's for cod in January and February. They were laid up only between November and January.

As early as 1845 Captain Marr remembers to have seen one hundred and forty sail of vessels on George's at one time.

In good weather the vessels made a very quick trip. In or about the year 1860 the schooner Bounding Billow went and returned within four and one-half days, bringing 65,000 pounds of cod-fish and 5,000 pounds of halibut. In 1856 the George's fishery was very successful.

In 1861, states the Cape Ann Weekly Advertiser, from fifty to seventy-five vessels sailed for George's about the 20th of January.

In 1863, in February, according to the Gloucester Telegraph, about forty vessels were fitting for the George's fishery.

In 1873 a writer in the Fisherman's Memorial and Record Book wrote: "There are now two hundred and fifty sail engaged in the business, whose average valuation is $6,000. The trips brought in during the best part of the season will average $700, and stocks of from $1,500 to $2,000 are not infrequent; while the Grand Bank fishery, comparatively a new branch of the business, often discounts from $3,000 to $4,000 on a single trip; the result of the energy and pluck of our fishermen."

5.—THE COD FISHERY OF ALASKA.

By TARLETON H. BEAN.

1. NATURAL HISTORY OF THE PACIFIC COD.

THE SPECIES DISCUSSED.—The cod fishery of Alaska has nearly ended its second decade,* yet it was not until the summer of 1880 that we knew positively what species of *Gadus* is the object of the fishery. Most writers have referred to it under the name of *Gadus macrocephalus*, which was bestowed by Tilesius upon the Kamtchatkan cod, the figure of which suggests that it was based upon a deformed individual. Cope, in 1873, described the young of the common Alaska cod as a new species, *Gadus auratus*, from specimens collected by Prof. George Davidson, of the U. S. Coast Survey, at Unalashka. Steindachner, in the Proceedings (*Sitzungsberichte*) of the Vienna Academy, LXI, 1, 1870, adopts the name *G. macrocephalus* for a large cod taken in De Castries Bay (mouth of Amur River), Siberia. In this example the length of the head is contained exactly three times in the total length to the extreme end of the pointed caudal peduncle. The same proportion may, however, be found in any place where large numbers of *Gadus morrhua* are taken, and it can readily

*This was written in 1880.

be proven to be only a matter of individual variation. The U. S. Commissioner of Fish and Fisheries, Prof. Spencer F. Baird, with a view to investigating the fisheries and fish of Alaska, sent the writer to that Territory to collect specimens and statistics during the summer of 1880. In this way an opportunity was gained for comparing the Alaskan cod directly with that of New England and of Europe, and for determining beyond a doubt that the commercial cod of both oceans is the *Gadus morrhua* of Linnæus. I have not seen fresh specimens from the Okhotsk, but there is no probability that it is different from the Alaskan. It is a matter of daily experience to find long-headed and short-headed cod in the same school off the New England coast or wherever the species occurs, as the length of the head is one of the most variable characters. I have just read in the Zoological Record for 1879 (Vol. XVI, published in 1881) the following sentence: "Day records and notices a fish captured at the mouth of the Thames, and referred to *Gadus macrocephalus* Tilesius, probably Yarrell's 'Lord Fish,' and considered to be distinct from *G. vulgaris*." This agrees with my own idea of the *macrocephalus* form of cod. You can find it in almost any large school of the common species. A series of cod illustrating the great amount of variation in this respect has lately been received from Alaska by the U. S. National Museum.

Golden cod, red cod, and other algæ forms are as well known at Kodiak and the Shumagins as they are around Cape Cod and Cape Ann. Even the beautiful lemon-yellow fish, which occasionally are found in the Ipswich Bay schools, are duplicated in Alaskan waters. Nor does the similarity between the commercial cod of the two oceans end with external characters which are taken into account in determining specific relationship, for we find a wonderful resemblance in their habits and food. Thus, the shore fish about the islands make their appearance in schools similar to ours and similarly named: First, the "herring school;" next, the "lant school;" then the "capelin school," followed by the "squid school" and the "winter school." Besides these there is an abundance of Bank fish, which are larger than any of the schools here named. All of the food-fish of the cod here indicated are exceedingly abundant. The herring is not identical with the common sea herring of the Atlantic (*Clupea harengus*), but it is very closely related to it, and the differences which separate the two species are very slight. The commonest lant is the same as the most abundant one of our New England species, and the capelin is identical with our Eastern one. The squid or cuttle-fish is *Octopus punctatus* of Gabb—a species which reaches a large size and forms one of the preferred baits for cod.

The cod come on the rocks in 25 to 30 fathoms about Kodiak, to spawn, in November and December, just as they do in the Atlantic, and these spawning fish, like their Eastern relatives, will sometimes lie perfectly still on the bottom and refuse to take the hook though it hangs temptingly in front of their noses. Young cod swarm near the shores, precisely as they were observed to do in Gloucester Harbor after the experiments of the U. S. Fish Commission with artificial propagation. On the 13th of July, 1880, our seine took young cod at Saint Paul, Kodiak Island. We dredged numbers of them near our anchorage at Belkoffsky, on the peninsula of Aliaska, July 23, 1880, averaging 1½ inches in length. On the following day young cod of the same size were found in the stomach of a large one of the same species caught near Oleny Island in 7 fathoms of water. On the 1st of October, in the harbor of Chernoffsky, Unalashka Island, the cod fry were very abundant, and some of them had reached a length of 3 inches or more. At Iliuliuk, on the north end of the same island, young cod of the same length were seined at various times from October 6 to 18. They fairly swarmed around the wharves, eagerly biting at anything in the form of bait and readily fastening themselves on hooks intended for much larger fish.

The resemblance between the Atlantic and Pacific cod-fishing grounds is strengthened by the presence in Pacific waters of a genuine pollock—not the fierce, cod-devouring tyrant of the

Atlantic, but a prettier, weaker relative, greatly loved and grievously persecuted by the cod. No one has yet recorded the existence of a haddock (*Melanogrammus*), hake (*Phycis*), or of a cusk (*Brosmius*), in Alaskan waters. The only members of the cod family definitely known are the true cod (*Gadus morrhua*), the tom-cod (*Microgadus proximus*), the polar cod (*Boreogadus saida*), the "wachna" (*Tilesia gracilis*), and the pollock (*Pollachius chalcogrammus*). Wherever the true cod is found occurs also the halibut (*Hippoglossus vulgaris*), the same species as that of the Atlantic. These two prime fish are associated; they come almost to the doors of the fishermen, and are present now around the shores of Alaska in the profusion which attended the infancy of the Cape Cod fishery.

DISTRIBUTION.—The cod seems to be entirely unknown as far south as San Diego, Cal. A circular sent by the chief of the Bureau of Statistics to Mr. W. W. Bowers, collector of customs at San Diego, elicited the following response: "I referred the circular to Dr. G. W. Barnes, the president of a society of natural history, and to various fishermen, but cannot ascertain that the codfish is known to exist in any of the waters adjacent to this port."

J. L. McDonald, in a book entitled "Hidden Treasures, or Fisheries around the Northwest Coast," states that "cod are taken in very limited numbers off the Farallones; they are lean and very poor and resemble the jaundiced cod on the Grand Bank."

The same author writes: "On the Heceta bank, NNW. from Cape Orford, Oregon, cod are found. The Indians residing on that coast report this fish as quite abundant in the summer months, and (they) are said to be large, solid, and delicious."

James G. Swan, in a report on the food-fishes of Cape Flattery, Washington Territory, informs us that "the cod of the North Pacific is not found in abundance at Cape Flattery; occasionally it is brought in, but it is by no means common. It seems to inhabit the deep water of Fuca Strait, and for that reason is seldom fished for, except occasionally some of the older fishermen will try during very fine weather to take fish in 80 fathoms. Further up the sound and in Hood's Canal and a few other localities the *Gadus* is taken, but it is small, evidently a young fish. Although its existence is well known to residents on Puget Sound, it is not taken in sufficient quantities to be relied on as a food-fish." Professors Jordan and Gilbert brought from Puget Sound specimens of the species, some of which have recently been distributed by the U. S. National Museum.

Mr. H. A. Webster, collector of customs at Port Townsend, Washington Territory, communicates the following information: "The cod, I believe, is always present in the waters of Fuca Strait and Puget Sound, but in such limited quantities that catching has not been pursued as a business, and the knowledge of [its] habits is very limited. Young cod, about the size of shad, have been somewhat abundant in Puget Sound during the winter months; cod weighing from four to six pounds have been taken during the summer months by Indians at Nee-ah-Bay. * * * The presence of small cod in the winter months in Puget Sound and at the mouth of the Strait of Fuca is an indication that large quantities may be found in the neighborhood of Cape Flattery—say west of Tahosh light and south from Vancouver Island. * * * No efficient search has been made off the coast of Washington Territory for this valuable fish."

To the cod fleet of 1866 British Columbia added two or three small schooners which were fitted out at Victoria. These vessels fished on grounds immediately north of Naas River, where they reported numerous banks as well as farther to the northward. At the same time cod were caught in Barclay Sound and brought to the Victoria market.

At Sitka, Indians brought a few cod to our vessel in June, 1880. The cod were reported abundant and readily caught, but the halibut, the many fine "bass" (several species of *Sebastichthys*), and the "rockfish" (various species of *Hexagrammus*) seemed to have greater popularity. Mr. A.

T. Whitford told me that the cod spawn in the vicinity of Sitka in spring, and that they have a remarkable number of eggs.

At Port Mulgrave, Yakutat Bay, we took but one cod in the harbor during the day spent there, and this one was large but sick. Good fish are plentiful in the deeper water outside. Nothing but hand-lines were used from the vessel.

Capt. J. Haley reports cod very abundant on the Hoochenoo bank in Chatham Strait. The bank extends from Hoochenoo Point to Point Samuel. He also states that there is a bank off Point Gardiner, and that there are banks on the east shore of Baranoff Island near Poghibshi Strait. According to Captain Haley small cod are abundant in Prince Frederick Sound.

While on a visit to the Aleut village near Graham Harbor, Cook's Inlet, we were told by Mr. Cohen that cod are present in the inlet throughout the year. On the 6th of July in Refuge Cove, Port Chatham, Cook's Inlet, a great many fine young cod were seined. It was in Port Chatham that we first saw capelin schooling. Plenty of excellent cod were caught here with hand-lines from the vessel.

Around the island of Kodiak cod are very numerous. On the 9th of July, while the Yukon was lying at anchor in the harbor of Saint Paul, schools of these fish were seen swimming about her. These were fine, lively fish, evidently the first of the summer run, which Mr. B. G. McIntyre informed me had not yet fairly begun. Young cod were seined on Wooded Island July 13. Between Kodiak and Unalashka are the extensive and well-known banks, Portlock, Seminoffsky, and the Shumagins, which have furnished the great bulk of the cod so far taken in Alaska.

There are cod banks in the vicinity of Unalashka. We had no difficulty in catching all we wanted with a small trawl-line or with hand-lines late in July and early in October. In July native fishermen at Iliuliuk were bringing in bidarka loads of beautiful fish, most of which were very large, to dry them for use in winter. The wonderful abundance of young cod 3 to 4 inches long was a feature here in October.

The species has been seen as far west as the island of Atka, of the Aleutian chain.

Cod have been reported abundant in Bristol Bay. They appear to be uncommon in Norton Sound, though occurring again more abundantly further north, as far as the ice-line. The eastern portion of Bering Sea may yet furnish important supplies of cod in suitable depths, since there is an abundance of its favorite food, notably sand-launce, capelin, smelt, herring, and pollock, which last is probably the "whiting" spoken of by Seemann as occurring abundantly in Hotham Inlet, Kotzebue Sound.

At the island of Saint Paul cod are taken rarely, the fur-seal having a monopoly of the catch.

At Saint Lawrence Island Messrs. Maynard and Elliott caught cod on the 22d of August, 1874.

The great fishing grounds of Kamtchatka are in the Okhotsk Sea and the sea of Kamtchatka.

We were informed by one of the whaling captains in Plover Bay, last September, that he has caught cod off the heads of Marcus Bay, East Siberia, in about latitude 64° north and about longitude 172° 40′ west. Off Indian Point (Cape Tchaplin), East Siberia, a little farther north than Marcus Bay, we were told by Eskimo who came aboard the vessel that they sometimes take cod at that point.

In the Arctic Ocean we saw no traces of the *Gadus morrhua*, its place being supplied to some extent by myriads of small polar cod (*Boreogadus saida*), which, like the pollock, has the lower jaw longer than the upper. On the 19th of August, 1880, in latitude 66° 45′ north, longitude 166° 35′ west, we saw great numbers of young *Boreogadus*, from an inch to an inch and a half long, swimming under the tentacles of a *Cyanea*-like jelly-fish.

In general terms we may say that cod are found around the whole southern shore of Alaska,

and as far south as Puget Sound, extending westward along the Aleutian chain as far as Atka, and not common on the western shore of the Territory much above Bristol Bay, though they have been observed as far north as Saint Lawrence Island. They are said to penetrate only a short distance into Cook's Inlet. We caught several large ones as far up the inlet as Chugachik Bay, but they were not healthy fish. In Port Chatham, which is near the entrance to the inlet, we found them common and good. Mr. Cohen told me that cod are present all the year near Fort Alexander.

In Refuge Cove, a small arm of Port Chatham, we took many young cod in brackish water. At Chernoffsky, also, on the island of Unalashka, we again found them abundant in brackish water, associated with young *Oncorhynchus*, *Salvelinus malma*, *Ammodytes personatus*, *Lumpenus anguillaris*, and a species of *Cottus*. Several small streams flow into Chernoffsky Bay at this point.

The young cod were taken in water varying from 3 feet to 1 fathom in depth, close to the shore. Fish of considerable size, weighing several pounds, were taken from the wharves at Iliuliuk during our stay. Cod are quite abundant close to the shores of the Kodiak group of islands, the Shumagins, and Unalashka Island. I have seen them taken in about 9 feet of water at Iliuliuk, and at a depth of at least 50 fathoms off Cape Cheerful. Mr. Devine, of Pirate Cove, says they are caught as far as 30 miles off Seminoffsky Island, at a maximum depth of 45 fathoms, and that on the middle ridge, in 60 to 70 fathoms, the best fish are taken with hand-lines.

Capt. H. R. Bowen states that cod are sometimes caught in 3 feet of water at the village of Saint Paul; but these are always sick fish. Wherever there are soundings, good fish may be caught. The cod of the Shumagins are generally taken at such short distances from the shores as may be readily reached with dories. The fishermen go out in dories from their vessels, or from the fishing station, in the morning, and return in time to dress the fish aboard or on shore in the evening.

COMMON NAMES.—J. G. Swan writes that the cod is called "kadatl" by the Makah Indians. The Sitkas call it "sacht." A Kodiak Eskimo, to whom I showed one of the fresh fish, told me that they knew it as "ah-mo-doc." The Russian name for the species is "treska," a name pretty widely known in the Territory. It is worthy of remark here that natives generally distinguish closely the "wachna" from the "treska." To the fishermen generally the fish is known as the cod. Men who have come to the Alaskan grounds from New England have brought with them the terms "rock-cod" and "kelp-bangers" for certain individual varieties. "Rock-cod" are the variously colored algæ fish, exactly similar to those known by the same name at Gloucester. "Kelp-bangers" are shore fish that frequent the kelp, as their name suggests. "Wachna" is a term applied to a species resembling the tom-cod, but very different structurally from this.

SIZE.—From all reports, none but small cod occur in Puget Sound and Hood's Canal. I measured several fresh ones at Sitka which were bought from Indians. One taken May 30 was 662 millimeters long; two others, secured June 12, were 435 and 542 millimeters, respectively. Capt. J. Haley informed me that the average weight, when dried, of 10,000 cod purchased by him on the Hoochenoo Bank was 3 pounds, which is quite as much as the average weight of the Shumagin fish. The largest one he saw weighed 30 pounds. He saw a few young fish.

A cod caught by us in the harbor of Port Mulgrave, Yakutat Bay, June 24, measured 870 millimeters. It was stout and heavy, but sick. In Port Chatham, Cook's Inlet, two healthy fish, among a lot taken July 5, measured 772 millimeters and 750 millimeters. One of these was a spent female. Off Marmot Island (Portlock Bank) on the 8th of July we caught with hand-lines, in a

very short time preceding dark, twenty-six cod, fine, plump, and healthy, averaging not less than 12 pounds.

Capt. D. C. Bowen gave me the following information about the shore fish around Kodiak: First comes the "herring school," consisting of medium-sized fish, continuing from May 1 to June or July; then the "lant school," short, thick, well-meated, but not so large as the herring school, occurring June to July. After this comes the "capelin school," of good-sized fish, about equal to Newfoundland cod, July to September. Last comes the "squid school," averaging 12 pounds each. All of these are shore fish. The bank fish are always larger.

Capt. J. C. Caton, who is well acquainted with the Shumagin fishery, says that in 1867 the Sanborn took 60,000 fish, averaging 2¼ pounds when cured and ready for the market. Now vessels will average 80 tons (60,000 fish) of 2½ pounds each. (The market returns show the average to be a little more than 3 pounds to the fish at present.) Captain Caton remarked that none of the fish are so large as the George's cod. Capt. Andrew Anderson informed me that when he was mate of the Wild Gazelle, in 1873, she took, on Seminoffsky Bank, 93,000 fish, averaging 2½ pounds each when dressed. In 1874 she caught 97,000 cod, averaging 3 pounds each. Capt. H. R. Bowen, of Saint Paul, Kodiak, gives the average of the shore fish there as 6 pounds round, and says that the largest weigh 14 pounds. Mr. Thomas Devine, in charge of McCollam & Co.'s fishing-station at Pirate Cove, Shumagins, gives me as an average of the fish taken there something between 8 and 12 pounds round, the largest weighing 50 pounds.

On the 19th of July I saw many fish brought into this station by dorymen. One of the men had 157 for his day's catch, none of them being less than 26 inches in length, and many of them weighing not less than 30 pounds. The smallest weighed about 8, according to my estimate. Prof. George Davidson, assistant to the U. S. Coast Survey, in his report on Alaska, states that in north latitude 53° 39′, west longitude 164° 10′, in 50 to 60 fathoms of water, many cod were caught from his vessel, the largest being 37 inches long; several reached 36 inches. The finest was 36 inches long, 23 inches girth, and weighed 27 pounds, was very fat, &c. In the New York Times of July 15, 1879, is found the following extract from the report of Captain White, of the United States Revenue Marine Service, who was on duty in the Alaska waters in 1878: "One day, when sounding south of Kodiak, wishing to lay in a stock of codfish, I ordered the sails set back, and prepared twenty lines, with four or five hooks to each line. Puget Sound clams were used as bait, and in two hours we caught 250 fish, weighing 30 to 40 pounds each."

From Dr. A. Kellogg, of San Francisco, surgeon and botanist of one of the Coast Survey expeditions, I have the following memorandum: "I copy from my diary verbatim the very brief note made on the spot relative to the cod caught on board the Lincoln, latitude 53° 30′ N., longitude 164° 30′ W.—cod 18 inches girth, 30½ inches length, 14½ pounds; 20¼ girth and 34 inches long, weight 20 to 22 pounds; 3 feet long and 23 inches girth, 27 pounds."

We were in the harbor of Iliuliuk, Unalashka, from the 27th of July to August 3, and from October 6 to 18, 1880. Between the first two dates we saw native fishermen daily bringing in cod for winter use. The fish were caught near the village, and were uniformly good-sized, many of them of 15 to 20 pounds in weight at least. Men were sent out from the vessel also to supply us with fresh fish. They generally fished on the ridge at the entrance to Port Levasheff, and never failed to secure a good supply of cod, averaging fully 12 pounds. In October there was no falling off in the supply, and the size was about the same. In deeper water, farther from the village, we took larger cod.

I find in the notes of Prof. D. S. Jordan the following comparison between the Okhotsk cod and that of the Shumagin Islands: "Okhotsk cod are larger and more numerous than Shumagin cod,

but they are thinner, less fat, and more pot-bellied, and weigh rather less when dressed—80,000 Shumagin fish, dressed, weigh 260,000 pounds; 80,000 Okhotsk fish, dressed, weigh 220,000 pounds. The latter are poorer, perhaps, because they are caught so early in the spring. They are fatter in July. Fishing, however, begins in June." For the dressed Shumagin fish this gives an average of 3¼ pounds each, and for the Okhotsk 2¾ pounds. The average for the Shumagin fish agrees substantially with that given by most persons who have furnished information about the Alaska cod. Professor Jordan's information was obtained from the foremost fish merchants in San Francisco, and mine from captains of fishing-vessels. The average size of the Shumagin fish is higher for 1880. There are many large fish averaging 6 to 8 pounds, or even more, when prepared for the *market.*

SHAPE AND COLOR.—With reference to the Shumagin cod, Capt. J. C. Caton informed me that most of them have black napes, but in some the nape (peritoneum) is white. Some of the fish which we caught on Portlock Bank July 8, 1880, had the nape black, and in others it was white. Mr. Devine, of Pirate Cove, Shumagin Islands, reports there black napes generally, with white or gray occasionally. Capt. H. R. Bowen, of Kodiak, says "they very seldom find cod with white napes—they are generally black." Capt. D. C. Bowen, of the same island, told me that white-nape and black-nape fish both are caught, black-napes being most plentiful. He says that young cod generally have white napes, and the big ones are almost always black-naped. Captain Haley informed me that the Hoochenoo cod have black napes. These statements coincide with my own observations at various points along the coast of Alaska, and it seems to be true that the peritoneum of the Alaskan cod is generally dark. The two large ones already referred to as having been caught in Port Chatham, July 5, 1880, had black napes.

The same variations in the external colors of the fish exist as are observed in the Atlantic. The shore fish are generally darker than the bank fish, and a reddish tinge is very common. Rock-cod are as well known as in the east. Mr. Devine states that very pretty yellow cod are sometimes taken. Capt. H. R. Bowen says that the deep-water fish are generally light in color. Mr. Devine informed me that the winter fish are whiter than those of any other season.

The same gentleman mentions peculiarities of shape among the cod, as, for example, "bull-eyed" fish, or those with very prominent eyes, probably due to their sudden removal from very deep water, and "seal-head" fish, distinguished by a short snout and wide space between the eyes.

The shore fish which were brought to us by Indians from Old Sitka were always dark colored, with long heads and eyes far apart, and with conspicuous blotches, in general appearance often resembling the small cod taken in shallow water off South Greenland—the *ogac* form of the common cod.

There are no differences as far as general appearances go between Alaskan and New England cod. It would be impossible to tell one from the other if they were mixed in a tank without tags or some other means of identification.

MIGRATIONS.—Mr. B. G. McIntyre, Mr. D. C. Bowen, and Capt. H. R. Bowen all agree in stating that cod remain throughout the year around the island of Kodiak. They were scarce last winter on account of the extreme cold, and up to the time of our arrival at Saint Paul (July 9, 1880) the customary summer run had not yet begun. Between that date and July 14, however, we saw schools of them around the vessel where she lay at anchor. According to Mr. Bowen, they made their first appearance at Saint Paul May 7, 1880. Captain Bowen states that they are always found in the same places. Mr. McIntyre informed me that they were so scarce about Saint Paul last winter that the natives could not catch enough of them for their own use—an illustration of the influence of temperature in determining the movement seaward of cod.

According to Capt. J. C. Caton, cod are present around the Shumagin Islands all the time, but at some seasons they are very scarce. The best fishing is in February, commencing about the 10th and lasting to March 10. At this time none of the vessels are engaged in the fishery; only the Pirate Cove Station is prepared to use the opportunity, and I infer, from remarks of the manager, that there is little activity in that quarter. Most of the vessels coming up to the islands get their best fish and best fare in July. Sometimes they do well in May. The fleet come up late in April or early in May and stay until the 10th or 15th of August.

Mr. Devine, who manages the permanent fishing station on Popoff Island (at Pirate Cove), also informed me that cod are to be found all the year round, but that they go off into deep water during cold snaps and toward evening. He stated that the school fish leave in August or September and return in January and February. They seem to move off to the southward and to return from the southward and westward.

With reference to the bank 20 miles east-northeast of Seminoffsky, Capt. Andrew Anderson told me that the fishing is best in August and September. The "yellow-fish" (*Pleurogrammus monopterygius*) school there abundantly about the middle of August, and will follow the bait up to the top of the water. Cod will bite at the yellow-fish in preference to anything else. A change is now being inaugurated in the distribution of the yellow-fish which may affect the movements of cod; the yellow-fish, which was a few years ago unknown or scarcely known about the Island of Unalashka, occurred both at the southern and the northern end, on the west side, during the summer of 1880. At Chernoffsky and Iliuliuk the species was observed in numbers, and if this habit becomes fixed we may expect an increase in the abundance of cod where this choice food may locate.

Mr. Marcus Baker has translated for me a note by Ivan Veniaminoff on the marine fishes of the Unalashka region, in which occurs the following sentence: "Some of these, and especially the cod, in the winter go off shore into deep water, but in summer time they are found along the shores of certain bays and in shoal water."

SCHOOLING.—Mr. D. C. Bowen, of Saint Paul, Kodiak, distinguishes various schools of cod about that island, which vary in size and other particulars and take their names from their favorite food during the time of their stay. He gives them in the following order: First, the "herring school," consisting of fish of medium size, which come about May 1 and stay until June, or even July; next, the "lant school," feeding on sand launce (*Ammodytes personatus*), and made up of short, thick, well-meated fish, not so large as those of the herring school, and appearing in June and July. Then follows the "capelin school," whose food is the *Mallotus villosus*, so well known on the Labrador coast, in July remaining until September. These are good-sized fish, about equal to the Newfoundland cod. The "squid school" comes on in August or September and remains until October. The fish of this school average 12 pounds in weight. The schools so far enumerated are all shore fish, and they are always smaller than bank fish. From October there are winter schools in some places. These are generally composed of short, thick fish.

Capt. J. C. Caton says that they catch males and females together in the spawning-season, and that they do not school when spawning.

Mr. William J. Fisher has furnished the following information concerning the schooling of cod around Kodiak, for which he acknowledges his indebtedness to Capt. H. R. Bowen: Cod associate in schools generally from May to the middle of September, and they live independently the rest of the year, the severity of the winter having much influence on their habits. At different seasons and in different places there are different schools. Males, females, and young are found in the

same schools. The movements of the schools are affected by the presence or absence of food and by the state of the tide, the fish taking the hook more readily at slackwater.

Mr. Devine, speaking about the Shumagin cod, told me on the 19th of July, 1880, that they found the fish both in schools and independent. They were "picking fish" at the time, and there had been "no great flush" of school fish this year. Different schools are found at different seasons and in different places, just as about Kodiak. Mr. Devine says that males, females, and young are not found associated in his vicinity. The males go together at certain times, and the females are associated. At the spawning-season there are more females than males. The movements of the schools are very much affected by sharks, and, to some extent, by dogfish. Dogfish are not abundant, but sharks are especially plentiful. The dogfish is identical with our Atlantic spined dogfish (*Squalus acanthias*). We did not get a specimen of the shark, but the National Museum has a couple of small ones from Sitka, which are very close to, if not identical with, the "tope" (*Galeorhinus galeus*). As for the influence of the tides, Mr. Devine says that fishing is best during the spring tides and poorest in slack tides.

Sometimes the cod have such a superabundance of food that they refuse to take the hook. This is, perhaps, of rare occurrence; generally it seems that the more a cod has in its stomach the more eagerly it bites, especially if the bait be something different from that previously eaten. One would suppose that a 12-pound cod, after eating forty capelin, would not take herring bait, and yet we had an illustration of that on Portlock Bank.

My own observations at various points along the Alaskan coast seemed to indicate that young cod from 2 to 4 inches in length prefer to school near the shores, in sheltered coves, where the water is shallow, and often where it receives a large admixture of fresh water. At Iliuliuk I found myriads of such young fish playing about the wharves, eagerly seizing the hooks baited for larger prey. Occasionally a larger cod, of about 16 or 18 inches in length, would be caught in the same vicinity, but almost invariably we found the small fry unmixed with older fish.

The supply of food forms a very important motive for the presence of cod in particular places at certain times. When we were in Port Chatham, for example, capelin were schooling there abundantly, and we caught fine cod freely. On Portlock Bank again capelin were plentiful, and nearly every cod examined had its stomach filled with them. At the Shumagins "England hake," or, more properly, pollock (*Pollachius chalcogrammus*), were abundant in July, and the cod were there feasting on them. The "yellow-fish" (*Pleurogrammus monopterygius*) is one of the finest of all baits *for cod and will play an important part in the future history of the fishery. This yellow-fish is* said by Capt. Andrew Anderson to be very abundant about the middle of August on the off-shore bank, 20 miles east-northeast of Seminoffsky Island, where it is found schooling like the mackerel, and will follow the bait up to the surface of the water. It is to be noted that August and September are the best months for cod on this bank. The herring (*Clupea mirabilis*) also has a great deal to do with a prosperous cod fishery. Capt. J. Haley told me that herring are wonderfully plentiful on the Hoochenoo Bank at the fishing-season and that there are enormous quantities of fine herring in Prince Frederick Sound, which serve to attract a great abundance of small cod thither. The vast shoals of herring which are found in various parts of the Gulf of Alaska are generally accompanied by hordes of cod. Elsewhere in this paper I have recorded the statement of Captain Bowen concerning the magnitude of a herring shoal seen by him; this will give a good idea of the amount of sustenance awaiting the pleasure of the cod around Kodiak. The same numbers are known to be present in many localities, and wherever found their influence on the prosperity of the fishery must be recognized.

ABUNDANCE.—Before entering into an examination of the influence of modes of fishing and

practices of the fishermen upon the abundance of fish, it will be well to review the actual numbers taken at different times and in various places. Captain Haley secured 10,000 fish in two weeks from Indians on the Hoochenoo Bank, and could have got many more. The Indians caught these cod with bark lines on barbless, bent-iron hooks, two of them going off in a canoe and bringing in from 25 to 50 fish, which were quite enough to satisfy their laziness. They would not allow any one else to fish, but if they had the number would have been readily quadrupled.

Mr. D. C. Bowen states that as many as 500 have been taken in a day by one hand-line fisherman on Portlock Bank, and that the average catch of the whole season per man is 75 per day.

Here may be repeated the statement of Captain White, of the United States Revenue Marine, who reported the capture, south of Kodiak, of 250 fish, weighing 30 to 40 pounds each, with twenty lines having four or five hooks each. This number was taken in two hours.

From the New York Times of July 15, 1879, I extract a sentence by William S. Dodge, formerly mayor of Sitka, to the effect that "at Kodiak Henry Richard and Thomas Bache, fishermen, caught alone, with hook and line, within the last six months, 22,000 cod."

Capt. Andrew Anderson told me at Saint Paul that with a crew of ten men, on Seminoffsky Bank, he has caught as many as 4,000 cod in a day, and that his average catch there was from 1,600 to 1,800 daily.

Mr. D. C. Bowen stated that John McCathrine and a man named Smith caught 1,700 cod in a day on one trawl (a 12-line trawl of 600 or 700 hooks) in Unga Straits. Their average catch was 1,200 fish.

A correspondent of the San Francisco Post, writing of the season of 1876, says: "One man on board the schooner Selma, which arrived the other day, had 13,000 fish to his credit," &c. These were caught during a season of four months.

Capt. J. C. Caton, who has been familiar with the Shumagin fishery ever since the second year of its existence, affirms that fish are plentiful enough to supply a large market when that is found. The evidence of all the fishermen goes to prove that the great want is not fish, but demand for fish. One such customer as Gloucester would whiten the Gulf of Alaska with hundreds of sails, where now there are less than a dozen, and there is every indication that full fares would repay the venture.

As for the influence of fishing and its accompanying practices, we have information from only two points, Kodiak and Pirate Cove. Capt. H. R. Bowen, of Saint Paul, Kodiak, says that cod are as abundant there now as they were when white men began fishing; that their haunts and habits have not been changed by the influence of man, and their numbers have not been diminished by over-fishing. Trawls have never been used in that vicinity. He regards the practice of throwing gurry overboard as injurious to the fishery; the cod, he says, will leave and their place will be taken by sculpins.

Mr. Thomas Devine, of Pirate Cove, said that cod are scarcer there now than they were five years ago. He accounts for their decrease by the increased fishing, especially with trawls, the injurious practice of throwing gurry overboard, and, to some extent, by the capture of the mother fish, which will sometimes take the hook freely. The loss of gear resulting from trawling has a bad effect upon the fishery.

FOOD.—The food of the cod in the Pacific is as plentiful and as varied as in the Atlantic. Most other fishes of suitable size are liable to suffer from its voracity, while certain species for which it has an especial liking are slaughtered in great numbers. There is a wonderful abundance of invertebrate animals, such as squid, shrimp, holothurians, crabs, marine worms, sea-fleas, and, in short, just such forms as are well known to every fisherman on the eastern grounds. The waters

of the Alaskan fishing grounds fairly swarm with this kind of life suitable to the wants of the cod. The fish which constitute in large measure the food of the cod are herring (*Clupea mirabilis*), capelin (*Mallotus villosus*), lant (*Ammodytes*), halibut (*Hippoglossus vulgaris*), whiting or England hake (*Pollachius chalcogrammus*), sculpins (*Hemilepidotus Jordani* and *trachurus*, also *Cottus polyacanthocephalus*), and yellow-fish or striped fish (*Pleurogrammus monopterygius*). Sometimes young cod are swallowed by older ones. I have seen a species of *Liparis* from a cod stomach on Portlock Bank. The yellow-fish is the best bait for cod, according to Captain Anderson and Captain Caton. Another food-fish of the cod is worthy of mention here, because of the interest which attaches to its common name of "cusk" (*Bathymaster signatus*), a species very different indeed from the cusk which is so much eaten for cod in the Eastern States.

Mr. Devine says that sick cod are sometimes seen feeding at the surface, and sometimes healthy fish will chase bait up. In this way yellow-fish will attract cod to the surface, and capelin will also. I have counted forty capelin in one cod taken on Portlock Bank, July 8, 1880.

REPRODUCTION.—According to Mr. D. C. Bowen, cod about Kodiak come on the rocks in 25 to 30 fathoms, spawning in November and December. Capt. H. R. Bowen, of the same island, states that cod, full of eggs, are caught in February. The eggs are very light straw color, and about as large as No. 12 shot. He says that eggs and milt sometimes run from the fish after they are caught.

Capt. J. C. Caton informed me that cod spawn around the Shumagins in February, on sandy bottom in shore, and that they will bite freely when spawning. Mr. D. C. Bowen says that at certain times spawning cod will lie perfectly still on the bottom and not take the hook.

Mr. Thomas Devine tells me that the Shumagin cod spawn in from 10 to 15 fathoms of water in January and February; the size and color of the eggs are the same as in the Eastern cod. The wharf at the Pirate Cove fishing-station is sometimes covered with spawn which has run from the fish after they were landed. He says that during the breeding season the males are long and slim and the females are short and deep. The smallest codfish he has recognized as such were 6 inches long, and they appeared in May or June. The smallest ones seen by Captain Bowen were, also, six inches long; they made their appearance about July, and were in company with the old fish.

On the 6th of July, 1880, we seined many young cod in Refuge Cove, Port Chatham, Cook's Inlet, where the water was less than a fathom in depth, and was largely diluted by fresh streams.

At Belkoffsky, on the peninsula of Aliaska, young cod about one and one-half inches long were dredged on the 23d of July. On the following day, while lying on the west side of Oleny Island, a cod 1½ inches long was found in the stomach of a large one.

On the 1st and 2d of October we seined many young cod at the head of Chernoffsky Bay, Unalashka; from the 6th to the 12th of the same month we saw them in great numbers swimming around the wharves at Illiuliuk, Unalashka, very active and wonderfully greedy. We may, therefore, say that from May to October, at least, young cod are found in shallow water near the shore, and that about the middle of the latter month they have reached an average length of 4 or 5 inches. At Illiuliuk, when a jig or a baited hook was let down into the water it would be at once surrounded by a throng of nibbling fry, not at all frightened by the presence and antics of numerous small boys. These small fish frequently succeeded in fastening themselves on the hooks, and were pulled out on the wharf, either to be eaten or used as bait or thrown away.

DISEASES, PARASITES, ENEMIES.—As a rule all large cod caught in harbors, in shoal water, are sick. On the 24th of June, 1880, one was taken in Port Mulgrave, Yakutat Bay, that measured 34½ inches in length, and was stout and heavy, but sick and unfit for food. The gills were not bright red as in a healthy fish, but dull and faded; the colors of the body were also dull.

Numerous parasites were present externally, and the abdominal viscera were infested with worms. A very unpleasant odor came from the belly when it was opened.

On the 2d of July, in Chugachick Bay, Cook's Inlet, three large cod were caught from the vessel, all of which were sick, their abdominal viscera being lined with worms and giving off a bad odor, yet the fish were quite heavy.

On the 5th of July a healthy cod 28⅝ inches long and blind in both eyes was caught on a hook in Port Chatham, near the entrance to Cook's Inlet. The fish was entirely free from parasites. Its stomach contained only the herring with which the hook was baited. Instead of the transparent aqueous humor in the anterior chamber of the eye, there was an opaque white substance, the result, doubtless, of an old injury. A second fish taken here (about an inch longer than the blind one) seemed to be perfectly healthy, but there were numerous small worms in the intestines. In its stomach were an *Ammodytes*, a little wad of kelp, and a pebble.

In examining a fresh fish caught near Sitka I found the inside of its mouth containing many lernæan parasites.

Capt. H. E. Bowen has never seen deformed cod in the vicinity of Kodiak, but diseased ones are common. He has frequently noticed ulcerated sores along the body, and especially on the head. Dead cod have never been seen to his knowledge.

Mr. Devine, of the Shumagins, has seen cod sometimes with their backbone broken, causing a deformity known as "rose bones," but he has never seen dead fish in any quantity at or near Pirate Cove. In earlier years, he says, you could heave up hundreds of sick cod at the wharf. Sometimes you would take cod long, thin, and gaunt, and after taking out the bone you might "read the Bulletin through them." Mr. Devine mentions, as external parasites found on Shumagin cod, "cuttle-fish, whelks, worms, and fish-lice." The commonest external parasites observed by me were small lernæans.

Around Kodiak seals and sea-lions prey upon cod, frequently taking them from the line, according to Captain Bowen.

Mr. Devine tells me that sharks are very abundant about the Shumagins and very destructive to cod. Dogfish (*Squalus acanthias*) also prey upon cod, but they are not abundant. We caught comparatively few dogfish during the summer—one at Port Althorp, one on Portlock Bank, and many at Sitka.

2. HISTORY OF THE FISHERY.

In the speech of Hon. Charles Sumner on the cession of Russian America to the United States (printed at the Congressional Globe office, Washington, 1867) is an abstract of the references made by early navigators and visitors in Alaska to the fishes of its waters. The cod is among those most frequently mentioned, appearing for the first time in the report of a Russian navigator in 1765. Mr. Sumner then quotes from Cook (1786), Portlock (1787), Meares, Billings (1792), Langsdorf (1804), Lütke, and Sir George Simpson (1841). All of these speak of the cod as being one of the commonest fish.

It appears that the first cod brought to San Francisco were taken by the brig Timandra off the island of Saghalien in 1863. I quote the account of it from the San Francisco Commercial Herald and Market Review of January 15, 1880: "The North Pacific cod-fishing grounds have been regularly prospected for fourteen years. The first fish ever brought to this market from that section was in 1863 or 1864, by the brig Timandra. While this vessel was lying becalmed off the island of Saghalien, the crew, for want of something better to do, commenced fishing. They were astonished at their success on their first day, and continued their pastime from day to day until

quite a quantity of fish had been caught. This was the origin of the business, which has since regularly employed from half a dozen to a score of vessels, and from forty to two hundred and fifty men during the season. * * * The North Pacific codfish fleet was organized in the spring of 1865."

The Gloucester Telegraph newspaper of October 11, 1865, has a paragraph which is believed to refer to the vessel above mentioned; it reads thus: "Two years ago a single vessel wandered off to the then unknown banks on an uncertain adventure and in three months brought in a cargo of codfish that astonished everybody. * * * The fishing grounds are in the Ochotsk Sea * * * ."

The San Francisco Commercial Herald and Market Review in its issue of January 15, 1880, tells us that "the North Pacific codfish fleet was organized in the spring of 1865," in which year seven vessels were engaged, and their combined catch was 469,400 fish. In 1866 eighteen vessels were employed and the catch was 724,000 fish. In 1868 the number of vessels was reduced to ten. The largest fleet in any year since the beginning of the fishery was that of 1870, when twenty-one vessels were engaged. Small fleets were out in 1872, 1873, 1874, and 1875, as will be seen by the accompanying table. The largest catch recorded is that of 1879, thirteen vessels having aggregated 1,499,000 fish. The average weight of the cured fish during the earlier years was from 2 to 3 pounds; but it ranges now between 3 and 4 pounds.

The total weight of the catch of 1879 is reported to have been 1,955 tons, or 4,379,200 pounds. The amount of cod brought into Gloucester during the same year was not far from 50,000,000 pounds, so that the whole cod fishery of the Pacific United States amounted to less than one-tenth of that of Gloucester alone, or less than one-twentieth of the entire catch of the Atlantic United States. This is by reason of the smaller demand for codfish on the Pacific slope, and not because of any scarcity of cod.

Table showing results of the North Pacific codfish fishery.

Year.	Vessels.	Fish.	Year.	Vessels.	Fish.
1865	7	469,400	1873	7	550,000
1866	18	724,000	1874	6	381,000
1867	10	943,400	1875	7	504,000
1868	10	608,000	1876	10	758,000
1869	19	1,032,000	1877	10	750,000
1870	21	1,265,500	1878	12	1,190,000
1871	11	772,000	1879	13	1,499,000
1872	5	300,000	1880	8	1,206,000

According to J. L. McDonald (Hidden Treasures, &c., p. 11) the Shumagin fishery dates from 1866: "In the spring of 1866 Captain Turner sailed from San Francisco in the schooner Porpoise; he pursued a northerly course, calling at Queen Charlotte's, Unga, and Shumagin Islands; around the latter-named group he found safe harbors, fuel, water, and other facilities for prosecuting his business; while on the grounds fringing those isles he found large, plump, healthy codfish in such numbers as to enable him to fill his vessel in a few weeks. After an absence of three months this 'hardy toiler on the sea' returned to the 'Bay City,' having performed a successful voyage, the honored pioneer of the northwestern salt fisheries."

I was informed by Capt. J. C. Caton, who has taken part in the Shumagin fishery since 1868, that the first fleet at the islands consisted, in 1867, of three schooners, the Sanborn, Captain Morse; the Porpoise, Captain Turner; and the Sarah Louise, Captain Holcomb. Captain Caton said that they caught most of their fish off Nagay; they came up to hunt fish and discovered these banks;

the Sanborn took 64,000 fish, the Porpoise 36,000, and the Sarah Louise 36,000; the trips sold for 12 to 13 cents per pound. Captain Caton came up in the Porpoise in 1868 and tried to make two trips, but got only half a fare on the second. In 1868 there were fourteen vessels at the Shumagins. The best fare was brought by the Mandiago (Captain Haines)—between 80,000 and 90,000 fish; the Sanborn took about 60,000; the Porpoise alone tried two trips and caught 63,000 fish. The prices were the same as in 1867.

The influence of the discovery of these extensive fishing banks in the waters of Alaska upon negotiations for the cession of Russian America to the United States has been declared considerable, as will appear from the following extracts from the work of Mr. McDonald, already quoted.

"In January, 1866, the author, while attending the session of the legislature at Olympia, the capital of Washington Territory, determined to make another bold push for Alaska, by soliciting the good offices of our Government for the purpose of obtaining a permanent foothold, and to open the prolific fishing grounds in those regions to our ambitious fishermen. To this end we penned the following memorial:

"*To His Excellency Andrew Johnson, President of the United States:*

"Your memorialists, the legislative assembly of Washington Territory, beg leave to show that vast quantities of cod, halibut, and salmon of excellent quality are found along the shores of Russian America. Your memorialists respectfully request your Excellency to obtain *such rights* and *privileges* of the Government of Russia as will enable our fishing vessels to visit the harbors and its possessions, to the end that fuel, water, and provisions may be obtained; that our sick and disabled fishermen may obtain sanitary assistance, together with the privilege of taking and curing fish and repairing vessels in need of repairs. Your memorialists further request that the Secretary of the Treasury be instructed to forward to the collector of customs of this, Puget Sound district, such fishing license, abstract journals, and log-books as will enable our hardy fishermen to obtain the bounties now paid to the fishermen in the Atlantic States. Your memorialists finally pray your Excellency to employ such ships as may be spared from the Pacific naval fleet in surveying the fishing banks known to navigators to exist from the Cortez Bank to Behring Strait.

"This memorial, written by a fisherman in behalf of the fishing industry on the northeast coast, passed both branches of our Territorial legislature with commendable unanimity and dispatch. In forwarding a copy of the above-named memorial to the Secretary of State we imparted such information touching the fisheries around the Russian possessions, and the impulse which the opening of those resources to our fishermen would impart to the commercial development on the northwest coast. In acknowledging our humble services the illustrious Secretary assured us that "in consummating the recent purchase, I was strongly fortified by the letters which you wrote to me touching the valuable fisheries in those waters." The New York Times of April 1, 1867 (the acknowledged organ of Secretary Seward), said "that a memorial from the Territorial legislature of Washington Territory, dated January, 1866, asking the President to obtain certain rights for the fishermen, was the foundation of the present treaty.

"On the 18th of October, 1867, the transfer of this vast territory from Russia to the United States was officially consummated by the respective commissioners of the two Governments, at Sitka, in the presence of the Russian population, who cheerfully welcomed the few Americans there also present. The union has been very cheerfully accepted by the people of the Territory. Our Government, on assuming possession, found numerous adventurers from the Pacific States domiciled in various parts of the Territory engaged in trade and in developing the resources in those regions; vessels laden with ware entered every harbor; stores were opened as by magic in every

acceptable roadstead along the southern and western coasts; an active competition for furs, oil, ivory, old copper, iron, and junk was earnestly inaugurated; commerce revived, the sails of our vessels whitened every creek, bay, and sound, and the staid Russians very soon obtained an insight into Yankee progress on the go-ahead principle."

3. THE FISHING GROUNDS.

The great bulk of the cod taken in Alaska are caught within easy reach of the shore, at such distances as may be traversed in canoes and dories. This is true for every part of the Territory in which the fish are found. While we were at Sitka (during part of May and June) Indians brought them down occasionally from Old Sitka, only a few miles away. Mr. A. T. Whitford, of Sitka, states that they are abundant in spring. "Lisiansky caught them with hook and line in Sitka Sound."* Capt. J. Haley informed me that small cod are abundant in Prince Frederick Sound Captain Haley gave me the limits of the Hoochenoo Bank as Hoochenoo Point and Point Samuel. As already stated, the fish brought to him here by Indians were caught from canoes; they were very abundant, and their average weight dried was 3 pounds, which is about the average of the Shumagin cod. According to the same authority, there is another bank off Point Gardiner, and there are banks on the east shore of Baranoff Island, near Poghibshi Strait. "Cod have been taken in abundance at Nootka, Sitka, Lituya Bay, Yakutat Bay, Chugach Gulf, Cook's Inlet, Bristol Bay, and throughout the Kodiak, Aleutian, and Pribyloff Islands."† Portlock found cod abundant at Port Etches, which is at the entrance to Chugach Gulf or Prince William Sound; Belcher took them near Cape Chiniak, Kodiak island. I am indebted to Mr. William J. Fisher for information about the shore fishing in the vicinity of Saint Paul, Kodiak. Mr. Fisher obtained this information from Capt. H. R. Bowen. Ten men are employed steadily from May to September, inclusive, and besides these the natives lay up their winter supplies whenever opportunity offers. The favorite grounds are on a pumpkin or clam bottom, in 15 to 20 fathoms of water. Dories and skiffs are principally used, and they carry from one to three men. The average daily catch per man is 200 fish. Within easy reach of Belkoffsky fine cod are taken freely. The fishing around the Shumagins is done at short distances from the shore. The fishing station of McCollam & Co. at Pirate Cove employs eight men, all of whom go out in their dories during the day and dress their fish on shore in the evening. Those who come up in the vessels from San Francisco are generally within easy reach of North Harbor, Unga Island. Thus we have traced the cod along the whole south coast of Alaska and found them abundant near the shore. The same is true of the Aleutian Islands. Near Iliuliuk, at the entrance to Captain's Harbor, and on the ridge at the entrance to Port Levasheff, cod are plentiful. I have been thus explicit in my details of the shore fishing to give an idea of the large proportion it furnishes of the entire catch, and to supply the opportunity of noting the great contrast with the New England cod fishery.

Extended areas of soundings on which cod assemble in great masses are present in the Gulf of Alaska, but they have been little investigated, and their limits and characteristics are imperfectly known. I have already referred to the Hoochenoo Bank in Chatham Strait, the bank off Point Gardiner, and those off the east shore of Baranoff Island, near Poghibshi Strait. These grounds are scarcely known, except to Indians, and to some extent to Captain Haley. It is unlikely that large vessels will seek cod there, because of the difficulties of navigation, but the time will come when great stores will be secured by small craft, the quality of the fish taken there being excellent and the size equal to the average of the Shumagin fish.

PORTLOCK BANK.—This is the most northerly of a series of banks extending along the Kodiak, Shumagin, and Fox groups of islands, at varying distances from the shore. A series of soundings

* Dall in Report Comm. Agric., 1870, p. 377. † Dall, *op. cit.*, p. 378.

made by the U. S. Coast Survey to the eastward of Kodiak and Afognak Islands shows the following depths in fathoms: 52, 52, 95 (no bottom), 90, 90, 55, 70, 45, 63, 75, 80. In the evening of July 8 we were becalmed on this bank, off Marmot Island, and caught very fine cod in 35 fathoms, soon shoaling it to 30. The bottom is said to be sand and gravel, as a rule; one of the soundings indicated mud. A sounding 20 miles to the eastward of Marmot Island, in 42 fathoms, showed a rocky bottom.* Concerning this bank Davidson gives the following information: "The soundings of Portlock, of Vancouver, and of this expedition prove the existence of a comparatively shoal bank, extending along the southeastern coast of Afognak and Kadiak, with a deep pocket of 90 fathoms, no bottom, 25 miles east of Saint Paul. The shoalest water obtained on this bank by this expedition was 45 fathoms, in latitude 58° 16′, longitude 149° 42′. It is fair to assume that this bank extends along the southeast shore of Kadiak, as incidental and unconnected observations indicate."†

BANK SOUTHEAST OF KODIAK.—I am indebted to Mr. W. H. Dall, of the U. S. Coast Survey, for information drawn from the records of the office concerning this and all the banks which follow. A sounding in north latitude 56° 13′ and west longitude 153° 39′ showed 22½ fathoms. The bank seems to extend in a southwesterly direction; 22 to 38 fathoms were the limits of soundings over an extensive area.

SIMEONOFF OR SEMINOFFSKY BANK.—Mr. Dall states that this ground was discovered by the Minnie G. Atkins in 1867. Soundings have been taken in north latitude 54° 45′, west longitude 158°, and in latitude 54° 38′, longitude 158° 30′. In the latter place Davidson records 40 fathoms. His description runs as follows: "Thirty-five miles east from the south end of the island of Niuniak, the southernmost of the Shumagin Islands, we obtained coral and sand bottom in 40 fathoms of water. * * * Ten miles farther westward the depth of water was 50 fathoms."

Capt. Andrew Anderson informed me that Seminoffsky Bank was visited by the schooner Shooting Star, formerly of Fox Island, Vinal Haven, Me., in 1870, and next by the Scotland and Amanda Ager. He and Capt. J. C. Caton locate the bank at 20 miles east-northeast of Simeonoff Island. They have found from 26 to 40 fathoms with smooth sand bottom on the inner shoal part, and big rocks outside. On the rocky portion many dory and schooner anchors have been lost. The shoal water part is about 2 miles long and one-half mile wide. The whole bank is said to be 10 miles long and from a mile and a half to 2 miles wide. There is deep water on the land side and seaward. These areas are from Captain Anderson. Captain Caton thinks the bank about 40 miles long and 10 or 15 miles wide; and he supposes the 26-fathom ridge to be 2 miles wide and 20 miles long. The fact is, the limits of none of the grounds are definitely known and they will not be until accurate surveys are completed.

It is on this bank that the "yellow-fish" (*Pleurogrammus monopterygius*) is so abundant in August and September and proves so attractive to the cod.

BANK OFF SANAK.—We have two positions for this bank: North latitude 54° 17, west longitude 161° 55′; latitude 54° 20′, longitude 162° 30′. Davidson gives the latter position as about 9 miles southeast from the Sanak Reef, where, he says, "we got bottom in 35 fathoms, rock and barnacles being brought up by the lead."

BANK OFF AKUTAN PASS.—Mr. Dall gives one position in north latitude 53° 20′, west longitude 164° 30′.

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*The series of soundings is from a Coast Survey chart, entitled "U. S. Coast Survey | Benjamin Peirce, Supt. | Alaska | and adjoining territory | 1869. | The Yukon River, Ranges of Mountains, Shores of Norton Sound | and many Features of the Interior, from a Reconnaissance by W. H. Dall, | Director of the Scientific Corps, of the W. U. Tel. Expedition, 1865–1868."

†Alaska Coast Pilot, 1867, p. 44.

Davidson has the following description of the bank in the Alaska Coast Pilot, 1869:

"The bank where trial was first made for fish was found on the 15th of September, during a prevalence of thick weather. We fortunately seized an opening and obtained good observations for longitude, with an approximate latitude; the position is in latitude 53° 35′, and longitude 164° 10′, and near it soundings were obtained in 50 fathoms of water, the lead bringing up sand and a small starfish. With thick, drizzly weather the vessel drifted to the northwest by compass, until 60 fathoms were struck, with sandy, pebbly bottom. Here the lead-line was baited, and while on the bottom the first cod took the hook. The fish proved very plenty, fat, and bit eagerly; frequently two were brought up on a double-hooked line, and sometimes three were brought up on a line with three hooks. The largest measured 37 inches in length, and several reached 36 inches. The finest was 36 inches long, 23 inches girth, and weighed 27 pounds; was very fat, and certainly of as fine, if not finer flavor than cod we had eaten eleven months before, freshly caught on the south coast of Newfoundland.

"The vessel drifted all the afternoon over this bank, with the same depth of water, and fish biting well, although all appeared in capital condition and their maws full of food, such as squid, halibut-head, fish the size of a herring, sea-lice, &c. We got no observations that noon or afternoon, nor any all the next day, on account of thick, foggy, drizzling weather, but the vessel could not have been far from latitude 53° 40′, and longitude 164° 30′, lying 65 miles ESE. true from the middle of the Akoutan Pass, and 40 miles SSE. from the Unimak Pass. * * * The 50-fathom position is 40 miles broad off the nearest island of the Kriniatzin group, lying between Unimak and Unalashka. Much deeper water, 104 fathoms, over a bottom of black sand, was subsequently found in latitude 53° 38′, longitude 165° 25′, 43 miles westward of the above cod bank, and 25 miles broad off the islands."

BANK OFF UNIMAK PASS.—This bank, for which we have a position in north latitude 54°, and west longitude 166° nearly, was first sounded on by the bark Golden Gate in 1865, then in the service of the Western Union Telegraph Expedition. Forty fathoms was found.

BANK OFF SOUTH END OF UMNAK.—In latitude 52° 30′ and longitude 168° 50′, 30 fathoms was recorded.

BANK SOUTH OF AMCHITKA.—We know nothing definite about this, but a bank is reported there.

BANKS NEAR ILIULIUK, UNALASHKA.—Cod are present here all the year, going off into deeper water in winter. They are most abundant on two banks—one a short distance inside of the entrance to Captain's Bay, and the other at the entrance to Port Levasheff. At the latter place there is a ridge on which the bottom is hard and rocky, rich in mollusks, crustaceans, worms, and small species of fish on which cod delight to feed. Here, in from 10 to 20 fathoms, we found plenty of cod associated with *Hippoglossoides elassodon*, *Bathymaster signatus*, *Gymnacanthus galeatus*, *Lepidopsetta bilineata*, *Hemilepidotus Jordani*, *Cottus polyacanthocephalus*, *Raia parmifera*, and the remarkable quill-fish (*Ptilichthys Goodei*).

COD IN BERING SEA.—The statement of Captain Bryant has been often quoted to the effect that: "Behring Sea is a mighty reservoir of cod and halibut, so that he never threw over his lines without bringing up fish in whatever part of the sea he might happen."

"The soundings of this sea," says Davidson, "and of the Arctic Ocean north of Behring's Strait, indicate it as the most remarkable submarine plateau of such great extent yet known. On the eastern half of this sea soundings of less than 50 fathoms are found over an extent of 18,000 square miles."

I quote from Davidson again concerning Cook: "In Behring Sea, in latitude 55° 48′, longitude

162° 42′, about 20 miles broad off the northwest shore of the Alaska peninsula, he 'caught a good number of fine codfish' in 30 fathoms. In Bristol Bay and River, emptying into the Behring Sea, where salmon were in great abundance, he found that fish 'in the maws of cod which he had caught.' In the same bay, southeast (of) Hagmeister Island, in water of 14 to 26 fathoms, he 'had tolerably successful fishing, catching cod and then a few flat-fish.' In latitude 61° 48′, longitude 180°, Saint Thadeus Nose bearing NNW. about 23 leagues distant, he caught 'abundance of fine cod' in 65 to 75 fathoms water. His successor, King, in September, 1779, in latitude 59° 38′, longitude 177°, about 150 miles west by south quarter-south from the island of Saint Mathew, 'got a great number of cod in 78 fathoms.'"

I have already mentioned the capture of cod recorded by Maynard and Elliott at Saint Lawrence Island.

There is, however, no important fishery for cod north of the Aleutian Islands; whether or not banks will be discovered and frequented in Bering Sea we are no better prepared to say than were the Cape Ann fishermen with reference to George's Bank half a century ago. It is highly probable that fishermen will avoid the dangerous lee of the Fox Islands at least until the Shumagins fail to reward their toil.

THE SHUMAGIN ISLANDS.—"These islands were discovered by Bering, in his second voyage, on the 29th of August, 1741, and were named after one of his crew who died and was buried upon one of them. They are situated in longitude 160° west and latitude 55° north, and comprise four large and about a dozen small islands, with a total area of about 1,000 square miles. They contain several Aleutian settlements, and Unga, the largest, has two fine ports, the north and south harbors, where wood, water, bait, and fish abound. The banks already discovered exceed in extent those of Newfoundland. * * * The voyage to the Shumagins and back occupies about one hundred and ten days, a saving of two months and 2,000 miles in time and distance [as compared with the Okhotsk fishery], in addition to the facilities for obtaining fresh provisions, wood and water, and the proximity of good harbors of refuge in bad weather."*

"The winds about the Shumagins * * * from June until the middle of August are from the southeast, with rain and fog; and from the middle of August to the middle of September from the northwest, with fine weather and smooth water; after which there are heavy southerly gales."†

The islands are generally high and to a great extent clothed with tall grass, scrub alder, and a kind of wild apple. The soil is soft and yielding, and walking is usually attended with great fatigue and vexation. The bluffs of Popoff Island show porphyritic rocks with varied hues—slate, gray, and purplish, and here and there is seen a reddish cliff colored by the oxidation of iron pyrites. Winds sweep down the slopes of these hills with great violence and caprice, sometimes capsizing vessels taken unawares. The Nagai, one of McCollam & Co.'s little schooners, formerly employed with the Unga in fishing for the Pirate Cove station, was lost through the winds or "woollies" in the summer of 1880.

One of the characteristic birds found about the shores of the islands in the fishing season is the pretty little paroquet auk (*Phaleris psittacula*). Great numbers of gulls, cormorants, auks, murres, guillemots, puffins, albatrosses, and jægers may be seen hovering over the water or afloat upon it where the surface schools of fish-food congregate.

In West Nagai Strait we saw the Page and the Wild Gazelle, which, besides the little Unga, composed the Shumagin's cod fleet for 1880. They were lying at anchor near Sanborn Harbor. Their dories were out, one man in each, hand-lining and trawling within easy reach of the vessels. Trawls were little used, the men depending almost wholly on the hand-lines.

*Dall in Rep. Comm. Agric. for 1870 (1871), p. 378.

†Davidson: Alaska Coast Pilot, 1869, p. 43.

The permanent fishing station on Popoff Island was established in 1876 at Pirate Cove by T. W. McCollam & Co. There are eight men engaged at the fishery, one of whom, Mr. Thomas Devine, is in charge. Fishing is continued all the year, except when interrupted by severe weather. When not fishing the men do nothing. Twelve dories are owned at the station. Both hand-lines and trawls are used. The men furnish their own gear, but receive their boarding, house, and fuel free. They are paid $27.50 per thousand for the cod, which must not be less than 26 inches long. The greatest distance from shore at which they fish is on Henderson's Island grounds, 4½ miles away. Besides the cod they catch plenty of halibut (*Hippoglossus vulgaris*), "cusk" (*Bathymaster signatus*), pollock or silver hake (*Pollachius chalcogrammus*), "greenfish" (*Hexagrammus*), yellow-fish or striped fish (*Pleurogrammus monopterygius*), "Irish lords" (*Cottus polyacanthocephalus*), common sculpins (*Hemilepidotus Jordani*), "Frenchmen" (*Hemilepidotus trachurus*), and arrow-toothed flounder (*Atheresthes stomias*). The average daily catch of cod per man with hand-line or trawl is about 100, and the catch for the year 20,000. The fish are dressed on shore by the men after their day's catch is landed. The small fish are then pickled and the large ones kenched. Mr. Devine uses about a ton of Carmen Island salt to 1,000 fish, and puts as many into a kench as he can get in to save room. The cod here, according to Mr. Devine, seem to be more watery than the eastern, some of them losing two-thirds in curing. I have observed the same thing occasionally, but the fish were always small shore-fish. Individuals differ in this respect just as they do in the consistency of their flesh. Mr. Devine notes a great difference in the ease of splitting fish, young school fish being readily split, while some others are hard and tough. Besides the men who fish from the station there is a schooner of 20 tons, the Unga, which carries five men, whose catch is brought to Pirate Cove. The men are all foreigners. They catch their fish in Nagai Strait, Coal Harbor Strait, Sanborn Harbor, Stepovakho Bay, and at the Pinnacle. They use hand lines and trawls. The gear of the Unga cost $362 in 1879. For bait they use halibut, sculpins, and cuttle-fish (*Octopus punctatus*, Gabb). Their season lasts from April to October, the catch averaging 35,000 fish, which are salted in bulk and then resalted at the station. The crew of the Unga receive $30 per thousand for their cod and the captain $35. They furnish their own gear. The salt used at the station costs $16 per ton there. The cost of bait is nothing. Besides the fish mentioned there is an abundance of fine clams. The sounds of the cod brought to Pirate Cove are said to be thin and tough. The heads are thrown away. Mr. Devine has a fine lot of pigs and chickens. While there is no lack of substantial fare at the station, the variety of the *menu* is enriched by the introduction of an *entre* called "Scotch dumplings," made by filling with chopped cod-livers and corn meal the pokes or stomachs of cod, which are then tied up and boiled. Mr. Devine told me that natives from Korovin Island come over to a cove near Pirate Cove to fish for salmon. In 1877 they brought to Pirate Cove a silver salmon (*Oncorhynchus chouicha*) 5 feet long. The largest cod taken by his men would probably have weighed 50 pounds. Halibut have been known to reach 300 pounds there.

The fishermen of Saint Paul, Kodiak, use No. 12 Shanghai hooks. Their boat-anchors weigh 13 pounds; the leads, for hand-lines, 5 pounds. The cost of bait is nothing; halibut, squid, and salmon, caught easily in the vicinity, being used. Six hundred fish in a day would be considered a large catch for one man now, 200 being the average. All the fishing for cod is done within easy reach of the shore or from the beach itself. The buyers of the fish furnish the lines and other gear and pay $20 per 1,000 for them dressed.

I have elsewhere given a table showing the number of vessels engaged in the Pacific cod fishery from 1865 to 1880, from which it will be seen that the fleet was at its minimum in 1872 when only five vessels were employed, and largest in 1870 in which year twenty-one were engaged.

The Shumagins fleet is made up of schooners, and these frequently of small tonnage, while the Okhotsk vessels are large schooners, barks, and barkentines. Fishing about the Shumagins is done in the narrow passages, and harbors are to be made through these straits; for this reason small fore-and-aft schooners are employed in preference to large vessels, and for this reason alone, it seems to me, the large craft go to the Okhotsk in spite of the established fact that the fish secured there are not so plump and tender as the Shumagins fish when fresh and are vastly inferior by reason of the treatment they receive on the vessels after being salted. Again, the round trip to the Okhotsk involves two months of time and 2,000 miles in distance more than the trip to the Shumagins. The Okhotsk fisherman is cut off from fresh provisions and good harbors; he rides out storms "hove to" or trusting to his anchors, and, in the end, brings back cod which ought not to command as high a price as the Shumagin fish. Why should vessels go to the Okhotsk at all? If the Shumagin cod are superior, which is admitted; if bait, provisions, fuel, and good harbors are present, and fish are plentiful, what is the motive for going farther? Small fore-and-aft schooners are required for the island fishing, and the larger vessels, if they fish at all, must hunt sea room. Is it because some men have formed the habit of going to the Okhotsk and simply keep on going from force of habit? There are certainly more than enough fish about the Shumagins to supply the wants of the San Francisco dealers for years to come. The fishermen agree that if the demand were larger plenty of fish could be found. Even with the large demand in Gloucester and Boston the famous George's Bank did not become a great resort until in 1850; and at the Shumagins we have fine fish and favorable conditions for their capture and preservation, so that when the call comes for increased and accessible supplies we shall find the industry active there.

4. THE VESSELS AND THE FISHERMEN.

THE FISHING FLEET.—The following tables show the name of each vessel, the rig, tonnage, and other details of the Pacific Ocean codfish fleet for the years 1878, 1879, and 1880:

San Francisco codfish fleet of 1878.

Name.	Rig.	Tonnage.	Built.	Place of building.	Crew.	Outfit.	Where fishing.	Sailed.	Returned.	Disposition of fish.	Number of fish.
Alaska	Sch	32	1870	Rogue River	7		Shumagins	Mar. 18	June 15	Lynde & Hough, San Francisco.	34,000
Alfred Adams*	Sch	64	1851	Essex, Mass.	7		do	Apr. 4	June 22	McCollam & Co., San Francisco.	148,000
Ariel†	Sch						do				45,000
General Miller	Sch	108	1875	San Francisco.	15		do	May 18	Sept. 25	N. Bichard, San Francisco.	23,000
J. H. Roscoe†	Sch	79.99	1851	Amesbury, Mass.	13		do	Apr. 9	Aug. 30	Johnston & Veasey, San Francisco.	20,000
May Queen	Sch						do	Apr. 3	Aug. 7		75,000
Sarah§	Sch	105	1867	Puget Sound	17		do	Mar. 29	Aug. 24	Lynde & Hough, San Francisco.	78,000
Three Sisters†	Sch	62.06					do				35,000
Wild Gazelle	Sch	114	1868	Kennebunk, Me.	16	Hand-lines	do	Apr. 6	Aug. 30	McCollam & Co., San Francisco.	66,000
Adelaide Cooper‖	Bark	300	About 1852	Pittston, Me.	32		Okhotsk	Apr. 16	Oct. 2	Lynde & Hough, San Francisco.	216,000
Constitution	Bktn	257	Rebuilt about 1870.	Philadelphia; rebuilt in San Francisco.	30		do	Apr. 11	Sept. 12	N. Bichard, San Francisco.	140,000
Fremont	Bktn	345	Rebuilt about 1870.	do	32		do	Apr. 20	Sept. 29	Lynde & Hough, San Francisco.	250,000
Page	Sch	125	1820; rebuilt several times.	East	15		do	Apr. 9	Sept. 10	N. Bichard, San Francisco.	60,000

* A tender for the fishing-station at the Shumagins.
† Bought fish caught by others.
‡ Quit the business in 1879.
§ Lost.
‖ Wrecked at Wilmington, Cal., winter 1879.

San Francisco codfish fleet of 1879.

Name.	Rig.	Tonnage.	Built.	Where built.	Crew.	Cost.	Outfit.	Where fishing.	Returned.	Disposition of fish.
Wild Gazelle	Sch	114	1868	Kennebunk, Me.	16	$8,000	$3,000	Shumagins	Sept. 20	McCollam & Co., San Francisco.
Alfred Adams*	Sch	64	1851	Essex, Mass.	7	5,000	1,200	do	Apr. 25 Aug. 25 Oct. 13	Do.
Undaunted	Sch	68	About 1872	Monterey Bay	8†	8,000	3,000	do	June 21	Lynde & Hough, San Francisco.
Sarah	Sch	105	1867	Puget Sound	17	[5,000]	4,000	do	Aug. 4	Do.
H. L. Tierman	Sch	145	About 1868	San Francisco	19	[12,000]	5,000	do	Sept. 19	Do.
General Miller	Sch	108	1875	do	15	17,000	3,000	do	Sept. 21	N. Bichard, San Francisco.
Alaska	Sch	32	1870	Rogue River	7	8,000	1,200	do	Sept. 19	Lynde & Hough, San Francisco.
J. H. Roscoe	Sch	79.99	1851	Amesbury, Mass.	13	8,000	2,000	do	Aug. 1	Johnston & Veasey, San Francisco.
Adelaide Cooper	Bk	400	About 1852	Pittston, Me	32	[10,000]	6,000	Okhotsk	Sept. 28	Lynde & Hough, San Francisco.
Fremont	Bktn	345	Rebuilt about 1876.	Philadelphia; rebuilt in San Francisco.	32	25,000	6,000	do	Oct. 1	Do.
Constitution	Bktn	257	Rebuilt about 1870.	do	30	17,000	5,000	do	Sept. 21	N. Bichard, San Francisco.
Page	*Sch*	*125*	*1820; rebuilt several times.*	*East*	*15*	*5,000*	*3,000*	do	*Oct. 8*	*Do.*
Glencoe	Bg	180	About 1850	do	24†	[2,500]	5,000	do	Nov. 7	John Molloy, San Francisco.
Unga	Sch	20	1876		5‡	3,000	1,000	Shumagins		McCollam & Co., San Francisco.
Nagay	Sch	20	1876		5	3,000	1,000	do		Do.
Pirate Cove Station			Established 1876	Popoff Island, Shumagins.	8		1,000	do		Do.

* A tender for the Pirate Cove station. She brought its catch and that of the Unga and the Nagay. The Nagay was lost in the spring of 1880.

† Number estimated.

‡ All foreigners.

In Professor Jordan's notes the number of seamen engaged in 1879 is given as 247; of these about one-third are Americans, more than one-half are Danes, Swedes, and Norwegians, with a sprinkling of Irish, English, Germans, Russians, and Portuguese. The nationality varies with each vessel and cannot be more closely ascertained.

The number of dories per vessel varies from nine to twenty-five.

San Francisco codfish fleet of 1880.

Name.	Rig.	Tonnage.	When built.	Place of building.	Crew.	Where fishing.	Returned.	Disposition of fish.
Alfred Adams	Sch.	64.00	1851	Essex, Mass	7	Shumagins	May 6, June 25, Aug. 16.	McCollam & Co., San Francisco.
Wild Gazelle	Sch.	114.00	1868	Kennebunk, Me		do	Aug. 23, Oct. 22	Do.
Page	Sch.	125.00	1820; rebuilt several times.	East		do	Sept. 4	N. Bichard, San Francisco.
San Luis	Bktn.	290.07				Okhotsk	Oct. 4	Do.
Constitution	Bktn.	257.00	Rebuilt about 1870.	Philadelphia, and rebuilt at San Francisco.		do	Oct. 28	Do.
Glencoe	Bg.	180.00	About 1850	East		do	Oct. 27	John Molloy, San Francisco.
Arago	Sch.	185.76				do	Sept. 20	Lynde & Hough, San Francisco.
Fremont	Bktn.	345.00	Rebuilt about 1876.	Philadelphia, and rebuilt at San Francisco.		do	Oct. 19	Do.
Unga	Sch.	20.00	1876	San Francisco		Shumagins	Winters at the Shumagins.	McCollam & Co., San Francisco.

All of the above vessels are owned in San Francisco by a few men. The present value of the fleet of 1879 is $105,300. These vessels are fitted out by their owners; the outfit of 1879 having cost $49,400 exclusive of the fishing-station and the curing establishments in or near San Francisco.

The fleet, or some portion of it, is constantly employed in the cod-fishery from April 1 to November 1. During the interval between November and April some, at least, of these vessels are engaged in other pursuits. One small vessel is employed exclusively in the fishery and winters at the Shumagins.

The great bulk of the fishing is done by vessels owned in San Francisco, and we have little information of any others; but there have been, from time to time, small schooners from other ports. We have already referred to the voyage of Captain Haley to the Hoochenoo Bank in 1879. These fish were sold in Wrangell for $100 per ton. In the fleet of 1866 were two or three small schooners fitted out at Victoria, British Columbia; these vessels fished with very fair success on the grounds immediately north of Naas River, on the coast of Alaska, where, and somewhat farther to the northward, they reported numerous cod banks. There was, however, no home demand for the catch, as an inferior fish, caught in Barclay Sound, had possession of the Victoria market. A portion of it was sent to Portland, Oreg., and sold well.* I have just been informed by Major Morris, special agent of the Treasury Department, that no vessels are now engaged in the cod fishery except vessels owned in San Francisco.

THE FISHERMEN.—The captain of the vessel receives a fixed sum per thousand for the whole number of fish caught. Each of the crew receives a stated price per thousand for the fish he catches, the captain keeping each man's account separate. The Shumagin fleet of 1879, with a total tonnage of 756, carried one hundred and fourteen men. The smallest number on any one vessel was five, and the largest nineteen. There are no separate seamen—all take part in working the vessel. The Okhotsk fleet of 1879 employed one hundred and thirty-three men for an aggregate tonnage of 1,207. Of these two hundred and forty-seven men about one-third are Americans. More than one-half are Danes, Swedes, and Norwegians. The remainder is made up of Irish, English, Germans, Russians, and Portuguese. The proportions of nationalities vary with each vessel, and have not been more closely ascertained. On the large vessels they have, besides the fishermen proper, a dress-gang composed of headers, splitters, throaters, and salters. "The header removes the entrails and the head; the throater cuts the throat and rips the fish; the splitter splits the fish open, removing a portion of the backbone, while the salter salts them and piles them in the hold."† This dress-gang receives a fixed sum per month in an ascending ratio from the header to the splitter, and besides this they receive the regular price per thousand for any fish that they catch in their moments of leisure; the salter, however, has little time, and the splitter none at all for fishing. At the Pirate Cove fishing-station the fishermen furnish their own gear (not the dories, however) and receive their board, lodging, and fuel free. They are paid a fixed price per thousand for the cod, none of which must be under 26 inches long, and they dress their own fish on shore, four of them combining to dress their united catch in concert. The person in charge of the station keeps an account of each man's fish as he gaffs them onto the wharf. At Kodiak the same plan is followed with the exception that the buyers of the fish furnish all the gear; they, of course, pay a less price per thousand for the dressed fish. The rule is to make one voyage annually, although the vessels which go up to bring cod caught for them by others make two or three trips between San Francisco and the Shumagins. In 1868 the Porpoise attempted two trips to the Shumagins, but she took only half a fare on the second.

* Cutts: Fishing grounds of the North Pacific, p. 8.
† San Francisco Post, 1876.

Besides those professionally engaged in the cod fishery there are at least two thousand adult males in the Territory of Alaska who derive part of their subsistence from codfish either fresh or dried. These men are estimated only for the parishes of Unalashka, Belkofisky, and Kodiak, and the coast from Mount Saint Elias to Cape Fox, the number being based upon figures in Petroff's preliminary report to the Census Bureau. There is at present no means of knowing how many cod are consumed by natives of the regions in which they abound, but the number must be very great. The bidarkas at Iliuliuk, referred to previously, brought in daily from 15 to 25 cod each. Skulls of this fish have been picked up on the beaches by hundreds at a time. My own observation of the fish-drying frames was made in the height of the salmon fishing, and, of course, salmon predominated over everything else. Wherever we went in the limits of cod we saw more or less hanging up drying without salt. Wherever the native gear has not been superseded by that of the white fishermen lines of bark or of kelp are used. The Indians of the Hoochenoo region have barbless iron hooks and bark lines. Two of them go off in a canoe, each one having *for his portion all the fish he catches. The two will catch from 25 to 50 cod in the time spent in* fishing each day. So far as I know trawl-lines are not used by any one except the professional fishermen.

5. APPARATUS AND METHODS OF FISHING.

THE FISHING GEAR.—In the earlier years of the Shumagin fishery hand-lines alone were used for catching cod. The use of trawls, according to Capt. Andrew Anderson, began there in 1869. *In 1874 one vessel used trawls. In 1875 the Dashing Wave was the only one fishing with them.* Since that time they have been extensively employed, so much so that one correspondent declares that they have made the fish less plentiful than they were five years ago. The Wild Gazelle uses hand-lines altogether; the Unga, hand-lines and trawls. The gear of the Unga and the Nagay, 20-ton schooners, for the season of 1879 cost $362 each. This includes dories, hand-lines, hooks and leads, trawl-lines, hooks, buoy-lines, anchors, buoys, and tubs.

Some of the dories used in the cod-fishery were bought in the East; others are made in San Francisco. The Beckwith dories are essentially like those of Cape Ann in shape and structure, but the materials are different; sugar pine and fir are used, and the rails are oak. A 16-foot Beckwith dory costs $27.50 without the oars. The average cost of dories in San Francisco is $25. Hooks and all other outfit, except dories, hawsers, and food, come from the East.

BAIT.—The item of bait has never been an expensive one for the San Francisco fleet. In the earlier years of the fishery salted herrings were the principal dependence, and a vessel of 100 tons required about $100 worth of this kind of bait, according to Davidson. Cutts's estimate is $100 worth of herring for a vessel of 200 tons. As late as 1879 salt herring were still relied on to some extent, but most of the bait was obtained on the fishing-grounds. In 1876 the fleet used salted clams in part, the main supply coming from Puget Sound. Davidson, in the Coast Pilot of Alaska, 1869, says that his party "*fished with clams, the Schizotherus nuttallii, obtained at Port Simpson* on our way up; but there are plenty of small fish, herring, clams, &c., suitable for bait, in all the harbors along the coast. The clam hangs best to the hook." There is no lack of fresh bait *throughout the fishing-area. Fine clams are exceedingly abundant at the Shumagins and at Sitka* and Cook's Inlet. Herring (*Clupea mirabilis*) are found in great numbers on the whole coast of Alaska as far north as Hotham Inlet, being particularly abundant in Prince Frederick Sound, Cook's Inlet, around Kodiak Island, and generally in all cod-areas. Captain Bowen told me that on the 7th of July, 1880, off Ugak Bay, while sailing at the rate of about 4 knots per hour he passed through herring-schools for four hours in succession. "Lant" (*Ammodytes personatus*) are

exceedingly plentiful, and extend even as far north as Point Belcher. Capelin (*Mallotus villosus*), as already stated, abound; great quantities of their young were taken by us in Plover Bay and on the Alaskan coast north of the Arctic Circle; in July the adults were swarming in Cook's Inlet and in the vicinity of Kodiak. Squid, or cuttle-fish (*Octopus punctatus*), form one of the commonest and best baits for cod. Young halibut (*Hippoglossus vulgaris*) are everywhere abundant and much used. Sculpins, too, are freely employed, the two species of *Hemitripidatus* being most used. At the Shumagins the pollock, or, as it is called there, "England hake" (*Pollachius chalcogrammus*), is a very taking bait in June and July. About this time also the "striped fish," or "yellow fish," (*Pleuragrammus monopterygius*), is the favorite with the fishermen. This species schools in large numbers, and will follow a baited hook up to the surface of the water; in itself an excellent table fish, it is at the same time unexcelled as a bait for cod. Salmon are extensively used in the cod-fishery, particularly around Kodiak, and I have been told that a kind of salmon trout is much employed in the Okhotsk. This trout may be *Salvelinus malma*, which I know to be abundant in Plover Bay, and which, on account of the large size frequently reached by it, must be very desirable for the purpose. The supply of bait comes, therefore, in small part, from San Francisco; but the greater portion of it is readily obtained on the fishing-grounds.

In 1878 the average length of a trip to the Shumagins was four months and three days; to the Okhotsk, five months and seven days. The average of 1879 was about the same.

6. CARE AND DISPOSITION OF THE CATCH.

FISH-CURING.—Ice is not at all used in the Pacific cod-fishery, except occasionally mingled with snow, by vessels for carrying fresh herring from Petropaulski to use them in the Okhotsk.

SALT.—All the fleet take as the greater portion of their outgoing cargo a supply of salt, allowing about 1 ton for 1,000 fish at the first salting on board the vessel. They require, therefore, from 30 to 200 tons each. The fish, after being split and washed on deck, are salted in bulk in the hold of the vessel and brought to San Francisco to be pickled in large butts and kept until wanted for the market, when they are taken out and dried half a day or so on flakes, and are then ready for sale. The resalting in San Francisco requires about 1 ton of salt for 5,000 fish. On their arrival from the fishing-grounds the fish are carefully washed, and the black peritoneum, or "nape," is removed before putting them into the butts. The vats or butts hold from 1 to 11 tons each. At the Pirate Cove station Mr. Devine uses about a ton of Carmen Island salt to 1,000 fish. The fish are kenched in a large warehouse, as many as possible being put into a bench in order to economize space. Some of the cod, according to Mr. Devine, seem to be more watery than the average of the Eastern, and lose two-thirds in curing. Only large fish are kenched here; small fish are pickled. There is at least one place in Alaska where codfish have been successfully "made"—that is, fully prepared to be put upon the market. The Western Fur and Trading Company of San Francisco had prepared for them by Capt. H. R. Bowen, at Saint Paul, Kodiak, in the summer of 1880, 30 100-pound boxes of dried cod and 350 boxes of boneless cod of 30 pounds each. This was done by way of experiment. In conversation with Captain Bowen and his father, D. R. Bowen, I was told that the cod can be made equal to the best Eastern fish if they are handled in the same way. Mr. D. R. Bowen has had twenty-five years experience in the Cape Ann fisheries, and his opinion is entitled to consideration. He says the cod dry better and more quickly at Saint Paul in a westerly wind than they will in San Francisco; they will dry without a bit of salt. Even the salmon will dry without salt there. "Take the season through," said Mr. Bowen, "I can take and make fish as well here as in Gloucester. They will dry the same as stock-fish in Norway." There are Norwegians aboard the vessel commanded by Captain Bowen who are thoroughly acquainted with the

stock-fish. I have tasted boneless cod from Gloucester side by side with a similar article prepared at Saint Paul, and I fully believe that the fish made at the latter place is equal in quality to the Gloucester fish in its prime condition.

Up to 1877 the salt used in the Pacific fishery was principally, if not entirely, what is known as bay salt, which was made by solar evaporation near Alvarado. From all that I can learn, bay salt is principally used now, but the quality has been vastly improved. There has been much complaint as to the presence of lime in the salt, which was believed to make the cod hard and brittle. A correspondent of the San Francisco Post, who made a trip to the Shumagins in the schooner Alaska in 1876, has this to say about the salt: "The cod brought into San Francisco for the last few seasons was notably hard, and did not command a fair price in the market. This hardness was given by the salt used in preserving them not having been properly refined. It contained a quantity of sulphate of lime and other impurities, which dried and burned up the fish. This season the fleet took out 1,200 tons of salt of a much superior character. That which we had on the Alaska was fine enough for table use, the crystals being large, translucent, and beautifully white." In 1879 about 800 tons of salt was used for 1,000 tons of fish, according to the San Francisco Alta (quoted in Sea World, August 4, 1879). I quote from the San Francisco Commercial Herald and Market Review of January 18, 1877, with reference to the preparation of cod: "Previously it was thought best to dry the fish for preservation, but it is now kept in pickle until the time for using it in market approaches, when it is dried in lots to suit. By this means a uniform article is offered from month to month, instead of the hard, dry, and tasteless stuff with which the seasons wound up. The plan of using brine a number of times has been given up, as it was found to cause the unpleasant odor peculiar to the poorly-cured codfish. Another cause of the success attending this interest is in the improved quality of the salt used. An analysis of the common bay-salt, that heretofore used, gave 40 per cent. of lime, soda, and magnesia, and these ingredients made the fish hard and brittle. The salt now in use is manufactured mostly by the Union Pacific Salt Company, and is guaranteed to contain 98 per cent. chloride of sodium and equal to the best imported from Liverpool. Under these favorable changes we are now producing an article equal to any the world can afford, and invoices of Eastern cod are falling off, only enough coming in to meet the wants of a few who still persist in using it."

The price of coarse salt is from $6.50 to $7 per ton. The salt used at the Pirate Cove station costs $16 delivered there.

I conclude my account of the methods of the fishery with a quotation from the article in the San Francisco Post, to which I have previously referred, which conveys a good idea of the manner of handling cod when they are transferred from the vessels to the curing establishments:

"Over at California City, Lynde & Hough have built a yard at an expense of $10,000, for curing and preserving fish. As the codfish arrive on the vessel they are packed as closely as possible, one over the other, in layers, with strata of salt between them. At the yard the first operation is to break cargo. The fish are then placed in a perforated wooden box, open on top, and let into the water by tackle from the ship. Across the top of the box boards are put for two men to sit on. They take the fish one by one, and by the aid of water and elbow-grease rub the black inner skin off. Their feet are in the water, and, although it is rather rough on the hands, especially to a beginner, we face it as Jeffrey faced the cat, and after a while one's hands get callous and as insensible to pain as the hide of the "armed rhinoceros." The next operation is to place the washed fish in pickle, for which purpose they are conveyed to the packing-house. In the packing-house a long series of barrels are arranged in rows sufficient in number to pickle 500 tons of fish. The pickle consists simply of a strong solution of salt, made with pure spring water,

conveyed from the heart of the cañon above, and in it the fish are allowed to soak for about ten days, when they are taken out and placed on the "flakes" to dry. The "flakes" consist of a frame, with a number of laths placed at intervals apart rising from each side of the frame and making an obtuse angle at the top. On these laths the codfish are spread to dry, and when night comes on taken under cover. A great deal of care has to be exercised in the drying process, as prolonged exposure to a very hot sun would result in the utter destruction of the fish. When properly dried the fish are ready for market, and command from 6 to 7 cents per pound."

Under the present arrangement, it will be remembered, the fish are kept in pickle until they are needed for the market, when they are dried on the flakes only half a day or so. The climate of San Francisco is said to be good for drying fish in summer, but not in winter.

7. CAPITAL INVESTED IN THE INDUSTRY.

CAPITAL IN VESSELS, APPARATUS, AND CURING ESTABLISHMENTS.—All the capital invested in the Pacific cod fishery is furnished in San Francisco. The parties who were engaged in the business in 1879 are the following—the names of their vessels being also given: Thomas W. McCollam & Co., 208 Clay street, the Wild Gazelle, Alfred Adams, Unga, Nagay,* Pirate Cove station. Lynde & Hough, 416 Davis street, the Undaunted, Sarah (now lost), H. L. Tiernan, Adelaide Cooper, Fremont. N. Bichard, 10 Howard street, the General Miller, Page, Constitution. James Laflin, 37 Vallejo street, the Alaska.† Johnston & Veasey, Davis street, near Washington, the J. H. Roscoe.‡ John Molloy, Clay street, the Glencoe.

The value of these vessels, as already stated, is $105,300.

Lynde & Hough have a warehouse 4 miles south of San Quentin, with wharf and tanks, which cost $35,000. McCollam & Co. and Bichard have warehouses opposite Saucelito. McCollam & Co. own the permanent fishing-station at Pirate Cove, Shumagins, where cod are kenched or pickled.

According to the information obtained in San Francisco from leading men in the cod trade, by Prof. D. S. Jordan, the capital invested in 1879 was as follows:

	Value.
Warehouses, wharves, &c	$70,000
Ships engaged	104,300
Outfit (including provisions)	48,200

The total expenses of all sorts were said to be about $225,000, and the total value of the product as sold delivered in San Francisco, $234,000.

Following is a copy of the returns of codfish-curing establishments in Saucelito Township California:

	T. W. McCollam & Co.	Lynde & Hough.
Capital	$6,000	$20,000
Maximum of hands	25	60
Males above 16 years	10	13
Hours in ordinary day of labor:		
May to November	10	10
November to May	9	9
Total wages during year	$2,500	$6,990
Months in operation on full time	12	12
Value of material (including mill-supplies and fuel)	$52,500	$25,100
Value of product	$82,500	$42,000
Average day's wages for skilled mechanic	.....	$1 50
Average day's wages for ordinary laborer	.....	$0 75

*Lost at the Shumagins in 1880. †Sold out and gone to Mexico. ‡Sold out.

8. FINANCIAL PROFITS OF FISHERMEN AND CURERS.

METHODS OF SHARING THE PROFITS.—The captain of the vessel receives about $8 per 1,000 for the entire catch. The dress-gang and salters get about $25 per month; good men, $30. As *already explained, most of these men have a chance to catch some fish, for which they receive* $25 per 1,000. The fishermen are paid $25 per 1,000 each for his own catch. The captain keeps each man's account separate.

In 1876 wages were much higher; headers received from $30 to $35 per month; throaters, $35 to $40; salters, $45; splitters, $65. The first two also had some time for fishing, and received $25 per 1,000 for the fish. In this year "one man on board the schooner Selma" had 13,000 fish to his credit, which, at $25 per 1,000, would give him $325, exclusive of any prize. As the Selma is a small schooner like the Alaska and does not carry a "dress-gang," the pay is more likely to be $30 per 1,000, which would give him $390, or over $97 a month—not bad pay for a sailor. In the *schooners the captains usually split their own fish and the men do the dressing. The captain is* sometimes paid by the month, receiving about $120, but more generally he has an interest in the quantity of fish taken, and receives from $8 to $10 per 1,000. Where the vessel is very small, it is usual to pay the captain by the month, because 28,000 or 30,000 would be a cargo, and at $10 a 1,000 that would bring him in only $280 or $300 for a cruise of four months.*

I believe the average pay of a fisherman in 1879 was small, judging from the table which follows:

Vessel.	Number of fish.	Price, per 1000.	Crew.	Cost of catching.	Average share per man.†
Wild Gazelle	85,000	$25	16	$2,125	$142
Undaunted	62,000	25	8*	1,575	.....
Sarah	71,000	25	17	1,775	111
H. L. Tiernan	97,000	25	19	2,425	135
General Miller	80,000	25	15	2,000	143
Alaska	10,000	25	7	250	42
J. H. Roscoe	52,000	25	13	1,300	108
Adelaide Cooper	225,000	25	32	5,625	181
Fremont	240,000	25	32	6,000	194
Constitution	205,000	25	30	5,125	177
Page	40,000	25	15	1,000	71
Gleseco	133,000	25	24*	3,325	.....
Unga	35,000	30	5	1,050	210
Nagay	35,000	30	5	1,050	210

*Number estimated.

†The captain, of course, is excluded, except in case of the last two.

Leaving out the exceptional cases of the Alaska and the Page, the average wages of the Okhotsk fishermen was $36 per month for the season of five months, and the average of the Shumagin men was $32 per month for a season of four months.

The average annual catch of cod at the Pirate Cove station is about 200,000 fish, of which, in 1879, the Unga and the Nagay together caught 70,000; the balance were caught by eight men, each of them averaging, therefore, about 16,250 fish. At $27.50 per 1,000 the gross earnings of each man were $446.87. Deducting all necessary expenses, each fisherman should have nearly $400 for his season's work, and his board, lodging, and fuel free. In 1880 the returns from the same station were 142,000 fish, of which the Unga took 35,000. Each man's share will therefore

*San Francisco Post.

be about $367.81, which will leave him perhaps $340, or an average of nearly $30 per month the year round, clear of necessary expenses.

At Saint Paul, Kodiak, the average daily catch per man is 200 fish, which are worth, dressed, $4. Very little cod is shipped to San Francisco from that point, the major portion being dried by the natives for their own use.

PRODUCTS OF THE FISHERY.—The greater portion of the Pacific cod are salted in the hold of the vessel and brought to San Francisco to be kept in pickle until they are wanted for the market, when they are "flaked" for a short time. The Pirate Cove fish are kenched in a building put up for the purpose, except the small ones, which are pickled. Kench-cured and pickle-cured cod are therefore the principal products of the fishery. Cod sounds at the Shumagins are said to be thin and tough and they are not put up. The heads are thrown away also. The Western Fur and Trading Company of San Francisco had put up for them, experimentally, by Capt. H. R. Bowen, at Saint Paul, 250 pounds of tongues in kits of 25 pounds each, 3,000 pounds of dried codfish in 100-pound boxes, and 10,500 pounds of boneless cod in 30-pound boxes.

Three sorts of codfish are usual in the market: Bundled, the common kind; boxed, the largest selected, in 100-pound boxes; boneless, the skin and vertebræ removed, in 12- and 30-pound boxes.

One of the San Francisco firms brand their best fish "Extra George's Codfish," anchor trade-mark.

In 1866 10,000 gallons of cod-liver oil were reported. In 1879 Lynde & Hough brought to the San Francisco market 3,000 gallons said to have been of superior quality.

The following table shows the quantity and value of cod taken in the Pacific Ocean fishery during the years 1865 to 1880:

Year.	Number of fish.	Average price per pound.	Weight, in pounds.	Value.
		Cents.		
1865	469,409	13	1,314,880	$170,934 40
1866	724,906	13	2,029,480	262,662 40
1867	943,480	12½	2,649,920	331,240 00
1868	668,000	12	1,684,480	202,157 60
1869	1,032,600	9	3,046,400	274,176 00
1870	1,265,500	6½	3,543,680	230,339 20
1871	772,000	7	2,213,120	154,918 40
1872	306,000	7	913,920	63,974 40
1873	556,000	6	1,632,960	97,977 60
1874	381,000	6	1,077,440	64,646 40
1875	504,000	7	1,429,120	100,038 40
1876	758,000	6	2,252,440	135,206 40
1877	750,000	5	2,027,520	101,376 00
1878	1,190,000	5	3,097,920	154,896 00
1879	1,499,000	4+	4,721,920	196,870 00
1880	1,200,000	5	3,618,000	180,900 00
Total			37,845,200	2,752,293 20

To this yield must be added the value of the cod-liver oil, of which 13,000 gallons are recorded, and of the tongues and dried and boneless fish prepared for the Western Fur and Trading Company at Kodiak. The figures given above relative to the number of fish taken each year are from the San Francisco Commercial Herald and Market Review. They agree in the main with numbers gleaned from other sources, but I have never seen any two statements that are exactly alike. The yield is put down at probably less than it really was, certainly not greater. The comparative results from the Okhotsk and the Shumagins for the years 1878, 1879, and 1880 appear in the following table:

Number of codfish taken 1878, 1879, and 1880.

	1878.	1879.	1880.
Okhotsk	666,000	803,000	917,000
Shumagins	524,000	696,000	289,000

It must not be supposed that the number of fish present at the Shumagins is decreasing; fish are plentiful enough there, but the greater part of the fleet in 1880 consisted of large vessels, which make it a rule to fish in the Okhotsk.

In 1879, according to one of the prominent men in the business, the total cost of producing cod ready for the salesroom in San Francisco was $63 per ton, or about 2¾ cents per pound. This dealer hoped to be able to reduce the cost for 1880 to $56 per ton, or 2½ cents per pound.

The selling price of cod in 1879 was lower than ever before, and the business was scarcely profitable. This depression was due in part to overstocking the market. A glance at the yield of the fishery will show that about 1,250,000 fish is the normal maximum demand, but in 1879 about 1,500,000 were brought in. Again, there was considerable rivalry between some of the dealers, which led to cutting under the rates. The consequence of this rivalry, combined with the depression from natural causes, appeared in the small fleet of 1880, most of the smaller speculators having given up the business.

In 1880 a combination was formed by the three principal houses, and prices are higher than they were in 1879. The rates are: Choice large in 100-pound boxes, $5.50 per box; medium in 50-pound bundles, 5 cents per pound; boneless in 30- and 50-pound boxes, 6½ cents per pound; in quantities less than 5 tons, 5 per cent. discount is allowed; and in lots of 5 tons and upwards, 7½ per cent.

6.—THE GILL-NET COD FISHERY.

By J. W. Collins.

1. INTRODUCTION.

Although gill-nets have long been used in Northern Europe, more especially in Norway, as an apparatus for the capture of cod, and are considered indispensable by the Norwegians, they have not until recently been introduced into the United States. It 1878 Prof. Spencer F. Baird, U. S. Commissioner of Fisheries, knowing how profitably these were employed by the Norwegian fishermen, decided to make experiments with them at Cape Ann, with a view to their introduction among the cod fishermen of this country. He accordingly secured a number of the Norwegian nets, which were sent to Gloucester and there tested by the employés of the Commission.

Experiments were made when the winter school of cod were on the shore grounds, but the results obtained were not satisfactory, owing chiefly to the fact that the nets were found far too frail for the large cod which frequent our coast in winter. This was apparent from the numerous holes in the nets, which indicated plainly that large fish had torn their way through, none being retained excepting those that had become completely rolled up in the twine. The current also swept them afoul of the rocky bottom, which injured them still more, so that they were soon rendered nearly unfit for use. The nets were invariably in bad order when hauled from the water, but even under such unfavorable circumstances nearly a thousand pounds of fish were

caught on one occasion. This seemed to indicate that nets of sufficient strength might be used to good advantage, at least on some of the smoother fishing grounds along the coast.

These preliminary trials, therefore, having demonstrated that nets could be employed advantageously in the American cod fisheries, Professor Baird availed himself of the first opportunity that offered for obtaining definite knowledge of the methods of netting cod in Norway, with the intention of disseminating this information among American cod fishermen.

The opening of the International Fishery Exhibition at Berlin, Germany, in the spring of 1880, presented a favorable opportunity for accomplishing this purpose. Professor Baird having appointed me as one of the commission to attend the exhibition on the staff of Prof. G. Brown Goode, desired that a careful study should be made of the foreign methods of the deep-sea fisheries as represented at the exhibition. The method of capturing cod with gill-nets, as practiced by the Norwegian fishermen, was mentioned as a subject which should receive especial consideration, and it was suggested that it might even be desirable to visit Norway, so that the practical operation of this fishery could be observed.

It was the original intention of Professor Baird that a report of the observations made at the Berlin exhibition should be published as soon after the return of the commissioners as possible, but circumstances delayed its preparation.

The use of gill-nets in the cod fisheries at Ipswich Bay during the winter of 1880–'81 resulted in such complete success that there is probability that they may be, at some future time, introduced into the bank fisheries, as well as those along the coast.

2. CONSTRUCTION AND RIG OF THE NETS.

NORWEGIAN METHODS.—The nets used in the Norwegian cod fisheries are usually made of hemp twine, of two, three, or four threads, but occasionally of flax or cotton. The three-layed hemp twine, which is the most common size, weighs a pound to 400 or 420 fathoms. It is made chiefly on spinning wheels by the fishermen's families, and the nets are constructed almost exclusively by the fishermen and their wives and children. Some of the hemp twine, however, is furnished by the factories of Norway and Great Britain, which also supply all of the cotton and linen twine.

The size of the mesh varies somewhat, according to the locality where the nets are to be used, as it is necessary to make the mesh correspond to the size of the fish that frequent different parts of the coast, or make their appearance at different seasons. The smallest mesh is about $5\frac{2}{8}$ inches ($2\frac{7}{16}$ inches square) and the largest 8 inches (4 inches square). Those exhibited at Berlin were 7 and 8 inch mesh.

The length of the nets varies from 10 to 20 fathoms, the average length of those used at the Lofoten Islands being $15\frac{1}{4}$ fathoms, when hung, and they are from twenty-five to sixty meshes deep. Nets about thirty meshes deep are generally used, while those of sixty meshes are employed only where there is little or no current. The nets are hung both to single and double lines, and these vary somewhat in size. Those exhibited were hung to double lines, each being $\frac{7}{16}$ of an inch in circumference, while Mr. Wallem says that 2-inch rope when single, and 1-inch rope when double, is the size commonly used at the Lofoten Islands. Some of the nets are hung to lines only at the top and bottom, having none across the ends, while others have them on the ends as elsewhere. This last method is said to have been recently introduced, and is considered an improvement when the line is a little short, so that the net will be a trifle slack or baggy. About one-third of the net is taken up in hanging; that is, if a net is 30 fathoms long, stretched out, before it is hung, it will

be about 20 fathoms long afterwards. They are hung with twine about the same size as that of which they are made. The end of the twine is first made fast to the hanging line, then hitched to the upper part of one of the meshes, the distance between the line and mesh being equal to one side of the mesh; then back to the line again, around which a clove-hitch is taken, thus forming one-half of a mesh. This method of hanging is thought by the Norwegian fishermen to be superior to any other for large-mesh nets. The nets are generally prepared for use in Norway by tanning, and will last, when so prepared, from one to five seasons.

The nets are supported upright in the water by floats of wood, cork, or hollow glass. At the Lofoten Islands, where nets are more extensively used than elsewhere, the glass floats are preferred, it being said that they replace to great advantage the old wooden ones, which failed to prevent the nets from settling on the bottom. The fishermen from Söndmör, however, who fish on banks where there is a strong current, prefer wooden to glass floats, since it is said that the latter are so much more easily carried away by the tide, causing the loss of many nets, while the principal objection to wooden floats is that they soon become waterlogged. But this is thought to be the lesser evil of the two, since they can, at the worst, only sink to the bottom with the nets, whence they may easily be recovered. From this experience of the Norwegian fishermen it may be inferred that while glass floats are preferable for general use, they are not so suitable as either wood or cork buoys where there is a strong tide. The glass floats are about 5 inches in diameter, with a covering of tarred marlin or spun-yarn hitched over them, to which is attached an eye. In this eye is bent the small rope that holds them to the net. When so prepared for use, these floats are very strong, and break far less frequently than might be supposed. They withstand the pressure of water when submerged better than anything else that has been tried, but are sometimes filled with water—"drunken" it is called—when set in 70 or 80 fathoms. The small ropes with which these are held to the nets vary in length from 1½ to 6 feet.

Oblong-shaped stones from 3 to 5 inches in length are used for sinkers. By experience the fishermen learn how large these should be to sink the nets to the desired depth. From ten to twelve are fastened to the bottom of the net at equal distances apart, being held in a double string.

Large stones are used instead of anchors to hold the nets to the bottom. These weigh from 72 to 144 pounds, the heavier one heading the current, and the smaller being on the other end of the gang, containing twenty to thirty-five nets. Besides these "mooring rocks" there are others of smaller size, which are held to the nets by a foot-line, one end being fastened to the stone which lies on the bottom, and the other to the rope that connects the lower part of the nets together. The larger stones are generally slung with rope, but sometimes with a band of iron around them, with an eye or ring to which the foot-line can be fastened. Iron anchors are not used, as the nets are liable to be torn on them should they settle on the bottom.

Buoys of different kinds are used by the Norwegian fishermen, but, according to Mr. Wallem, at the Lofoten Islands glass buoys, having a capacity of about three to five gallons, are the most common. These are generally egg-shape and are covered in the same manner as the glass floats. Sometimes a buoy is made by fastening several of the latter around a staff. The glass buoys of both kinds are employed in the trawl as well as the net fishery; they will rise to the surface again after having been under water for several days—an advantage not possessed by other kinds—and it seems that buoys of this description might be profitably used by our bank fishermen, who frequently lose large quantities of gear on account of the wooden ones bursting and filling with water when they are submerged to any considerable depth. Hard-wood iron-bound kegs are used by some of the Norwegian net fishermen. From two to four glass floats, such as are on the nets, are fastened to the bight of the buoy-line at different distances from the buoy, for the purpose of keep-

ing the slack or scope from going on the bottom when there is no current. Where there is a strong tide, and a probability of the large buoy being drawn under the surface of the water, a number of the glass balls are attached to it with a line, these serving as "watch-buoys" for the other.

NEWFOUNDLAND METHODS.—The nets employed in the Newfoundland cod fishery are usually made of hemp twine one size smaller than salmon-twine, which is also occasionally used. The size of the mesh is generally about 6 inches (3 inches square), a large mesh not being required for the small fish that frequent that coast. The nets vary in length from 50 to 80 fathoms and in depth from 3 to 4 fathoms. They are hung to the lines in the same way that the Norwegian nets are, the foot-line being 1¼-inch rope, while small-sized double lines of opposite lays are the hangings for the top and ends. Rope is used on the lower part of the net, because, when set close to the bottom, small line would probably be bitten off by ground-sharks, thereby causing the loss of a portion of the net.

To preserve the nets the Newfoundland fishermen make a mixture of tan and tar, which is thought better than either used separately. The tan is commonly made from spruce buds, fir bark, and birch bark (hemlock bark is not used), which are boiled together until sufficiently strong, when the bark is removed, and tar added in the proportion of 5 gallons of tar to 200 gallons of tan, the whole being stirred well together. Considerable care is necessary in applying this, or else it will not be evenly distributed on the net. The custom of mixing tan and tar has doubtless been introduced from England, as it is known that the Cornish fishermen do this, pouring out their tanning liquor into large vats with coal tar, and this mixture is found to preserve the nets much longer than simple tanning. The Newfoundland nets, when prepared in this manner, generally last about four seasons.

The floats are made of the best bottle-cork, when obtainable. Before being used they are dipped in hot pitch or tar, after which it is said they will stand for four weeks at the bottom in 50 fathoms before getting water-soaked. The fishermen have two sets of floats—one when soaked being replaced by the other.

The sinkers most generally in use by the Newfoundland fishermen are made by tying small rocks in a bag of old netting or cloth; but lead sinkers, similar to those on seines, are occasionally attached to the nets. The sinkers weigh from 1 to 2 pounds, are about 13 feet apart, and are fastened close to the bottom of the net.

Anchors, rocks, and stone killicks are used for moorings to the nets. The former weigh from 20 to 25 pounds each, while the killicks and rocks vary from 25 to 60 pounds, the heavier heading the current and the lighter being on the opposite end of the net or gang.

The buoys are generally made of dry fir poles, 6 to 8 inches in diameter, are usually from 3 to 4 feet long, and sharpened at one end, through which is a hole for the strap that the buoy-line bends to. Kegs are also used for buoys.

AMERICAN METHODS.—The nets that were first tried in Ipswich Bay were made of twine about the same size as that used in Norway; indeed, part of them were Norwegian nets which had been lent to Capt. George H. Martin by the United States Fish Commission. These were found, as in the previous trials made by the Commission, entirely too weak for the purpose, and were soon badly torn; not, however, before it had been proved that suitable nets could be very successfully used. The nets that have since been constructed for this fishery are made of twelve thread Scotch flax twine. The twine is very strong, and is found to be well adapted for the capture of large cod. The nets are 9 inch mesh (4½ inches square), that size having been found well adapted for taking the large winter cod in that locality.

The size of the nets depends somewhat on the locality where they are used, and also on the

movements or habits of the fish. In some places where the cod keep close to the bottom, long shallow nets are probably the most suitable, while at other points, as at the Lofoten Islands, where fish are often found in the greatest numbers some distance from the bottom, deeper nets are required.

The nets made for Captain Martin were 50 fathoms long and 3 fathoms deep, but as nearly all the fish were caught near the bottom, other parties have since had longer nets of less depth; many of those made for the shore-fleet are 100 fathoms long and 2 deep.* These were hung to small double lines of opposite lays, and they are generally tanned or tarred before being used. It may be well to mention here the Dutch method of tanning cotton herring nets, which is thought better than any other by those foreign fishermen, and may, perhaps, be applied with equal advantage to other nets, when made of that material. The tan is made by boiling catechu in water in the proportion of 1 pound of the former to 2½ gallons of the latter. When the solution is sufficiently strong the nets are soaked in it for twenty-four hours, after which they are dried. They are tanned and dried three times, and then soaked in linseed oil. A pound of oil is provided for each pound of net, and they are allowed to remain in it as long as any will be absorbed. They are then well drained and spread out on the ground to dry, after which the process is completed by tanning them once more.

Glass floats, similar to those of Norway, have been used on the American nets.† These cost about 30 cents each, when covered with coarse netting, and twenty-five of them are attached to a 50-fathom net. Bricks are chiefly used for sinkers, one of which is fastened to the foot of the net directly beneath each of the floats, they being held in the same manner that stone sinkers are. It is probable that suitable metal sinkers may soon be devised, and perhaps desirable improvements may be made in the floats as well, though various devices which have been tried have not met with the approval of the fishermen. The cost of nets 50 fathoms long, with floats attached, is about $18.

Fourteen-pound trawl-anchors have been found suitable for Ipswich Bay, one being attached to each end of a gang of three nets, but it is quite probable that heavier ones will be required where there is deeper water and more current.

The buoys are common quarter-barrels, rigged in the same manner as for trawling.

3. THE NEWFOUNDLAND FISHERY.

Gill-nets have long been used in the Newfoundland cod fishery, especially on the east and south coasts of the island, but the exact date of their introduction is unknown. It is asserted, however, that this method of fishing has been pursued since early in the present century, and is still carried on to some extent.

The coast of Newfoundland is indented with many large bays or fiords, which are favorite feeding grounds for the cod. In the early summer they make their appearance in pursuit of the capelin that gather in immense numbers along the shores to spawn, and generally remain from three to five weeks. During this time the schools of cod usually keep near the surface of the water and the nets are set floating, but later they are set at the bottom, for when the capelin leave the shores the cod move into deeper water. The nets are set singly or in gangs of three to seven. Two anchors are generally attached to a gang of floating nets, as represented in the plate, but where there is a current one is sometimes found sufficient. They are usually set in the afternoon and

* These nets have been principally made by the American Net and Twine Company, and H. & G. W. Lord, Boston, Mass.

† These are made at the glass factories in Boston.

hauled in the morning. Owing to the comparative lightness of the anchors fewer men are required to haul these than in Norway, as a single fisherman will sometimes take in one or more nets, though in most cases two or three go in a boat. The net-fishing is far less productive than that of Norway, but sometimes a large catch is made. Captain Jacobs states that on one occasion he took from four nets 2,000 cod, but says that this is rarely equaled. These fish are what are known in the American markets as medium cod.

4. THE AMERICAN FISHERY.

Mention has been made of the introduction and trial of cod gill-nets by the United States Fish Commission in 1878, but no attempt was made by the fishermen to use them until the fall of 1880, when Capt. George H. Martin, of Gloucester, Mass., master of the schooner Northern Eagle, fitted out with them for the winter cod fishery off Cape Ann and in Ipswich Bay. The immediate cause which led to this trial was the difficulty of procuring a supply of bait, which is a source of considerable trouble to our shore fishermen, and its cost, even when obtainable, is such a heavy tax on this branch of the fishing industry that often the fishermen hesitate to engage in it, fearing the result will be a loss rather than a gain. It was to obviate this difficulty and to render our cod fisheries more valuable in consequence, that led Professor Baird to bring the cod gill-nets to the notice of the American fishermen. The bait principally depended on by the shore fishermen in the vicinity of Cape Ann, during the fall and early winter, is young herring (*Clupea harengus*), known as the "spirling." The appearance of these fish about the cape is somewhat irregular; sometimes large schools remain for several weeks, and at other times but few can be taken. There was so little probability of getting a supply of bait in the fall of 1880 that Captain Martin hesitated about fitting out, fearing that the cost and difficulty of securing a supply of this article, which is indispensable to the trawl-line fishery, would render the undertaking unprofitable. While the matter of fitting out was under consideration, gill-nets were suggested by the father of Captain Martin, an employé of the Fish Commission, as a means of solving the perplexities of the bait question. He thought the idea a good one, and, together with several of his crew, visited the station of the Commission at Gloucester, looked at the Norwegian nets that were there, and consulted with the agent in charge as to the probabilities of success. The result of this interview was that Captain Martin decided to fit out and give them a thorough trial, and nets were therefore obtained for this purpose, part of them being supplied by the Fish Commission.

Before the trial trip was made Captain Martin had an interview with me at Gloucester, and I briefly explained to him the Norwegian methods of using the nets. He thought, however, that they might be "underrun," as trawls are sometimes, which would enable one man to handle a gang of nets for which an entire boat's crew, six to eight men, is required in Norway.

Ipswich Bay, where the nets have been chiefly used, lies north of the prominent headland of Cape Ann, which divides it from the waters of Massachusetts Bay on the south. A sandy beach extends along the northern and western sides of the bay, and the bottom sinks gradually from this, only reaching a depth of 25 to 30 fathoms at a distance of several miles from the land. The bottom of the bay is a sloping sandy plateau, with only here and there small patches of rocks or clay, supporting but a small amount of animal life that may serve as food for the cod. It is, therefore, a spawning rather than a feeding ground for these fish, and large schools visit the bay during the winter for the purpose of reproduction, and generally remaining until late in the spring. The nets are usually set along the northern part of the bay, but a few miles from the shore, in about 15 fathoms of water, where there is less current than at some other points along the coast.

A peculiar habit of the fish taken in Ipswich Bay has been observed. The fishermen state

that a large percentage of the cod which have been caught in that region have been netted on a small area of bottom, not exceeding three-fourths of a mile in diameter. This "spot of ground" appears to be swarming with cod for a considerable portion of the winter, while the adjacent bottom seems to be almost entirely barren of fish. It is rather irregular in outline, the fishermen say, judging from where the fish are taken, but so far as anything can be told of its physical conformation, it does not differ from the rest of the sandy slope immediately surrounding. It is said that there is no "feed" on the bottom. The fishermen have a theory that there are fresh-water springs in this particular locality, around which the cod love to gather; nor, indeed, can they assign any other reason, since there appears to be no special feature in the character of the bottom. So persistent are the cod in clinging to this locality that, almost invariably, nets placed within its limits come up well filled with fish, while gear set a dozen or twenty fathoms distant get very few, if any, cod. The fishermen have been very much puzzled to understand how the fish get to this spot and escape the walls of netting which surround it on all sides. They do not believe that enough cod could be there at one time to fill the nets night after night for months, and they arrive at the conclusion that the fish must reach the place during the day, at which time they are supposed to rise above and swim over the nets that bar their progress at the bottom, and which, of course, can be seen by daylight.

The common dory has been used for fishing the nets, each vessel having from seven to nine of them, according to the number of the crew. The men go singly, one in each dory, and, while out, either setting or underrunning, the vessel is generally kept under way, the captain and cook managing her and picking up the crew when the work is completed. As a rule, each one of a netter's crew, except the captain and cook, is provided with a gang of three or more nets, which are fastened together at top and bottom when set, these forming a wall at the bottom of the sea 150 to 300 fathoms long and 2 or 3 fathoms deep, being held in position by an anchor at either end. The anchor-lines are 50 fathoms long, and one end of each is bent to the upper corner of the nets.

Under favorable circumstances, one man can set a gang of nets by letting the boat drift with the wind or tide and throwing them over as it moves along, but, as a general rule, two men can accomplish this much better. When setting for underrunning, the anchor is first thrown over, and 25 fathoms of the line paid out, when the buoy-line is bent to it.* The buoy and line are then thrown over, and the remainder of the anchor-line, the end of the latter being made fast to the nets, which are the next to follow. A middle buoy is attached to the center of the gang. When the nets are all out, the other anchor-line, with the buoy-line attached, is veered out, and last of all the anchor is thrown over, which finishes the work. The nets are usually set in the afternoon, and allowed to remain setting for several days, unless for some reason the vessel leaves the fishing ground. Even then, when forced to seek the shelter of a harbor during a storm, they have sometimes been left out. The distance at which the gangs of nets are set apart is said to be about 40 fathoms, but this is a matter to which no rule can be applied, as surrounding circumstances will cause many variations. Fish are caught only at night, and consequently the nets are underrun only in the morning, unless the men are detained by unfavorable weather until later in the day. In underrunning, the fisherman goes to one of the buoys on the end of his gang of nets, takes it in the dory, and hauls away on the buoy-line, the buoy being thrown out on the other side, and the line allowed to run out on one side as fast as it is hauled in on the other. When the anchor-line (underrunning line, as it is sometimes called) is up, it is taken across the dory and the fisherman hauls along towards the nets. These are underrun by pulling them in on one side of the dory,

* It is probable that a better way would be to fasten the buoy-line to the upper corner of the net, where the end of the anchor-line is attached.

and, as fast as the fish are removed, allowing them to pass over the other side into the water, the *anchors*, which remain firmly fixed in the bottom, holding them in position until the work is accomplished. When the end of the gang is reached it is thrown off the dory, *and the nets remain setting* as before, needing no further attention until the next day. When underrunning, they may be taken across either the forward or after part of the dory, *as circumstances may require.*

The time occupied in underrunning depends somewhat on the smoothness of the sea, but more particularly on the amount of fish taken. *When the catch* does not exceed more than 4,000 to 5,000 pounds to the vessel, it is done in about two hours, but when 15,000 to 18,000 pounds are caught, about *four hours are required.*

The success which has resulted from the use of nets in Ipswich Bay has been quite remarkable, the *catch being much* more than that of the trawlers fishing on the same ground. The amount taken for the first three trials, which were made in Massachusetts Bay, in unfavorable weather *and with* inferior nets, was 4,000, 6,000, and 7,000 pounds, respectively.

On a trip ending January 11, 1881, 35,000 pounds of cod were *taken by the Northern Eagle*, 8,000 pounds of which were caught in a single morning. Two other vessels, which were absent the same length of time, fishing at the same place *with trawls, got only 4,000 and 8,000* pounds, respectively. After that time she made another trip, taking the same amount, 35,000 pounds, in four days fishing, 18,000 pounds of which *were caught in one day.* On this day the schooner Christie Campbell, of Portsmouth, set ten trawls (each trawl having 1,000 hooks) close to the nets. The 10,000 hooks caught about 2,000 pounds of fish to the *18,000 taken in the nets.*

The Northern Eagle began fishing with the nets November 27, 1880, and as early as the 20th of January, 1881, had caught 111,000 *pounds of cod. None of the* trawlers took more than one-third of that amount, though they were fishing at the same place. The netted fish are larger than those caught on *trawls, averaging, during the* first six weeks' fishing, 23 pounds each. Among these were individuals which weighed 75 and 80 pounds apiece, but no small fish, such as are frequently taken on trawls, and can be sold only at a reduced price. This has been the invariable rule whenever gill-nets have been used. No immature fish, such as are called "trash" by the *fishermen, have* been taken. In addition to the advantages already mentioned, no bait is, of course, required for net fishing, and not only is the expense for this article saved, *but the loss of time and* trouble incident to securing it and also to baiting trawls is dispensed with. In consideration of these facts it is not strange that a lively interest was manifested in the fishing communities because of this innovation, and it is not surprising that many vessels have been supplied with this kind of apparatus for the winter cod *fishery. The advantages* that may be secured by our fishermen from the use of these nets can hardly be overestimated. It is possible that they may be profitably employed on some *of the larger fishing* grounds. There is no good reason to doubt the practicability of underrunning nets on the Banks, especially on the shoaler parts. They surely may be set and hauled on *any* part where cod are now taken. The use of these, if good catches can be obtained in them on the off shore grounds, would obviate the necessity of leaving the Bank *before a trip had been* secured, as must now be done by trawlers, in order to obtain a supply of bait. It is the general custom of the trawl fishermen to use fresh bait, *and since this will not keep longer* than two to three weeks, it is easy to see that much time must be lost in seeking for it. Indeed, the supply is at all times so uncertain *that some vessels* are not actually engaged in fishing more than one-half of the time, and it may be safely said that Bank fishermen do not spend much more than two-thirds of their time on the fishing ground, the remainder being occupied in the search for bait. Again, a large sum of money *is paid for bait, and, all things* considered, it is quite apparent that even if the daily catch should be smaller than when trawls are used, the profits of the trip would be much greater.

G.—HADDOCK FISHERY OF NEW ENGLAND.

By G. Brown Goode and J. W. Collins.

The winter fishery for the capture of the haddock, *Melanogrammus æglefinus*, is carried on chiefly from the ports of Gloucester, Boston, and Portland, though participated in to some extent by vessels from Portsmouth, Swampscott, and other ports. Although haddock are caught in large quantities, from spring to fall, by numerous vessels and boats employed in the fisheries between Portland and Philadelphia, the winter haddock fishery is far more important, and is peculiar in its methods. It is of comparatively recent origin, dating back about thirty years. We are told that in 1850 immense quantities of haddock were caught on the trawls in Massachusetts Bay, and that a petition was prepared by the Swampscott fishermen asking for a law which should prohibit trawl-fishing, on the ground that this method would soon exterminate the haddock. It is impossible to trace with any degree of certainty the steps in the history of this fishery, since it is pursued only for a few months in the year by vessels otherwise occupied a large portion of the time. The fish have been disposed of in a fresh condition, and the catch has not been carefully recorded.

1. FISHING GROUNDS.

The winter haddock fishery is prosecuted, from October to April, on nearly all of the inshore ledges and the nearest of the off-shore banks south of Sable Island Bank and north of Sandy Hook. The principal haddock fishery is, however, located north of Cape Cod. The depth at which the fish are taken varies with the locality, but is within the limits of 25 and 90 fathoms; usually in water deeper than thirty fathoms.

In the fall, when fishing first begins, the vessels set their trawls along the coast from Nantucket Shoals to Grand Menan, in 30 to 90 fathoms of water. On the outside of Cape Cod the fishing is within 5 to 15 miles of the shore; in Massachusetts Bay, principally on the outer slope of Middle Bank and the southern slope of the shoal ground that lies to the eastward of Cape Ann, usually called "the Southeast," the eastern part of the shoal water on Jeffries Ledge, and along the coast of Maine within thirty miles of the shore, especially about Monhegan Fall, South-southwest, and Western Ground. Fishing in this region continues until midwinter, and is kept up by a smaller class of vessels, such as those hailing from Portland, throughout the whole season. The larger vessels, comprising the major portion of the Gloucester fleet, strike farther out to sea, fishing upon George's Bank, usually in 25 to 40 fathoms, near the localities frequented by the winter cod-fishermen, and also on the western part of the Bank. They also fish on Brown's Bank, in water about the same depth, and on La Have and about Cape Sable. The fishing on La Have Bank for haddock was first attempted in the winter of 1880–'81.* This fishery has been attended with the greatest success. Fishing continues on these outer banks until the end of the season, when it is time for the vessels to engage in other fisheries. A few large schooners follow the haddock fishery during the whole year, often visiting the off-shore grounds, and marketing their catch at Boston.

* Capt. S. J. Martin, of Gloucester, writes, under date of May 10, 1881, as follows: "The first vessel that went to La Have Bank for haddock was the schooner Martha C., of this port. She made her first trip there last winter."

2. THE FISHERMEN.

The fishermen who take part in this fishery are usually picked men from the Gloucester fleet. A large portion of them are engaged in the mackerel fishery in the summer.

This fishery requires as much skill, pluck, and endurance as the halibut fishery, and men are selected in both of these fisheries on account of similar qualifications. Not infrequently the same crew will remain with the vessel in the summer when she is in the mackerel fishery, and in winter when she is employed in the haddock fishery. There is so much competition among those who desire to ship with a good skipper that very often his entire crew list is made out five or six months in advance.

3. THE VESSELS.

The vessels composing the Gloucester fleet are chiefly the stanchest and swiftest of those which in summer engage in the mackerel and cod fisheries. The Portland fleet is made up of a smaller class of vessels, averaging from 35 to 40 tons; these in summer are engaged in the mackerel or shore fisheries. The few Swampscott and Boston vessels which take part in the winter haddock fishery are marketmen and mackerelmen in the summer. A few vessels of the Boston fleet have been built specially for the haddock fishery. Some of these, built in 1884–'85, are of extra depth and large size, and are specially adapted for heavy weather.

The rigging of the haddock catchers is precisely similar to that of the halibut catchers. Since 1879 many of the largest vessels of the Gloucester fleet have been employed in haddock fishing; these generally carry riding-sails, and they usually have gaff-topsails. Formerly very few of them carried gaff-topsails. Their outfit of nautical instruments and charts is, as might be expected, less complete than that of the halibut vessels.

Since the haddock vessels are rarely, if ever, anchored on the fishing grounds, their arrangement of cables and anchors is very different from that in use in the halibut and George's fleets. They usually have a chain cable on their starboard side, and upon the port side a cable similar to that used by the George's and halibut vessels, from 150 to 225 fathoms in length, which is stowed in the fore hold. One end of this cable is bent to the anchor and the other passes down through a hole in the fore hatch and is coiled below in the fore hold. The anchors are like those used on George's-men.

The deck is arranged in a manner different from any that has yet been described. There is usually a single gurry-pen forward of the house, and the space between the sides of the gurry-pen and the house, and the rail on either side, is so arranged that it can be divided into pens for the reception of the fish. Three or four pens may be placed on each side.

The remainder of the deck is clear, but there is a booby-hatch over the main hatch, through which access is gained to the bait-room.

The haddock-catchers do not ordinarily carry davits or a reefing-plank. The mainsail is provided with an "out-hauler" or patent reef-gear, which answers the purpose of a reef-tackle and earing, and facilitates the process of reefing from the deck. A few of the larger vessels, however, are provided with davits and reefing-planks.

The arrangement of the hold is also peculiar. The space which in a halibut catcher is occupied by the forward ice-house is here taken up by the bait-room. The bait-room is sometimes, but not always, bulkheaded off from the fore hold. It is one large compartment, with rough board benches all around, on which the men sit while baiting their trawls. In the center stands a stove. In this room the fishing-gear is always stowed when not in use. The after hold is generally fitted up with

pens resembling those in the after hold of a halibut schooner. In these pens ice is carried when the vessel is making long trips. When large fares are obtained, part of the fish are stowed in the bait-room, which, on the larger vessels, is so arranged that pens can be built in it by sliding boards into grooves. The haddock schooners carry a larger amount of ballast than those of any other class; a vessel of 50 tons requiring 30 or 35 tons of ballast.

4. APPARATUS AND METHODS OF THE FISHERY.

DORIES.—The larger haddock-catchers carry six dories, the smaller four or five.* Most of the dories used in this fishery are deeper and wider than those in any other fishery, and are built specially for the purpose. The ordinary bank dory is also frequently in use. The so-called "haddock dories" are 14 feet in length on their bottoms. When on deck they are nested in the ordinary manner, two or three on a side, and are stowed nearly amidships on each side of the booby hatch, not nested close to the rail, as is the practice upon other vessels carrying dories. A haddock dory ready to leave the vessel in order to set its trawl is provided with the following articles in addition to the trawl-lines: Trawl-roller, two pairs woolen nippers, dory-knife, gob-stick, gaff, bailing-scoop, thole pins, two pairs of 9-foot ash oars, buoys, buoy-lines, anchors, and black balls.

TRAWLS.—The haddock trawls have the ground-line of tarred cotton, of 14 to 18 pounds weight to the dozen lines of 25 fathoms each in length. Hemp is occasionally used, especially by the Maine vessels and by some of the Irish vessels from Boston. The gangings are of white or tarred cotton, in weight about 4 to 6 pounds to the 300 fathoms of line. They are about 2 feet in length, and are fastened to the ground line at intervals of 3½ feet. The manner of fastening the gangings to the ground-line is different from that upon the halibut trawls.† The hooks are numbers 15 or 16, center draught, and eyed.‡ The hooks are fastened to the gangings in the same manner as on the cod trawls. The haddock trawls are coiled in tubs, similar to those employed in the George's fishery. A flour barrel, sawed off above the lower quarter hoops, is used for a tub. Each tub of haddock trawl contains 500 hooks, or about 292 fathoms of ground-line. Each dory is provided with six or eight tubs of trawl, and two to eight of these tubs of line are set at once, as the case may require. Sometimes only two or three tubs are set at a time, and several sets are frequently made in a day, when the weather is suitable.

One of the anchors is similar to those used upon the cod trawls, while the second anchor is often of the killick pattern. The buoy-line is the same as in the cod or halibut trawl, and its length is 15 to 30 fathoms more than the depth of water in which it is used. The buoys are similar to those used in cod-trawling. Each buoy at the end of the trawl has a black ball upon it, and a middle buoy, without a staff or black ball, is also used§ when the whole length of the trawl is set.‖ Instead of the regulation keg buoy, a "kit" is sometimes used by the haddock trawlers.

BAIT.—When it can be obtained, the principal bait used by the haddock catchers is salted menhaden slivers. This is considered the best bait, and it is said that haddock will often bite at this when nothing else will tempt them. The trawl-hooks, when this bait is used, may be baited days or even weeks in advance, while the vessel is waiting for a chance to set. When fresh bait is used the trawls can be baited only a short time before, indeed, only a few hours before they are to be set.

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* The haddock-catchers of Maine and some of the ports in Massachusetts, fishing with "single dories," carry one for each man besides the skipper and cook. These boats are 13 feet long, and managed by a single fisherman.

† They are fastened either by tucking and hitching or by a simple hitch around the ground-line.

‡ The Irish fishermen of Boston sometimes use a galvanized hook of the same size without an eye.

§ This is to aid the fishermen in recovering their trawls in case they are parted at either end.

‖ When the trawls are set in shallow water where there is a rocky bottom three or four middle buoys are sometimes used.

Fresh herring is also used for bait, though to a comparatively limited extent, until within the past five or six years, when they have been the only bait which could be procured.

Capt. S. J. Martin, of Gloucester, writes: "Five or six years ago pogie slivers were exclusively used for bait by haddock fishermen, but for the past two winters none of these could be obtained, and mackerel and herring have been the principal bait. The first vessels that started in October (1880) took fresh mackerel for bait. When the herring came on the coast, or were brought to Gloucester frozen, they were the bait depended on by the haddock catchers."

In cutting up menhaden slivers for haddock bait sections are made trapezoidal or square in form, with a surface area of about a square inch. One of these pieces is placed on each hook, and as the hooks are baited the line is coiled in the tub, the hooks being placed around on the side, points up.* When the fisherman is ready to bait his trawl, he sits upon his bench, with the empty tub between his legs and the trawl-line removed from the tub and turned right side up in front of him, his bait being in a bucket at his side. In his left hand he takes eight or ten pieces of bait, and with both hands he pulls the line toward him, coiling it in the tub after baiting the hooks; he places them in the tub in the manner just described.

As is always the case where a number of men are working together at the same employment, there is sharp competition among the men as to who shall be the first to get his trawl baited. The average time consumed in baiting five hundred hooks is from forty-five to sixty minutes, though the most skillful men have been known to accomplish the task in half an hour. It will be seen that the labor of baiting three or four tubs, which falls daily to each man when the fishing is good, occupies a considerable portion of the day, or rather of the night, since the baiting is usually done at night. In baiting at night each man has a lamp of peculiar pattern, which is fastened to the edge of his tub by a hook; sometimes the trawls are snarled, and the whole night is devoted to clearing and baiting them. A man will go into the hold to bait after the fish are dressed in the evening and perhaps not finish his task until daybreak, when it is time to go out to set again.

METHODS OF FISHING.—As has been remarked, the haddock catchers never anchor on the banks when fishing. The usage in this respect has greatly changed within the last few years. When the fishery was less extensive and was carried on entirely upon the inshore grounds they were accustomed to anchor, set their trawls, and underrun them, but now the trawls are all set while the vessel is lying to, waiting for the dories. This operation is called "setting under sail," and its successful performance is one of the most complicated evolutions performed by vessels and boats, requiring a high degree of skill on the part of the men on the vessels and in the boats.

Let us imagine ourselves on the deck of a haddock schooner at daybreak approaching Jeffries Ledge. The skipper, having first sounded and obtained the desired depth of water, decides to make a set and gives the order, "Get the top dories ready!" at the same time indicating how many tubs he thinks it is desirable for each dory to set. The four men to whom the two top dories belong adjust the anchors, buoy-lines, and buoys which are already in the dories, and also place in them the other necessary fishing-gear. The dory-tackles are then hooked on, and the boats are swung over the side of the vessel. The middle dories are then equipped in a similar manner by their respective crews, and as soon as these are ready the top dories are dropped into the water and paid astern and the middle ones are swung over the side, the bottom dories being then prepared for action in their turn. The middle dories are now dropped down and paid astern with the others, and the bottom dories are swung upon the sides and are ready to be lowered at the proper moment. Eight men take their places in the dories towing astern; perhaps, in fact, the four men belonging to the top dories are already there and ready to set.

* The Irish fishermen of Boston place their trawls in baskets, coiling the line in one part and putting the baited hooks in another division of the basket.

The skipper now gives the order to one of the dories that was first put out, "Throw out your buoy." This being done the dory tows astern of the vessel until the buoy-line runs entirely out; the men in the dory then sing out, "Let go the painter!" The dory is cast off and they begin to set their trawl in the ordinary manner, their course usually being to leeward, and nearly at right angles with the direction of the vessel. This operation is repeated in succession with each boat: the last dories dropping astern after the others have been let go. Sometimes when the wind is moderate and it is practicable, all six dories are dropped down before the first begins to set. The boats having been let go in the manner described, are thus left scattered along in the wake of the schooner at intervals of 100 to 200 fathoms, the first and the last dory being from three-quarters of a mile to a mile and a half apart. As soon as the last dory has been dropped, the vessel keeps off and runs to leeward, and is ready to pick up the first one as soon as her trawl has been set, and the others in regular succession. The time occupied in setting the trawls under sail varies from half an hour to an hour.

When the dories are picked up, a part or all of them are taken on deck and the vessel immediately begins to work back toward the weather buoys; as soon as the weather buoys are reached the boats are usually dropped again in the manner already described, and the men begin hauling. This second evolution occupies from one hour to an hour and a half, according to the strength of the wind and other circumstances. As the dories are dropped a second time they find themselves at the very place where they threw overboard the first anchor and a mile or two to the windward of the place where they dropped their last anchor. They are now able to haul to the leeward, which is easier than hauling to the windward and is more advantageous to the fishing, since the tender-mouthed haddock are less liable to drop from the hooks of a trawl when it is slack than when it is taut.

For the dories to haul their trawls occupies from one to four hours, according to the length of the trawl, the number of fish on the hooks, and the state of the weather. While the dories are hauling, the vessel is lying-to with the jib to windward and drifting back and forth along the line of boats, waiting for the men to finish hauling their trawls or signalize, by raising one of the oars, that they have a load of fish and wish to be taken on board. After the lines have all been hauled the dories are again taken on deck, unless another set is to be made on the same ground. When the dories set the whole length of lines it is very unusual for a vessel to make more than one set in a day; sometimes, however, a smaller number of lines is set and the operation is twice performed. In exceptional instances, after the whole string of tubs has been once set, a smaller number, perhaps a tub to each man, is set in the latter part of the day.

The operation of shooting alongside of the dories and picking them up is one of the most difficult feats of seamanship which can be accomplished by a fishing schooner.

The haddock trawls are often set in rough weather and at times when there is what would be called a strong, whole sail breeze, and, occasionally, when it blows hard enough to make it necessary to reef the sails. After the trawls have been set and the vessel worked back to the weather-buoys, if the weather looks at all threatening, it is customary to take the bonnet out of the jib and put a reef in the mainsail, so that if the wind should increase while the trawls are being hauled the vessel can be managed by the skipper and the cook—the only men left on board.

As might be expected, men are sometimes lost in this method of fishing, the losses being occasioned by sudden snow-storms which cut the dories off from the view of those on board of the vessel, or by heavy squalls which render it impossible for the schooner with only two men on board to go through the necessary evolutions.

It should be stated that the evolution of setting under sail is varied at different times and by

different skippers, but that the differences in the manner of performing the evolutions are not of much importance, and that the most common method is that which is here described.

When fishing on George's Bank, the Gloucester haddock vessels are obliged by the force of the tide to resort to another method of setting, which is called "*double-banking* the trawl." The tide is so strong that the trawls cannot be set in the ordinary way, for the buoys would be carried beneath the surface. Two dories are therefore lowered at once, and jointly perform the act of setting; only two tubs are set by each pair of dories. The set is made in the following manner: The men in one of the dories hold fast to the weather-buoy, while the men in the other dory set the trawl. After the trawl is out, the dory which sets it holds fast to the lee buoy until by some signal, such as lowering the jib, the skipper of the schooner gives the order to haul. The trawls are left on the bottom fifteen or twenty minutes before they are hauled. The men in the two dories begin to haul simultaneously; the anchors are thus first raised from the bottom and presently the bight of the trawl and the two boats drift along with the tide, the distance between them gradually narrowing as they haul.

Haddock are often found so plenty on George's that it is not necessary to set more line at a time, even were it easier to do so, since a single tub of trawl will often bring up enough fish to fill a dory. Several sets of this kind can be made in a day, when the weather is favorable.

Some of the Maine and Swampscott vessels send out only one man in a dory. This usage is called "fishing single dories," and is, of course, practicable only in comparatively moderate weather.

5. THE MANNER OF CARING FOR THE FISH.

As the fish are brought alongside they are pitched into the pens already described. As soon as the dories are discharged and taken on deck, and the vessel is under way, the men begin to dress the fish. The process of dressing differs entirely from that of dressing cod. There are no *dressing-tables* or *dressing-tubs*. The men *distribute themselves* among the pens. Four or five men are engaged in ripping the fish, this operation being performed by seizing the fish by the eyes or some part of the head with the left hand and ripping them down from the throat. The remainder of the crew occupy themselves in taking out the liver and roes, which are saved in barrels separately, and in removing the viscera. The fish are washed by pouring buckets of water over them as they lie in the pens or on deck, and are packed away in the hold or left on deck, unless, on account of distance from the land or mildness of the weather, it is necessary to ice them, in which case two or three men go into the hold and stow the fish away between the layers of ice. The fish are iced with greater or less care, according to the length of time expected to elapse before the arrival of the schooner at the market. All the vessels going to La Have, George's, and Cape Negro *carry from 5 to 6 tons of ice each trip.*

6. PRODUCTIVENESS OF THE FISHERY.

The vessels of the Gloucester fleet, in the winter of 1880–'81, obtained, on an average 350,000 pounds of haddock, valued at $6,000. The schooner Martha C. obtained about 600,000 pounds, stocking $11,500. The Edith M. Pew obtained 550,000 pounds, stocking about $11,000.

Capt. S. J. Martin, of Gloucester, Mass., writes under date of February 12, 1882: "The schooner Martha C. arrived yesterday with 90,000 pounds of haddock; she was gone eight days. Schooner Josie M. Calderwood, 85,000 pounds, gone seven days. Schooner H. A. Duncan, 80,000 pounds, gone seven days. Four vessels left Gloucester on Saturday and were back on Wednesday, each with 40,000 pounds of haddock, having fished one day and a half. That is good and quick work."

The Cape Ann Advertiser of February 10, 1882, says: "Schooner Mystic, Capt. John McKenzie, has stocked the year ending February 8, 1882, $21,002. He claims high line of the shore haddocking fleet, and so far as we know this is the largest stock ever reported in this fishery. The crew shared $780.06. In 1880 he stocked $17,765, the crew sharing $765.

"The New schooner Dido recently built at Essex, for Mr. George Steele, of this city, has been engaged in the haddock fishery just one month to-day, during which time she has made three trips, stocking $3,750. On her last trip she stocked $1,400. Her crew shared for the month $138 each. The Dido is commanded by Capt. William N. Wells. Schooner Richard Lester, Capt. Ozro B. Fitch, on a recent haddock trip stocked $1,100."

The same paper, on February 24, 1882, states that "the largest haddock fare ever landed was that of the schooner Martha C., of Gloucester, Capt. Charles Martin, which arrived at Boston on Friday [February 17] from a George's haddock trip, and weighed off 93,000 pounds haddock, stocking $1,943, the crew sharing $91, the result of two and a half days' fishing. Absent ten days. This was the largest catch and best stock ever reported in the haddock fishery."

The Martha C., in thirteen hours' fishing, in the winter of 1880–'81, caught 90,000 pounds of cod and haddock. The total amount of haddock carried into Boston in 1870 was 17,000,000 pounds; of this amount probably at least 13,000,000 were obtained by the winter haddock vessels. The total yield of this fishery does not, probably, fall below 18,000,000 to 20,000,000 pounds.

7. RUNNING FOR THE MARKET.

No class of vessels, not even the halibut schooners, take more risks in running for market than do the haddock schooners. It is of the utmost importance to them to reach the market with their fish in good condition, and, if possible, to be in advance of other vessels engaged in the same business. In the stormiest of weather all sail that they will bear is crowded upon them, and harbors are made even in heavy snow and thick fogs. The trips are short, averaging frequently not more than two or three days, and rarely longer than a week or ten days; they are, therefore, constantly running for the land, and are more accustomed to making the coast than the halibut vessels, and become so familiar with the harbors most frequently resorted to, especially with that of Boston, that they are able to enter them when no other vessels, probably not even pilot boats, would care to make the attempt. What has already been said about the dangers encountered by the halibut schooners will apply as well, in its fullest extent, to the haddock schooners.

8. THE MANNER OF OUTFIT.

In the winter haddock fishery every man supplies his own dory and outfit complete, besides paying his share of the provision bill. In the settlement of the voyage the vessel draws one-fourth of the net stock, or in the case of the older vessels, according to the old system, only one-fifth, after certain stock charges have been deducted for bait, ice, wharfage, and towage. The remaining three-fourths or four-fifths of the net stock is divided equally among the crew, the owner paying the skipper's commission or percentage from the vessel's share. The average share of each man in the Gloucester crews for the winter of 1880–'81 was about $290. The most successful shared $500 to $550. The largest stock ever made in one day's fishing in the winter's shore fishery up to 1880 was that of the Eastern Queen, of Gloucester, which carried to the Boston market, in 1873, 25,000 pounds of haddock, and stocked $1,100. This vessel also made the largest stock of that season, realizing in five months $10,250 clear of all expenses, the crew sharing $550 each. The crew of the schooner David J. Adams, in March, 1881, shared $107 each in a ten days' trip in the haddock fishery.

9. THE HADDOCK FISHERY FIFTY YEARS AGO.

A writer thus describes the haddock fishery from Gloucester Harbor in the early part of the present century:

"The fitting out of the fleet for the haddock fishery commenced about the first of April. The first move was to run the boats on the beach, or landing as it was then called, and have them calked and graved. The latter process consisted in applying a coat of pitch to the bottom and burning it down with a tar-barrel, which gave a smooth and glossy surface. Painted bottoms in those days were very rare.

"The time occupied in making a haddock trip was from two days to a week, the fish being mostly taken on Old Man's Pasture, Heart's Ground, and Inner Bank, about twelve miles off of Eastern Point. The fish were taken to Charlestown for a market and purchased by the hawkers, among whom were Johnny Harriden, Joe Smith, Isaac Rich, and others, who took them over to Boston in hand-carts and retailed them at a good profit. The codfish were generally salted. The smallest were cured for the Bilboa market, and the largest were made into dun fish, as they were called, for home consumption. They were kept on the flakes several weeks, and thoroughly dried until they became of a reddish color, and were highly esteemed as an article of food. The haking season commenced in July, and the pollock fishery was prosecuted from September to the middle of November. Each boat carried three men—skipper, forward hand, and cook, who went at the halves, as it was called, the crew receiving one-half the gross stock, and the owners the balance."*

8.—THE HAKE FISHERY.

By G. Brown Goode and J. W. Collins.

The capture of hake is a branch of the shore fisheries, and is by no means as distinct an industry as those which have been already described. It is generally carried on from June to November along the New England coast north of Cape Cod, chiefly by small vessels of 20 to 40 tons, and which at other seasons of the year are often hauled up, though some of them engage in the winter shore haddock or cod-fishery or in the fall herring fishery, and in the spring are more frequently employed in the cod-fishery before the hake make their appearance. The hake fishery is also carried on from small boats.

The men engaged in the hake fishery are of the class described in the chapter on fishermen as the shore fishermen of Maine.

1. THE FISHING GROUNDS.

The coast of Maine is a favorite region for the hake fishermen, almost every settlement along its whole extent having some small boats or a few vessels engaged in this fishery. The fishing is also carried on in Ipswich Bay by boats from Rockport, Pigeon Cove, Folly Cove, Lane's Cove, Annisquam, and the Isles of Shoals.

About the mouth of the Bay of Fundy there is excellent hake fishing, and around Prince Edward Island the hake are very large and abundant, and some of the Maine vessels occasionally visit this region to engage in the capture of this species. In 1878 and 1879 several vessels from Bristol, Me., were thus employed.

* Fisherman's Memorial and Record Book, Gloucester, 1873, p. 73.

The favorite fishing grounds are upon soft and muddy bottom in 25 to 75 fathoms of water, and usually within 15 miles of shore. Frenchman's Bay is one of the favorite haking grounds, being largely frequented by the smaller boats. As long ago as 1850 it was customary for the New England fishermen to resort in large numbers to this locality.

Many of the grounds formerly considered very good are now thought by the fishermen to be of little importance. The fishermen attribute the remarkable decrease which, in many instances, has occurred in the abundance and size of the species, to the absence of menhaden from the coast north of Cape Cod, which fish they believe formerly attracted the large hake near the shore. Where large hake were formerly caught only small ones can now be taken.

2. THE VESSELS.

The vessels are the smallest class of fishing vessels, and the majority of them old-fashioned, and only used in the season of pleasant weather. Most of them are schooners, a few are pinkies, and quite a number of them are of the old-fashioned, round-bowed, square-stern model, long ago abandoned by builders. Many of them date back to the first third of the present century. They carry from one to four dories, according to the size of the vessel, and are provided with light cables and anchors of no uniform pattern. There is no uniform method of fitting up the hold of the vessel or its deck, none being required in this kind of fishing.

3. APPARATUS AND METHODS OF THE FISHERY.

The boats are of all patterns, from the dory to the Quoddy boat.

The fishing is carried on, for the most part, at night and chiefly with trawls. A few of the boat fishermen still use hand-lines. The trawls are similar to the haddock trawls, though sometimes slightly heavier. They are coiled in tubs and are set in strings with 300 to 1,500 hooks each. They are set from the boats or dories in the same manner as the trawls used in the shore cod fishery, and are usually underrun twice a day—in the morning to remove the fish, and at night to bait the hooks. Some fishermen, however, bait in the morning when they remove the fish. Others, again, will remove the fish and rebait both in the morning and in the evening. The trawls are left down until it is necessary to change their position, or until a fare of fish is obtained. It is not unusual for a trawl to be left down, by a boat fisherman who carries his fish daily to the shore, for several weeks at a time.

The favorite baits are herring and mackerel, which are, for the most part, obtained from the weir fishermen along the shores, though occasionally the bait is caught in gill-nets. In former years, when menhaden or pogies were abundant on the coast of Maine, they were the favorite bait. The hooks are baited as in the cod fishery.

4. THE PRODUCTS.

The hake vary in size from 1 to 20 pounds, and individuals of 30 or 40 pounds are occasionally obtained. At the present time they are chiefly valued on account of their sounds and livers, the former being used in the manufacture of isinglass (see chapter on isinglass), the latter for the manufacture of oil. Until within thirty years the sounds had no value, but since that time the isinglass industry has sprung up.

The fish are split and salted in the ordinary manner, and stowed in the hold of the vessels or in fish-houses, by the boat-fishermen, by whom they are shipped to Gloucester, Portland, or Boston in freight vessels as soon as the curing is completed, or, at latest, at the end of the season. The

sounds are removed and dried. They are strung upon strings and hung either in the rigging or in the cabin or forecastle of the vessel—wherever there may be a fire—or else, by the boat-fishermen, about the buildings on shore or on small hurdles or flakes made of old netting. The sounds are sold to the agents of the isinglass factories, who make trips to all the hake fishing stations in person, and ship their purchases to their employers by rail or steamer. The livers are sold to persons at various points along the coast, who make a business of extracting the oil by exposure to the sun or by the ordinary methods of boiling.

The total catch of hake for the United States is about 33,000,000 pounds in the fresh condition, 90 per cent. of which is cured by drying. On the hake-trawls are caught considerable quantities of cod, haddock, pollock, and cusk, which are split and salted with the hake and disposed of in the same manner.

According to Mr. A. Howard Clark, 25 per cent. of the boneless fish packed in Gloucester in 1880 were hake. In 1881 there was landed in Gloucester from Eastport alone 180,000 pounds of hake.