

**PRELIMINARY EXAMINATION OF HALIBUT FISHING
GROUNDS OF THE PACIFIC COAST**

By A. B. ALEXANDER

WITH

INTRODUCTORY NOTES ON THE HALIBUT FISHERY

By H. B. JOYCE

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INTRODUCTORY NOTES ON THE HALIBUT FISHERY.

By H. B. JOYCE.

Halibut, which have been sold in the markets of the United States as food fish for many years, were, prior to 1850, very abundant off the coast of New England and the maritime Provinces. They were however, shunned by fishermen seeking cod and other species, and when caught were frequently cut from the hooks. The combative nature of the halibut tends to drive cod and other desirable fish from the hooks of a trawl or hand line, and sometimes from the ground.

When properly prepared and packed in ice immediately after being caught, kept from the light and air, with a temperature as near the freezing point as possible without actually freezing the fish, halibut will remain in good condition from three to four weeks, and at the end of the time will be perfectly sweet and fresh. Because it is possible to keep halibut in good condition longer than most kinds of fish they are greatly in demand by dealers; and they possess, moreover, a greater commercial value than other bottom species, largely on account of the attractive whiteness of their flesh. They are also an easily digested food.

The demand for halibut is quite as great as for salmon, mackerel, and other oily species. Even after being kept until the freshness has departed, they can be prepared and eaten without danger.

When the demand for halibut reached a stage calling for all that could be procured, both fresh and salted, the rapidly growing industry soon depleted the banks of the Atlantic coast, until it was possible at times for fishermen to receive as high as 30 cents a pound for small trips. The uncertainty of the supply and the consequent fluctuation in price led to the inauguration of the halibut industry on the Pacific coast, in the waters of Washington, British Columbia, and southeast Alaska.

The first attempts on the west coast were crude and unsatisfactory. The fleet of small craft gradually developed, however, into a better class of vessels. Sail vessels gave way to small steamers, some of which were chartered. The steamers at first purchased a considerable portion of their cargo from the Indians. Unfortunately many

of the fish obtained in this manner were never paid for, and in some instances the crews of the vessels received no compensation for their labor.

The fish were usually taken to the first market available, generally Seattle or Tacoma, from which points they were shipped to New York and Boston.

Previous to 1894 little or no profit was realized from the fishery, and from the fishermen's point of view the case seemed to be hopeless; but the introduction of Pacific coast halibut in the markets of the East aroused the fish dealers of New England to a realization of the importance of the new source of supply. A combination was formed sufficiently large to prosecute the fishery in the same manner as conducted on the Atlantic coast and powerful enough to secure from the railroads low rates of transportation across the continent, and also means of prompt delivery to local points. This also applied to all other kinds of fish shipped. When these fish reached the East in carload shipments they were delivered to local dealers in small quantities for daily trade. At first strong objection was made to the Pacific coast halibut on the ground of quality, but for this there was little foundation, the Pacific fish being quite as valuable as those of the Atlantic coast.

In shipping fish the main requirement is their proper state of preservation on arriving at their destination, a feature of the business that frequently has been overlooked. An expert in the fisheries of the Atlantic coast was engaged to superintend the catching and handling of halibut, and unremitting care to the improvement of every detail connected with the fishery resulted in landing the fish at the shipping point in an inviting condition, to the satisfaction of both dealer and consumer.

As early as 1888 and 1889 attempts were made to fletch halibut, but they were soon abandoned on account of the small demand for the smoked product. Fletching, however, is likely to lead to wanton destruction of fish, as fully one-half of the halibut caught are too small for the purpose, and in consequence are often thrown away. Such was the case with the few trips of fletched halibut taken on Cape Scott and Queen Charlotte Islands grounds.

No authentic information is to be had regarding the age of halibut. It is thought, however, that more than 20 years are required for the fish to reach full growth. While the halibut caught seldom weigh more than 200 pounds, individuals have been taken weighing 400 pounds. The largest specimens have been taken off the coast of Newfoundland. The average weight of the Pacific coast halibut will not exceed 30 pounds. It is probable that fish of this size are about 5 years old. Larger fish are found from Cape Scott northward than on grounds farther south.

In the early history of the Pacific halibut fishery a large portion of the catch was taken in waters on the south side of Dixon Entrance, in Hecate Strait, between Queen Charlotte Islands and the islands fringing the coast of British Columbia on the east side of the strait. The Indians of this region had fished in these waters from time immemorial, obtaining an ample supply of fish for their needs, and they furnished the first information to the white man of the abundance of halibut on grounds adjacent to their villages. They were instinctively very reluctant to impart the information desired, and with good reason, but constant persuasion on the part of white fishermen and a promise of 50 cents a fish to the Indians for all the latter might catch were inducements too great for the Indians to resist. Fish were furnished by these people which were never paid for; and in a very short time the white fishermen had acquired full knowledge of all the local grounds pointed out by the Indians and all others which they could locate.

At this period eastern fishermen began to appear on the ground, backed by a considerable amount of capital, and having devised means of distributing large quantities of fish, were in a position to equip and operate a fleet of sufficient size to supply the market in carload lots. A steamer which in the previous winter had been engaged in the same fishery and had met with loss was chartered by the new company, and several members of her crew were induced to continue in the fishery. Instead of dories Columbia River boats were used in setting the trawls. Lumber for camps, a scow for a dock, and necessary supplies were shipped from Puget Sound ports, and a fishing station erected on shore near the best-known fishing ground. The place selected was near the west end of Banks Island in Hecate Strait. The boats were manned by two men each and furnished with the necessary amount of gear, 1,200 fathoms of trawl. They were paid 25 cents a fish, one-half the sum promised to the Indians. This was afterwards changed to 1 cent per pound.

This industry started by eastern dealers caused competition to arise in British Columbia. Two firms were inaugurated, working on the plan adopted by the New England dealers, and the vessels belonging to these firms met on a small fishing ground near the west end of Banks Island, where there was only room for one vessel to set gear. In one month's time they had so depleted the ground that its yield was reduced to a minimum, and an extensive search for halibut failed to offer any hope for a profitable catch for some time in the future. The enforced idleness of the crew, combined with the necessity of doing something toward paying for the outfit and running expenses of the vessels, caused a more thorough search to be made on the sloping side of an extensive bank composed of boulders and sand which lies from 5 to 10 miles off the rocky shore fringing the coast.

The ground when first discovered furnished a large supply of halibut, and fish were very plentiful on all parts of it. As soon as a scarcity of fish was noticed in any one place, the vessels shifted to another part, and under these conditions the ground yielded continuously for three winters. At the end of this time a large area had been covered, extending from a point 5 miles southeast from the west end of Banks Island along the sloping edge of the ground to Rose Spit, a sandy point situated on the northern end of Graham Island of the Queen Charlotte group, covering a ground about 50 miles long by 4 miles wide.

During this time the fishermen had become more expert, and at the end of the third season they were able to handle double the amount of gear they did at the beginning of the fishery. The method of caring for the catch had also been improved upon. The fish were dressed, iced, and stowed away in the hold in less than half the time formerly required. Full fares were quickly obtained, and in many instances placed on the market in better condition than trips landed by halibut vessels of the Atlantic coast.

Large profits were made and the business increased until the railroad rates became an important factor in railroad business. The increased efforts on the part of fishermen to produce fish and the opening of extensive markets in the Middle West caused more vessels to engage in the fishery, and in 15 years from the time of its inception there was a noticeable decline in the supply. The original fishing grounds in Hecate Strait and Dixon Entrance gave small returns as compared to the catch of previous years.

In the meantime, however, new banks had been discovered. Occasionally a vessel would repair to the original ground in the hope that the depletion caused by the overfishing was only temporary, similar conditions having prevailed on the halibut banks of the Atlantic, and the contention among fishermen being that halibut were as plentiful as ever, only that they had migrated to undiscovered grounds. Little was known of the halibut banks along the stretch of coast west of Dixon Entrance to Bering Sea, or, for that matter, of the ground from 20 to 40 miles offshore between Cross Sound and Yakutat Bay.

The sharp competition in the fishery has led to increased effort to secure large catches in the quickest possible time, and this necessarily involves the use of more extensive fishing gear. Where formerly 4 skates of trawl, of 6 lines each, was considered a sufficient outfit for two men, the same number of men now operate from 8 to 10 skates (bundles) of 8 lines each, equal to 3,500 fathoms, or 21,000 feet. This line is set in one continuous string, covering a distance of approximately 4 miles.

The Columbia River boats originally used in the Pacific halibut fishery have given place to the dories used in the Atlantic industry. The dories now employed, however, are 20 feet long, an increase of 2 feet over the length of those formerly used, because of the additional gear handled. The Pacific fishermen operate from two to four more skates of trawl to a dory than are generally "run" by fishermen on the Atlantic coast, this in a measure because of the comparative shallow water in which halibut have been taken, and the close proximity of these banks to the mainland, where much greater risk can be taken than on grounds situated far from the coast.

To lessen the labors of unloading by handling the fish separately, dories are now fitted with a heavy net, covering the bottom and sides to the risings, which when brought together at the top forms a bag. The fish when taken from the hooks are thrown into the bottom of the dory, between the parting boards, in the usual manner. When a dory has secured a load the net is drawn together at the top by the rope to which it is hung. A signal is then made to the vessel indicating a desire to unload. The steamer runs alongside, a tackle is lowered, and the contents of the bag hoisted on deck. The time occupied in performing this operation seldom exceeds three or four minutes. The dory is furnished with another net and left to finish hauling the trawl; the steamer in the meantime goes to other dories requiring assistance.

This method of transferring halibut from the dories to the steamer has proved very satisfactory, and saves a great deal of time and labor, making it possible to catch and handle nearly twice as many fish in a day as by the old system. The net was invented by Capt. H. B. Joyce and used by him several years before it became generally adopted.

A steamer usually carries 12 to 14 dories, equipped with the quantity of fishing gear mentioned. On good fishing ground the trawls are set parallel to each other, about one-third of a mile apart, the area covered by the trawls of a single vessel sometimes exceeding 15 square miles, or 9,000 acres. One fish to 2 acres of ground is a catch seldom taken. An area fished upon one day seldom yields more than one-half as much the day following. The increased number of steamers makes it almost necessary for one or more to fish on the same ground several days in succession.

Another result of the competition, and one which imperils the lives of fishermen, is the reckless regard they have for weather conditions. Where formerly fishing was carried on in weather which boats could ride out in safety, it is now a common practice to fish when the sea is running high. As the trawl is hauled the danger grows if fish are being caught, and when a dory is loaded or partially loaded the occupants are in a precarious position. Care and skillful management must be exercised in coming alongside of the steamer and discharging

the fish, and cases are known where the men have been flung bodily from the dory by a sea, the dory turned bottom up, and the men forced to cling to the bottom of the boat until rescued by the steamer or another boat. In the last 18 years about 12 men have been drowned in this industry. It is now the practice of some fishermen to wear life vests.

After the dories have been put overboard the steamer cruises among them, and those on board keep a lookout. The system of signals makes it possible to render assistance promptly when needed.

The crew of steamers engaged in the halibut fishery receive 1 cent a pound for the catch, and their labor includes cleaning and icing the fish and doing such work on the fishing ground as may be required. On arriving in port they are expected to discharge the cargo, pack the halibut in boxes, and place them in freight cars; refit the vessel for another trip, taking in ice, bait, stores of all kinds, and performing the necessary work pertaining to the voyage; and stand a regular watch while on the passage either to or from the banks.

The owners keep the vessel in good condition and furnish dories, trawls, buoys, anchors, ice, bait, and food. They take possession of the catch as soon as it is landed, settling with the crew on the return trip.

The captain of a halibut steamer receives \$125 a month and a commission of 5 cents a hundred pounds for fish landed; first mate, \$100 a month; second mate, \$100; engineers (two), from \$125 to \$150; firemen, two or three generally being employed, \$50; cook, \$100; deck hands, from two to four, \$45.

Gasoline schooners and sailing vessels furnish dories only and take one-fifth of the gross stock of all fish caught. The expenses for food, water, fishing gear, bait, ice, gasoline, etc., are deducted from the remaining four-fifths and the balance equally divided among the crew, including the captain and cook. The master sometimes receives a commission.

When halibut trawls were first introduced on the Pacific coast little or no attention was paid to the kind or quality of bait used for the capture of halibut, it having been found that cod, salted herring, flounders, sculpins, and various other species could be utilized. In a few years, however, fishermen began to notice that the best results were obtained with carefully selected bait, and soon thereafter it was found that halibut would soon bite on "gurry" bait, accepting preferably fresh herring, squid, or other bait. At the present time halibut fishermen of the Pacific coast depend largely upon fresh bait, and their demands are annually increasing. A cold-storage plant at Ketchikan, Alaska, has been supplying a large portion of the halibut fleet with bait during the last few years, and it is very probable

that in the near future other plants will be erected at suitable places along the Alaskan coast adjacent to the fishing grounds. As the fishery increases in importance and grounds lying farther west are resorted to, as is likely to be the case, it will no doubt be found very necessary to establish cold-storage plants or employ fishermen to furnish bait fresh from the water.

There seems to be a far greater loss and waste of fishing gear on the halibut banks of the Pacific than the Atlantic, caused largely by vessels fishing close together. As stated elsewhere, many of the minor grounds are found by means of landmarks, and at times when a fleet of three or four steamers and as many sailing vessels are fishing on a small area, each vessel trying to secure a trip in the quickest possible time, the operations are generally somewhat reckless, trawls being frequently set across and on top of each other to such an extent that it is difficult to haul them. At such times it is not an uncommon occurrence for a dory to lose 5 or 6 lines of trawl and frequently several skates. At other times, on account of stormy weather, especially during the winter months, whole "strings" of gear are lost with the entire catch. It often happens that fishermen are suddenly interrupted in hauling their trawls by a heavy gale, rendering it necessary to cut the gear, which as a rule is seldom recovered, remaining on the bottom together with the catch, which pollutes the ground and undoubtedly has more or less of an injurious effect on the fishery. It is stated by fishermen that several inshore grounds have in this manner been greatly abused.

Until recent years the halibut fishery on the Pacific coast has been confined to comparatively shallow water, 40 fathoms being about the average depth. In the last three years, however, many of the grounds, such as Cape Scott, Hecate Strait, Rose Spit, North Island, and grounds in the channels and bays of southeast Alaska, have shown signs of depletion and the fleet has investigated in greater depths. Trawls set in 70 or 80 fathoms are more difficult to haul than if set in shallow depths, especially if there is a strong tide running, as is frequently the case on shore grounds. Until eastern fishermen engaged in the halibut fishery on the Pacific coast a depth of 100 fathoms was not considered. At the present time fishing is carried on wherever halibut are found, regardless of the depth.

The fishing banks of Canada near the British Columbia coast are situated between Prince of Wales Island, Alaska, and Cape Flattery. They include the shallow waters along the Pacific coast reaching from the land offshore to where the depth is 1,000 feet, a width of from 15 to 40 miles; also the shoaler parts of the great inlets that extend into the continent at Queen Charlotte Sound between Vancouver and Queen Charlotte Islands, and those between Queen Charlotte Islands and Prince of Wales Island extending inshore to where

the distance from land is less than 5 miles and in a few places is within 2 miles.

These fishing banks thus surround the Queen Charlotte Islands, beginning at a point outside 20 miles south of the northwest end and continuing in through Dixons Entrance and southeasterly through Hecate Strait to and around the west and southwest sides of Vancouver Island. Only a small proportion possesses any great value for fishing and those areas are for the most part more than 3 miles from land. They have been found usually after diligent search, and have been known to supply to the fishermen millions of pounds from a single spot.

One of these places is near the west end of Queen Charlotte Islands, an area 1 mile wide and 6 miles long, which was frequented from 1906 to 1909; little has been found there since. One place off Naden Harbor, 2 miles wide by 6 miles long, was frequented from 1905 to 1908; very little has been found there since. One place near the north point of Queen Charlotte Islands, 5 miles wide, 15 miles long, frequented from 1895 to 1908, and undoubtedly the most prolific spot of halibut fishing ground in the world, has not since 1908 produced any great quantity, although when first visited the fishing was always good except, perhaps, during a period of two or three weeks at a time each year in June and October.

The first ground discovered at the west end of Banks Island, an area 3 miles wide and 10 miles long, was frequented from 1892 to 1909 with varying success, usually best during April and August. It is very rarely visited now.

The largest place on the coast, 10 miles wide and 25 miles long, and reaching from Skiddigate Inlet southward along the east side of Queen Charlotte Islands, lies 4 to 14 miles from land, except at Reef Island point, where it passes about 2 miles from shore toward the east end of Banks Island. This area, which has produced the best quality of fish taken, seems nearly exhausted. Very good catches were made on the eastern part in August, 1911, but they were not equal to the catches made when first discovered in 1903.

Another spot near Queen Charlotte Sound, discovered in 1903 and called Goose Island Bank, reaches from 10 to 50 miles southwesterly from Goose Island, which is on the continental side of Hecate Strait. It is a bank spreading over an area of 20 by 30 miles, and since its discovery in 1903 has furnished an abundance of fish of small size, averaging in weight from 9 to 18 pounds each, not considered desirable for shipping long distances, but otherwise of good quality. This bank still furnishes its usual catch in July and August.

These are all the known spots of value on the British Columbia coast until Cape Scott is reached. The bank at the west end of Vancouver Island near Cape Scott and those near the ocean side of

Vancouver Island have been frequented by halibut fishermen since 1888 and are still visited, but with less success. There have been millions of pounds taken from near Cape Scott and occasionally from small spots which have been located along the shores of Vancouver Island, where good fishing would be found lasting sometimes several weeks.

The banks stretching from the Straits of Fuca southward 50 miles from Cape Flattery and westward to those off the coast of Vancouver Island are a continuation of those along the coast of Vancouver Island and the conditions found there are about the same. These Flattery Banks have been fished on since the beginning of the halibut fishery on the Pacific coast, have produced a greater quantity for their size than any other ground, and are still frequented between January and July, after which the quality of the fish found there is poor; and the better fishing is farther north.

This enumeration of the most productive spots for halibut fishing does not include those situated off of the coast of Alaska, which have not been operated on so long or so extensively as those of British Columbia. All the Alaska grounds are situated on the great shelf or continental plateau which extends from the shores of the continent under 50 to 150 fathoms of ocean, a distance of 15 to 50 miles from land to where the embankment suddenly deepens to 1,000 or 1,500 fathoms and the grounds become muddy.

The halibut industry is carried on mainly from Vancouver, British Columbia, and Seattle, and in 1911 the halibut fleet on the Pacific coast consisted of 13 steamers and 58 sail and power vessels. The parties operating from Vancouver represent the wholesale dealers in fish at New York and Boston operating in the West under the name of New England Fish Co. and the Canadian Fisheries Co. (Ltd.). This combination took up the industry after the failure of the pioneers to secure a profit, and by reason of their large trade combined were able to dispose of the product at profitable rates. They employ under the New England heading three steel steamers designed for the business of an average value of \$75,000 each (with outfit), built and registered in the United States. The catch of fish is landed in Canada in bonded warehouses and shipped in bonded refrigerators via Canadian Pacific Railroad to Boston and New York, where it is admitted free of duty as product of American fisheries; if any part of the product is sold in Canada, a duty of one-half cent per pound is paid.

Under the name of the Canadian Fisheries Co. (Ltd.), this combine has two steel boats, bought in England (secondhand) and valued at about \$25,000 each, the cargoes of which are landed free in warehouses in Canada and sold as product of Canadian fisheries there without the payment of duties in Canada; if any part of the catch of these

boats is shipped to the United States market as product of Canadian fisheries, a duty of 1 cent per pound is to be paid United States Customs Service.

As portions of every cargo are unsuitable for shipping long distances, it is important that a market be found in Canada near Vancouver.

These two companies operate, in connection with their steamers, 60 to 70 small fishing boats, or dories, with two men in each, and 300 miles of fishing lines, and about 20 operatives at their warehouses in Vancouver, British Columbia. The combined product of the five steamers has been about 16,000,000 pounds of fish yearly. In addition, this company has a large cold-storage plant and warehouse near Ketchikan, Alaska, where it receives from its own steamers and other fishing craft something like 2,000,000 pounds yearly, which are transhipped (mostly frozen) to Seattle or Vancouver and in refrigerator cars to eastern markets. About 40 fishing craft, of 15 to 40 tons register and belonging in Seattle and southeastern Alaska, bring and sell their catches to this company at Ketchikan during a part of the time.

Five steamers of an average value of \$25,000 each (with outfit) are operated by the firms in Seattle and, in addition, one steamer and one or two power craft are operated from Tacoma. The fishing firms also operate gasoline power boats and about 54 power craft are operated independently from Seattle and Tacoma. During the winter months, or between September and April, about 40 of these craft operate in southeast Alaska waters, and, in connection with the power fishing craft of southeast Alaska, ship their catches by the steamers plying in winter between Juneau, Alaska, and Seattle. An average of three small boats with two fishermen in each is carried on the power and sail craft, of which there are 88 altogether. The aggregate of fishermen so engaged from Seattle and southeast Alaska is 600, in addition to the crews employed on the steamers, or altogether 1,060 men. The Scandinavian race predominates.

The banks of southeast Alaska are likely to become valuable as soon as a method is perfected for handling the catch so that it will reach the consumer in satisfactory condition for food. This will greatly increase the importance of the fisheries of the Pacific coast and will stimulate the development of other industries which may be established in connection with fishing.

PRELIMINARY EXAMINATION OF HALIBUT FISHING GROUNDS OF THE PACIFIC COAST.

By A. B. ALEXANDER.

The decreasing supply of halibut reported on some of the Pacific banks which were formerly fished with profit, and the marked falling off in 1909 and 1910 in certain localities, alarmed the fishermen and caused a request to be made of the Bureau of Fisheries for an extended practical investigation designed to reveal the possibilities of certain banks lying west of southeast Alaska and not hitherto fished for halibut. Nearly all the grounds off the coast of central and western Alaska, including banks in Bering Sea, had previously been investigated by the steamer *Albatross* for cod, but no special effort had been made to ascertain the abundance of halibut, although fish of this species were frequently taken on hand lines from the ship and on trawls set for cod.

Vessels employed in the cod fishery have at times reported taking incidentally considerable quantities of halibut on *Albatross*, *Portlock*, *Sannak*, and other banks. Pelagic sealers also have reported catching halibut on various banks between Middleton Island and Unimak Pass. Trials of this kind, however, furnished little knowledge as to the abundance of halibut in any particular locality or the extent of ground where good fishing might be expected. Beyond the vicinity of Kodiak, Yakutat, and a few other places along the coast, fishermen possessed little authentic knowledge of halibut grounds.

On May 25, 1911, the steamer *Albatross*, Commander Guy H. Burrage, United States Navy, commanding, left Seattle, Wash., fitted with necessary fishing apparatus, such as halibut trawls, hand lines, dories, etc., for making an investigation of halibut banks in Alaskan waters. In addition to the regular crew there were four practical halibut fishermen, Harry Greenwood, Chris Jachobsen, J. F. MacDonald, and G. W. Friis, who during the cruise were under the direction of Capt. H. B. Joyce, of Seattle, a pioneer in the halibut fishery of the Pacific coast, who for a number of years had been in charge of steamers belonging to the New England Fish Co., of Vancouver, British Columbia, and who had been instrumental in calling atten-

tion to the need of an investigation of the fishing grounds of Alaska hitherto not fished for halibut.

After coaling at Comox, British Columbia, the *Albatross* went to Ketchikan, northward through Wrangell Narrows, Frederick Sound, Chatham Strait, touching at Killisnoo, thence through Icy Strait into Cross Sound by Cape Spencer, from which point a course was shaped for Portlock Bank, latitude $58^{\circ} 20' 00''$, longitude $150^{\circ} 30' 00''$ W. Here a "flying set" was made as a test, it having been reported that a vessel had taken a considerable number of halibut on hand lines while drifting over this ground.

From this position the ship continued in a westerly direction over Portlock Bank, across the mouth of Cook Inlet into Shelikof Strait, following the coast line in a southerly and westerly direction as far as Unimak Pass, in which vicinity was the most western point in the halibut investigation. The work was begun in this locality instead of on more eastern grounds in order to take advantage of the pleasant weather which generally prevails here in June and July, but is followed by storms during a period favorable for fishing on Albatross, Portlock, and other banks farther east.

In order to make a fair test of the commercial value of the halibut banks covered by the *Albatross* as compared to those of southeast Alaska and other grounds where extensive fishing has been carried on, it was thought advisable to use the same kind of bait (salted herring) that was used in developing those grounds, and this was done in the majority of trials made.

The halibut caught during the investigation average about 20 pounds. The largest fish were taken on grounds east of Albatross Bank, and the largest individuals were found off Dick Bay, Marmot Bay, in and off Prince William Sound, Portlock Bank, and on grounds lying between Cape St. Elias and Yakutat Bay.

LOCALITIES EXAMINED.

Ketchikan.—The *Albatross* arrived at Ketchikan May 31, and there learned from local fishermen that during the past season a considerable quantity of halibut had been caught off Kelp Bay, on muddy bottom, which is looked upon as an unusual occurrence.

According to Capt. Joyce, a good halibut ground lies 25 miles southwest of Coronation Island, on which many large fares in the last two years have been taken. Another ground about 25 miles southwest from Forester Island has supplied several large cargoes, and 40 miles southwest by west from the island a "spot" has recently been located on which halibut are plentiful at certain seasons.

Killisnoo.—On the evening of June 2 skates of halibut trawl were set off Killisnoo in the harbor in 75 fathoms of water. This set was

made more for the purpose of getting a portion of the gear in working order than for testing the resources of the ground, the area of ground, kind of fish generally found here, and their abundance being already known. The Indians of this locality have always resorted to this spot of ground for their supply of halibut, and for the last 15 years commercial fishermen have occasionally fished in this region.

At times halibut are quite plentiful in this particular locality, but not sufficiently numerous to attract vessels operating a large amount of gear; neither is the ground large enough for more than one or two small vessels at a time. Small boats and canoes at the proper season make good catches.

On the trawls, which had remained set overnight, were found 34 black cod, 7 turbot, 8 rockfish, and 10 ground sharks. The absence of halibut was no doubt due to there being no herring or salmon present, it being too early in the season for those species. During the run of herring and salmon, which occur later in the season, halibut are fairly abundant.

Leaving Killisnoo, the *Albatross* sailed out to sea through Icy Strait and Cross Sound. Fishing for halibut has been carried on in Icy Strait by white fishermen about 15 years, at first chiefly during the winter months, salmon-cannery steamers being employed. In later years small craft engaged in the fishery at various seasons, and in recent years a considerable fleet has fished in this region. Near Cape Spencer two small halibut schooners were seen engaged in hauling their trawls, several of the dories having good catches.

Portlock Bank.—On the morning of June 5 we arrived on the eastern edge of Portlock Bank and made several soundings, ranging from 58 to 67 fathoms. A school of orcas came close to the ship, their movements indicating that they were in pursuit of prey. A considerable number of petrels, auks, and other species of bird life were also usually observed on fishing banks.

Two skates of halibut trawl baited with salted herring were set in 38 and 40 fathoms of water, on hard sand and gravelly bottom; latitude $58^{\circ} 20' 00''$ N., longitude $150^{\circ} 30' 00''$ W. The trawls were set 2 miles apart. At the end of one hour and twenty minutes they were hauled, the first taking 7 small halibut and 15 cod, the halibut averaging a little over 5 pounds in weight and 22 inches in length. On the second trawl there were found 21 halibut, averaging 16 pounds in weight and $29\frac{1}{2}$ inches in length, and 25 small cod. The largest halibut weighed 36 pounds, length 42 inches. During the time the trawls were being set and hauled 54 cod and 1 small halibut were caught on hand lines from the ship. The cod ranged from 18 to 36 inches. The result of this trial would indicate that a halibut steamer would meet with considerable success on this ground. A vessel

operating the usual amount of gear carried by fishermen would, in a few days, naturally attract large halibut, as the bait which falls off and is "shacked" from the hooks generally has that effect if any large fish are near. The position occupied was near where a sealing vessel had reported taking a considerable number of halibut on hand lines and by "jigging." About 3 miles from the ship numerous whales and birds were observed.

During the night the *Albatross* steamed through Shelikof Strait. The following morning, the weather being thick and stormy, it was decided to seek shelter in Halibut Bay, southwest end of Kodiak Island. At this anchorage cod were quite plentiful, 58 being caught on hand lines in a comparatively short time.

Chignik Bay.—We arrived at Chignik Bay on the morning of June 8. The season was backward, the weather cold, the mountains and surrounding country covered with snow, in many places to the water's edge. The salmon cannery men were making preparations for the season's catch, driving piles for the traps, hanging web, making cans, unloading various material from the ships, and putting the cannery machinery in order.

The ship remained at Chignik Bay until June 26 for the purpose of making a survey of Chignik Lakes. On arriving at Chignik it had been contemplated to land the surveying party, and have the vessel engage in the halibut investigation on Albatross Bank or some other ground adjacent. No time, however, was lost by remaining in the harbor, as no satisfactory results could have been obtained owing to the unfavorable weather during that period.

Fishing parties frequently visited the ground lying off the mouth of the bay, with fairly good results, the various trials resulting in 423 cod, 29 halibut, 3 turbot, and 7 sculpins. The depth of water ranged from 20 to 26 fathoms; character of the bottom, sand, rocks, and small pebbles. The cod were of good quality, but comparatively small. The halibut were also small, the largest single individual weighing 12 pounds; general average, 8 pounds. Both hand lines and trawls were used. On several occasions more fish were taken on the hand lines than on the trawl. This frequently happens at certain times on all grounds, especially where there is an abundance of starfish, as was the case on this ground. The baited hooks of the trawl which lie on the bottom attract the starfish and are preempted by them.

While halibut and cod in the immediate vicinity of Chignik are not plentiful viewed from a commercial standpoint, yet they are sufficiently abundant to more than supply all local demand. It is not uncommon to find halibut in the salmon traps here during the salmon season, and occasionally large individuals are taken in the harbor

and lagoon close to the wharves, being attracted from offshore grounds by the offal from the canneries.

The harbor is not well suited for fishing vessels, it being exposed to easterly winds; the holding ground is also poor. In the spring of 1911 a cannery ship dragged ashore and was a total loss.

The *Albatross* left Chignik June 27, steaming through Unga Strait, and passed a cod fisherman off Cape Pankof bound into Bering Sea. There seems to be no reason why the San Francisco and Puget Sound cod fleet should confine their fishing wholly to the Bering Sea region, there being good cod grounds on the banks lying off Kodiak Island, the Shumagin and Semidi Group, where the quality of cod is said to equal those found farther north. It is stated that fish in the localities mentioned are not numerous; but it is safe to say that the small vessels of the fleet, and many of the large ones, would find little difficulty in obtaining cargoes as quickly as on banks in Bering Sea.

Akun Island.—On the morning of June 28, having arrived at Akun Island, situated on the west side of Unimak Pass, four halibut trawls, baited with salted herring, were set at the mouth of Akun Bay at intervals of 1 mile apart, in depths varying from 41 to 74 fathoms; character of bottom, fine gray sand. The trawls remained down 1 hour and 20 minutes, the result being 5 halibut, 115 cod, and 7 sculpins. The average weight of the halibut was 10 pounds; average length, 28 inches; maximum weight and length, 16 pounds and 34 inches. The cod were evenly distributed among the dories, showing that the ground had a considerable number of cod on it, and with fresh bait and a trial lasting several days fair fishing might be expected. The cod were larger than those taken at Chignik, several weighing 25 pounds; the largest weighed 30 pounds. The hooks brought up a variety of marine growth, starfish, mussels, sea urchins, and live shells covered with sponge. Trawls set any distance from the eastern side of Akun, or a mile or more outside the mouth of Akun Bay, would come in contact with the strong tide sweeping through Unimak Pass. It is very doubtful if the halibut fishery could be carried on here with any degree of success, except on the slack of the tide, which is of short duration. It would not be possible to haul a trawl at other times.

Lost Harbor.—This harbor is situated on the west side of Akun Island and affords a good shelter from easterly winds. For the purpose of making a trial in this locality the ship came to anchor at 3 p. m., and a skate of trawl was set off the mouth of the harbor; depth 20 fathoms, rocky bottom. The catch was 2 halibut, weighing 4 and 8 pounds, respectively, and 10 cod; the cod averaged 10 pounds. The result of this trial would not indicate halibut to be plentiful at this season. A trial later in the year, at the time salmon

appear, might prove more successful. It is quite safe to assert that cod in this vicinity are sufficiently abundant to furnish a supply for a large shore plant if operated properly.

Akutan Harbor.—In the evening we steamed across Akutan Bay and anchored in Akutan Harbor. On our way into the harbor a dory was dropped and a trawl set off the mouth in 27 fathoms of water, on rocky bottom, where it remained one and one-half hours. The catch was 1 halibut, weighing 4 pounds, and 12 cod.

While steaming across Akutan Bay a large fishing schooner was sighted through the fog which afterwards proved to be the *Vera*, of Seattle, some of whose crew had been fishing with handlines from dories in and out the mouth of Akutan Harbor while the vessel was taking a supply of water. In two days 4,200 cod were taken—1,500 the first day and 2,700 the day following. That cod were plentiful was indicated by the number taken on the trawl set at the mouth of the harbor.

It was stated by the people living at Akutan Harbor that a whale plant was soon to be erected and a cod station established, each to be conducted on a large scale. A large steamer was about to be launched at Seattle to engage in the whale fishery, and several motor boats and dories were expected in a few days to take part in the cod fishery. The motor boats are to be used in towing the dories to and from the fishing grounds and performing such work about the station as may be required.

Akutan Harbor for many years has been occupied by the Alaska Commercial Co., of San Francisco, as a trading station, but recently the property was transferred to another company which is to carry on the whale and cod fisheries previously mentioned.

Many humpback whales were observed on the eastern side of Akun Island, and quite a number in Akutan Bay, which separates Akun and Akutan Islands. Whale birds were numerous and other sea birds plentiful.

While no large body of salmon visit Akutan, yet enough are taken by the natives for local demands. It has also been the custom of the natives of Unalaska to visit Akutan each season for the purpose of laying in a supply of red salmon, that species being found there in greater numbers than in the streams of Unalaska.

North Head.—Leaving Akutan Harbor, the next trial for halibut was made off North Head, where two skates were set in 26 fathoms of water; character of bottom, rocky. On one skate there were taken 1 halibut, 38 cod, 2 skates, and 2 sculpins. The second skate caught 12 cod, 2 turbot, and 2 sculpins. The halibut weighed 5 pounds and measured 23 inches. The cod were large, such as those found on the offshore grounds. There was marked absence of birds or other forms of life which would indicate prolific ground.

The tide was not so strong as on the east side of Akun Island, and in consequence the trawls were easily hauled. Had they been set a mile or more from the shore a strong tide would have been encountered.

In the afternoon, June 29, we anchored off Dutch Harbor, Unalaska, and after coaling left on July 5 for Bering Sea.

Slime Bank.—Off Akutan Pass we passed through immense flocks of whale birds. Many of the flocks covered several miles in length and from one-half to 1 mile in width. Throughout the summer months these birds may be found in great numbers in the vicinity of Akun and Akutan Islands and in Unimak Pass, and they are also numerous along the coast of Alaska wherever whales are present in considerable numbers. The amount of food necessary to supply them must indeed be large, and as more birds are found in Bering Sea and in the passes leading into it than elsewhere the waters must be teeming with minute animal life and small surface fishes sufficiently abundant to supply both whales and birds.

Our first set made in Bering Sea, and probably the first halibut trawl ever set in this sea, was made on the morning of July 6, with two trawls about one-half mile apart in 43 fathoms of water; character of bottom, black gravel; Cape Lapin bearing southeast, 16 miles distant.* The result of these sets, lasting 54 minutes, was 54 cod, 1 turbot, 1 skate, and a small crab. Only a few of the cod were brought on board. The maximum weight was 32 pounds and 39 inches in length; minimum, 12 pounds and 29½ inches.

The end of one of the trawls dropped off into 60 fathoms of water, in which depth some of the largest cod were taken. It is stated by most fishermen who have fished on banks in Bering Sea that as a rule the best fish are found farther off shore than where fishing is usually carried on. The reason why vessels confine their operations to the inshore grounds is that the crew are paid by the fish, and smaller fish are found near the shore. In other words, it is to the advantage of the crew to catch no more than they must of the fish over 28 inches in length, the standard measurement of what is termed a "count fish," because large fish fill the hold too quickly.

In the afternoon a set was made in 54 fathoms on sand and gravelly bottom in latitude 54° 53' 00" N., longitude 165° 20' 00" W., a distance of 22 miles from Cape Sarichef. On account of a strong wind and choppy sea the trawls were hauled after 45 minutes, taking 6 cod.

In previous trials for bottom fish in Bering Sea by the *Albatross* on grounds farther eastward, scattering halibut were taken. Fishermen who make annual trips to Bering Sea for cod report finding large quantities of small halibut on the eastern part of Slime Bank,

* All bearings are magnetic. The position of the trials, showing the latitude and longitude and depth of water, were platted by Lieut. Lewis B. Porterfield, U. S. N.

in the vicinity of Amak Islands, close inshore off Black Hill, and in various localities on Baird Bank, in some instances so numerous, according to one fishermen, as to be considered a nuisance. There is no report of large halibut having been taken on the above-mentioned grounds. It is estimated that few will exceed 25 pounds in weight. They are used by the hand-line cod fishermen for bait. Individuals weighing upward of 100 pounds have been reported caught on local grounds off the Pribilof Islands. Owing to unfavorable wind and weather no further trials were made in Bering Sea.

Davidson Bank.—Our next trial was made July 7 off Tigalda Island, the southeast end bearing north, distance 3 miles; depth of water 42 fathoms; character of bottom, gray sand. This ground may be termed the western end of Davidson Bank.

In a set (1 skate) lasting 40 minutes 11 cod, 1 flounder, and 7 sculpins were caught. A strong tide was running against the wind. On this ground strong tides may be expected, it being near Unimak Pass. Immediately following this set one was made on the southern and western edge of the bank 21 miles southeast by east from the last station occupied, in 62 fathoms of water; bottom, fine gray sand; latitude $53^{\circ} 45' N.$, longitude $164^{\circ} 30' W.$ The length of the trial was one hour, resulting in 12 good-sized cod and 1 skate. Had there been halibut in any considerable quantity it is very probable that at least a single individual would have been captured. In localities where halibut are fairly plentiful a skate of trawl in one hour's time usually captures several.

The results of the investigation in the vicinity of Tigalda Island and that portion of Davidson Bank covered would indicate a scarcity of halibut. It is possible, however, that at an earlier or later period they may be found in paying quantities. A diligent search lengthened into an entire season would be required to determine the richness of the ground; but inasmuch as no halibut were caught at the stations occupied we are of the opinion that at this season negative results would have followed a much longer trial.

Sannak Bank.—At 8 o'clock on the morning of July 8 a trawl was set in 50 fathoms; bottom composed of pebbles and rocks; latitude $54^{\circ} 13' N.$, longitude $162^{\circ} 10' W.$, or Seal Rock, off Sannak Island, bearing W. by N. $\frac{1}{2}$ N., $16\frac{1}{2}$ miles distant. The usual time was devoted to this trial, 28 cod, 3 halibut, 1 rockfish, and 1 large octopus being taken. A second dory made a set a short distance from the first, in 43 fathoms of water, and in 30 minutes caught 63 large cod and 2 octopi. The halibut averaged 10 pounds and 30 inches. The cod were extra large, those which were brought on board ranging in weight from 32 to 35 pounds and in length from 29 to 41 inches.

Two large stones came up on one of the trawls, to which was attached a considerable growth of crinoids, a very good indication

that fish are more or less abundant. This ground would be a most excellent place to operate with cod trawls. A vessel fitted with trawls would have little difficulty here in securing a trip in one-half of the time she would need if hand lines were used.

This position was on the edge of the bank, less than 3 miles from the 100-fathom curve, and about 7 miles from where the water suddenly deepens to 211 fathoms, soft, muddy bottom.

The next trial was made in 64 fathoms, rocky bottom, latitude $54^{\circ} 08' 30''$ N., longitude $162^{\circ} 11' 20''$ W., Lookout Point, Canton Island, bearing NW. $\frac{1}{4}$ W. 16 miles distant. Two halibut weighing 7 and 9 pounds, respectively, and 2 red rockfish composed the catch.

From this position the ship steamed east 2 miles and set one skate of trawl, in 45 fathoms of water, rocky bottom. On hauling the trawl it was found that the anchor was caught under a rock, and in trying to clear it the buoy line chafed off, causing the loss of the gear. The trawl having been baited with fresh octopus good results were expected, and a comparison was to be made between salt and fresh bait. This position was also close to the 100-fathom curve and 4 miles from a depth of 435 fathoms marked on the chart.

At 6 p. m. another trial was made on rocky bottom in 47 fathoms, a distance of 34 miles from the previous trial, Pinnacle Rock bearing NW. $\frac{1}{2}$ W., distance 17 miles, or latitude $54^{\circ} 31' N.$, longitude $161^{\circ} 33' W.$ At this station 2 halibut, the combined weight amounting to 15 pounds, 8 cod, and 9 sculpins were caught, a much smaller catch than was expected, the position being on the western edge of the Shumagin Island ground, where large numbers of cod are annually taken. If a cod trawl had been set here it is very probable that a much larger catch of cod would have been taken.

Unga.—A short call was made at Unga, situated on Unga Island, Sunday morning, July 9, the ship anchoring off the mouth of the harbor about a mile from the village.

A cod station has been operated here many years by a San Francisco firm. Fishing is carried on in dories, hand-lines only being used, as at Sand Point and Pirate Cove, Popof Island. The supply of fish comes from local grounds in Popof Strait, and at various points off the southern and eastern sides of Unga Island. The fishermen leave the station in the morning, weather permitting, and return in the afternoon. The fish are dressed on shore, salted in large vats, and at the end of the season shipped to San Francisco, where they are dried and prepared in various styles for the market.

From the fishermen on shore we were informed that an attempt at one time had been made to introduce cod trawls, but they proved unsuccessful. In what manner they were a failure we were unable to learn. It is very probable that fishermen were not familiar with this form of apparatus and in consequence could not operate it.

It was learned that halibut are not plentiful in these waters at any time. Scattering individuals are caught in August at the time herring put in an appearance.

It was stated that a considerable body of herring frequently visits Simeonof and Semidi Islands, the first mentioned being one of the Shumagin Group, the second lying about 100 miles to the eastward. A few days previous to our arrival a vessel left Unga fitted with gill nets to engage in the herring fishery at those islands and at other places adjacent where fish were to be found.

Shumagin Bank.—On July 9 a set was made on Shumagin Bank, 19 miles to the southward of Unga, in 40 fathoms of water; character of bottom, sand and pebbles; Mountain Cape, Nagai Island, bearing ENE., distance 16 miles, or latitude $54^{\circ} 53' N.$, longitude $160^{\circ} 38' 30'' W.$ One halibut, weighing 3 pounds and $20\frac{1}{2}$ inches in length, 3 cod, and 2 sculpins was the catch in a trial lasting one hour. From a fisherman's point of view this ground would not be considered of sufficient importance to spend much time upon it, although, as previously stated, a trial made at some other season might yield good results.

The next station occupied was 16 miles farther off shore in 80 fathoms of water; sand and gravel bottom; Mountain Cape, 22 miles distant, bearing N. $\frac{1}{2}$ E., or latitude $54^{\circ} 34' N.$, longitude $160^{\circ} 24' W.$ Better results were obtained here than in the preceding trial, 3 halibut, 16 cod, and 1 turbot being taken. The halibut averaged 10 pounds in weight and 29 inches in length. The cod were of good quality. The catch fell short of expectations, presumably for the reason suggested by the report that a sailing vessel had incidentally caught a considerable number of halibut on this ground while becalmed.

During the night of the 9th a run of 67 miles was made to the eastward, and in the morning the ground was tested in 90 fathoms of water 21 miles ENE. from Simeonof Island, latitude $54^{\circ} 55' N.$, longitude $158^{\circ} 34' W.$; character of bottom, mud and sand. It had been reported that a good catch of halibut had been taken here on hand-lines by a passing vessel, but a trial of 1 hour and 20 minutes resulted in only 4 cod and 1 skate.

Steaming 27 miles on an ENE. course, we arrived at another position where halibut had been reported plentiful and began setting a "string" of four trawls in separate dories. The first trawl was set on rocky bottom, 48 miles ENE. from Simeonof Island, latitude $54^{\circ} 53' N.$, longitude $157^{\circ} 48' W.$ Two others were set 2 miles apart in a SSE. direction, and the fourth 3 miles from the third, a distance of 7 miles from first dory. The depth of water varied from 48 to 70 fathoms. They remained down one hour and a half, the aggregate catch amounting to 11 halibut and 97 cod. The average weight of

the halibut was 15 pounds, average length 30 inches. Numerous sea birds were present, the first observed since leaving Akutan Pass.

Two other trials were made during the day. The trawls were baited with salted herring and fresh halibut and set 2 miles apart, one in latitude $54^{\circ} 59' N.$, longitude $157^{\circ} 43' W.$, and the other in latitude $55^{\circ} 01' 30'' N.$, longitude $157^{\circ} 43' W.$, on rocky bottom, each in 42 fathoms of water. They were kept down 1 hour and 30 minutes, with a result of capturing 14 halibut, 46 cod, 7 sculpins, and 1 starfish. The halibut averaged 11 pounds in weight and 20 inches in length, the maximum weight of a single individual being 20 pounds. The cod were large and of good quality. The result of these trials would indicate an excellent cod ground, and probably a good halibut ground at certain seasons. Whales and birds were abundant.

Semidi Islands.—On the morning of July 11, at 6.15 o'clock, fishing was begun off Semidi Islands, Lighthouse Rocks 7 miles distant and bearing WNW. $\frac{1}{4}$ W.; depth 48 fathoms, rocky bottom. At this station one skate of trawl was set, remaining down one hour, on which 1 small halibut and 4 cod were caught.

In the next investigation, which began at 8.05 a. m., Lighthouse Rock bearing W. $\frac{1}{4}$ S., 10 miles distant, a dory was put over with one skate of trawl and set in 48 fathoms; character of bottom, sand and small rocks. The ship steamed 2 miles on a NE. $\frac{3}{4}$ N. course and dropped a dory where the water was 49 fathoms deep, after which continued on the same course and put over two more dories at intervals of 2 and 3 miles, in 50 and 53 fathoms. At these stations 23 halibut and 52 cod were caught. The trial lasted 1 hour and 40 minutes. A large number of whales and numerous birds were present, indicating the presence of marine surface life.

The taking of this number of halibut on salt bait in such a short time is somewhat convincing that this region is favorable for a considerable catch of this species. The true value of the ground, however, can be determined only by fishing vessels.

Chowiet Island.—The next trial was made in the vicinity of Chowiet Island, one of the Semidi group, which bore NW. $\frac{1}{2}$ W. $6\frac{1}{2}$ miles. The set was begun in 100 fathoms of water, deepening to 120 on the outer end of the trawl; bottom sandy. There were few, if any, indications of halibut on this spot of ground. Twenty-six cod, 2 skates, and a basket starfish was the catch.

Chirikof Island.—From the position of the last trial the ship steamed 27 miles in a northeasterly direction, and at 6.50 p. m. made a trial 11 miles from Chirikof Island, the north end bearing east. Character of the bottom, dead shells; depth, 40 fathoms. The trawl was kept down 1 hour and 20 minutes, the catch consisting of 2 halibut, 8 cod, and 1 skate. The halibut weighed 9 and 12 pounds, respectively; length, 27 and 29 inches. The considerable number of

dead shells which came up on the hooks indicates, as a rule, poor fishing ground.

Western entrance to Shelikof Strait.—During the night the *Albatross* steamed to the north and eastward, and on the morning of July 12, the weather being foggy, sounded in 114 fathoms of water some 8 or 10 miles to the westward of Seal Rocks, which lie close to the western end of Kodiak Island. Stood inshore 3 miles and sounded in 98 fathoms and later got a depth of 58 fathoms, at which time the fog lifted, Cape Ikulik bearing N. by W. 6 miles distant. In this position a skate of trawl was set baited with salted herring and fresh cod, chiefly the former. After 1 hour and 40 minutes the haul resulted in 7 halibut, 16 cod, 6 skates, and 2 turbot. The halibut were taken on the hooks baited with salted herring and were small, the largest weighing 11 pounds, the smallest 6 pounds. There was a considerable quantity of mud, sand, and small rocks on the trawl anchor. Whales were very plentiful. The number of halibut taken here does not compare favorably with trials of equal length on most grounds in southeast Alaska, although it might be possible for a vessel operating a quantity of trawls to secure a trip in a comparatively short time.

A run of $12\frac{1}{2}$ miles in a southeast direction brought the ship in the vicinity of Low Cape, situated close to the southwest end of Kodiak Island, in 34 fathoms of water, rocky bottom, the cape 8 miles distant, bearing E. by N. At 12.30 p. m. a second trawl was set 1 mile S. by E. $\frac{3}{4}$ E. from the first, in 52 fathoms, the character of the bottom the same as at the first station.

The first trawl remained set one hour, and from it were taken 13 halibut, 9 cod, 1 skate, 4 sculpin, and 1 octopus; from the second, 8 halibut, 13 cod, 1 skate, and 1 sculpin. The halibut taken by the first dory averaged $11\frac{3}{4}$ pounds, and that by the second 14 pounds, a higher average than for any previous catch during the cruise.

It is very evident that a considerable body of halibut inhabit this ground. In the opinion of Capt. Joyce, and also the four practical fishermen on board, a halibut steamer well equipped with trawls would take 50,000 pounds of halibut in one day's fishing. The indications here are as good as in many places on southeast Alaska and Queen Charlotte Island grounds, where fishing has been carried on for the last 18 years and millions of pounds of halibut caught.

Cape Alitak.—The dories having been hoisted, a course was shaped for Cape Alitak, and at 4.55 p. m. a set was made with one skate of trawl in 27 fathoms; bottom, shells and small rocks, the cape bearing NE. by N. 10 miles distant, Cape Trinity $14\frac{1}{2}$ miles distant and bearing ENE. The trawl was baited with salt herring and fresh cod; trial, 1 hour and 15 minutes. Here the catch consisted of 4 halibut,

11 cod, 2 skates, and a basket starfish. The halibut were smaller than those captured in the previous trial, the average weight being $8\frac{1}{2}$ pounds and length $26\frac{1}{4}$ inches. Another dory set a trawl $\frac{1}{2}$ mile E. by N. $\frac{1}{2}$ N. from the first one, in 40 fathoms; character of the bottom, blue clay; length of trial, 1 hour and 30 minutes; the result being 3 halibut, weighing 9, 10, and 12 pounds, respectively, 3 skates, and 1 turbot.

Evidently halibut on this ground were scattering as compared to the former spots investigated in this region, but as good and poor grounds are frequently found close together, it is not at all unlikely that a mile or more in any direction might reveal favorable conditions.

Two whale steamers were seen steaming at a moderate rate of speed, and one of them fired several times at whales, of which many were present. On this ground and on the entire coast of Kodiak Island, from Marmot Bay to Cape Alitak, are usually found, during the summer months, a large number of humpback whales.

Alitak Bay.—Lazy Bay, situated on the northern side of Alitak Bay 4 miles from the entrance, offers good shelter for vessels fishing on grounds in the vicinity of Seal Rocks, Low Cape, Cape Alitak, or Tugidak Island.

Albatross Bank.—This bank covers an area of about 4,000 miles, and extends practically from the western end of Portlock Bank along the southeastern side of Kodiak Island to Trinity Islands. Near the coast it has for many years been resorted to by local fishermen for cod. Halibut have incidentally been caught on various parts of the bank, but no systematic search has been made for them, as there is no local demand sufficiently large to warrant the expense of an outfit of proper fishing gear.

In the evening of July 12 the vessel passed through the channel between Cape Trinity, Tugidak, and Sitkinak Islands, and headed south and eastward under slow speed. At 4.50 a. m., arriving at the place for the next trial, a dory was put over on the western part of Albatross Bank in latitude $56^{\circ} 21' N.$, longitude $153^{\circ} 15'' W.$, where one trawl, baited with fresh octopus and salted herring, was set in 18 fathoms of water; hard, rocky bottom. At the time of setting the trawl a very strong tide was running to the northeast; weather foggy, but clearing later and affording an opportunity to locate our position.

At the expiration of one hour the trawl was hauled, but soon after breaking out the anchor the ground line parted, and it was necessary to go to the other end. Here again, however, the line parted a few hooks from the end. On the few hooks that were saved six cod were caught. On this spot of ground the bottom is undoubtedly too rocky and rough to operate trawls. Hand lines probably would obtain much better results.

From this position the ship steamed 29 miles in a N. $\frac{1}{2}$ E. direction, and at 10.15 a. m. arrived at latitude $56^{\circ} 36' N.$, longitude $152^{\circ} 56' W.$; depth, 44 fathoms; character of the bottom, sand and gravel. A trial lasting 1 hour and 20 minutes with one skate of trawl resulted in 4 halibut, 28 cod, 1 skate, and 1 sculpin. The halibut were small, averaging $5\frac{1}{2}$ pounds.

In latitude $57^{\circ} 00' N.$, longitude $152^{\circ} 21' W.$, 2 halibut, 17 cod, and 2 skates were taken on a trawl which remained set 1 hour and 30 minutes; depth, 45 fathoms; bottom, rocky. The cod were of medium size; the halibut averaged 15 pounds, one individual weighing 22 and the other 8 pounds. This position was 32 miles from the previous trial and the last one made for the day.

Portlock Bank.—This bank is a continuation of Albatross Bank. Its western boundary begins at about 152° west longitude and in the latitude of Ugak Bay, extending in a northerly and easterly direction a distance of about 120 miles and covers an area of nearly 7,000 square miles, all of which is within the 100-fathom mark. Were that portion of the bank included on which 175 fathoms or less are found, its size would be increased to about 8,500 square miles.

On July 14 work began at 5 a. m. Sounded in 42 fathoms; character of the bottom, shells and small rocks. This position was 44 miles in a N. by E. $\frac{1}{4}$ E. direction from the previous station occupied. It is quite evident that cod were much more plentiful here than halibut, 19 of the one and only 2 of the other being taken.

Thus far cod have predominated in the various trials made on this bank. That halibut may be found at times in commercial quantities on that part visited by the *Albatross* is very probable, but it is thought that cod will be found on all parts in greater numbers.

In a trial 17 miles from the last station, latitude $57^{\circ} 46' N.$, longitude $151^{\circ} 27' W.$, 3 halibut and 13 cod were caught in 34 fathoms, rocky bottom. The fishermen reported that one end of the trawl was in nearly 100 fathoms of water. Several hydroids were brought up on the trawl. In the evening the *Albatross* anchored off Kodiak Harbor.

The trials made on Albatross Bank do not bear evidence that halibut in large numbers may be looked for at this season. A few trials on a bank at a certain season is hardly a fair test of the ground; at an earlier or later date results might be satisfactory. Therefore it is recommended that should halibut fishermen visit this ground they give it more attention than the time at our command would permit.

Kodiak.—The Alaska Commercial Co. having abandoned most of the stations in Alaska, which at one time gave employment to a large number of natives, several former employees are contemplating establishing a cod-fishing station at Kodiak. It is understood that several

vessels have been negotiated for to engage in the cod and halibut fisheries, the necessary dories, fishing gear, etc., having already been purchased. It was also stated that a large three-masted schooner was to be fitted for freezing halibut, salmon, and other fish, and it was subsequently learned that the schooner obtained a cargo. The cod and halibut were taken off the eastern end of Kodiak Island, western edge of Portlock Bank.

Vessels fishing on Portlock or Albatross Banks or any of the local grounds off Kodiak Island should not find it difficult to obtain a supply of bait. The various species of low-grade salmon which are sometimes used for bait are obtainable in their season at different parts of the island.

At times herring are said to be plentiful in Victoria and Uganik Bays, situated on the northern part of Kodiak close to Kupreanof Strait. Herring are also found in Marmot Bay.

Salmon are easily captured in drag seines, and herring in the same manner when found in bays. Gill nets set on the banks and in harbors and bays might also be the means of adding to the bait supply. The numerous birds generally observed on the fishing grounds in this region strongly indicate the presence of surface fish, among which are herring.

Fishermen, as a rule, are not inclined to spend much time in search of bait or make much effort to catch it, provided it can be purchased at a reasonable price, it being considered more economical to purchase than to catch it. Should a portion of the halibut fleet find it profitable to fish on banks off the coast of central Alaska, stations supplying bait would doubtless be established within a short time.

On July 17 the investigation was continued, the first trial being made broad off Chiniak Bay, 15 miles in a S. by W. direction from the position of the last trial, on July 14. The set was made in 54 fathoms on rocky bottom, a distance of 12 miles from Cape Chiniak, which bore SW. $\frac{3}{4}$ W. The trawl was allowed to remain down 1 hour and 30 minutes and captured 9 halibut, 11 cod, and 5 turbot. The largest cod weighed 27 pounds; halibut averaged $9\frac{1}{2}$ pounds in weight and $28\frac{1}{2}$ inches in length. One individual measured 36 inches and weighed 22 pounds; the smallest 24 inches and 5 pounds.

The ship ran $14\frac{1}{2}$ miles toward Ugak Island and sounded in 40 fathoms; broken bottom, composed of shells, pebbles, gravel, and mud, the island bearing SW. $\frac{1}{2}$ S.; distance, 10 miles. One trawl was set, and 1 mile SW. by W. from the first dory a second set was made in 38 fathoms on hard bottom, composed chiefly of small rocks. The first trawl remained down 1 hour and 15 minutes and the second 1 hour and 40 minutes, the combined catch amounting to 10 halibut, 15 cod, 9 sculpins, 2 skates, and an octopus. The halibut were small,

ranging from 3 to 7 pounds. In the immediate vicinity of both of these stations whales were plentiful, apparently feeding upon surface life of some kind. The result of these two trials did not indicate a prolific halibut ground.

On July 18 one dory left the ship at 4.50 a. m. and made a set about 30 miles from the last station in 72 fathoms on small rocks and pebbly ground, latitude $57^{\circ} 12' 30''$ N., longitude $151^{\circ} 12' 00''$ W. The economic species caught were 9 cod, 1 black cod, and 1 Attu mackerel. On the ground were several whales playing around the dory and ship. Attached to some rocks brought up on the trawl were several crinoids, indicative of what is termed by fishermen "good bottom."

The Attu mackerel was accidentally taken, hooked in the eye, apparently indicating that a school of this species was passing under the dory at the time the trawl was being hauled, and this fish was caught as the hooks were pulled rapidly through the water. So far as known, there is no previous record of mackerel being taken any considerable distance from the shore. Our position at the time was 37 miles from Narrow Cape, which is situated at the northern entrance of Ugak Bay, Kodiak Island, and $5\frac{1}{2}$ miles from the 100-fathom curve— $9\frac{1}{2}$ miles from where the bottom drops off into profound depths. Mackerel have generally been observed and caught near ledges and kelp patches along the coast.

During the day two other trials were made on the southern and eastern edge of the bank 14 miles apart, the first 22 miles from the last position occupied. At 1.35 p. m. a sounding was taken in 62 fathoms. The arming on the lead showed the bottom to be composed of coarse sand. At 1.45 p. m. a skate of trawl was set, baited with fresh cod and salt herring; latitude $57^{\circ} 27' 00''$ N., longitude $150^{\circ} 40' 00''$ W. The length of this trial was 1 hour and 40 minutes, during which time the ship steamed 5 miles on an east course and sounded in 160 fathoms, getting no bottom.

On returning to the dory it was found that the trawl had taken 3 halibut and 33 cod. The average weight of the halibut was $9\frac{1}{4}$ pounds, average length $38\frac{3}{4}$ inches. The five cod that were saved averaged 20 pounds and 36 inches. They were excellent in quality, as were the others that were removed from the hooks. It is very probable that a trawl-line fishing vessel would soon secure a fare of cod in this region.

At 5.50 p. m., in 55 fathoms, rocks and sandy bottom, latitude $57^{\circ} 42' 00''$ N., longitude $150^{\circ} 42' 00''$ W., a trawl was set and 3 halibut, averaging 13 pounds and 30 inches, and 32 cod were caught, the trial lasting 45 minutes. The trawl, as in the previous trial, was baited with salt herring and fresh cod. There seemed to be as many cod taken on the salt bait as on the fresh. This was also true of the halibut.

Marmot Island.—During the night the ship covered a distance of 41 miles in the direction of Marmot Island. This island lies off the eastern end of Afognak Island, the two being separated by Marmot Strait, which is 3 miles wide and 10 miles long.

On the morning of July 19 a trial was made in 55 fathoms, Marmot Cape bearing west 5 miles distant; character of the bottom, dead shells. On this ground the catch consisted of 2 cod and 2 skates. The true character of the bottom in most cases was not determined until the trawl had been hauled. A deep-sea lead having an arming of tallow brings up a sample of the bottom, covering a diameter of $1\frac{1}{2}$ inches. The lead may strike on some particular spot composed of sand or gravel, while the general character may be broken shells and mud, on which little or no marine life could be expected. As a trawl covers a considerable stretch of ground, it more accurately determines the character of the bottom than the ordinary process of sounding.

At 11.10 a. m. another trial was made near the south side of Izhut Bay, Afognak Island, a distance of 19 miles west of our former position, on rocky bottom in 30 fathoms, the inner end of the trawl being one-half mile from the shore, Pillar Cape, situated on the north side of the bay, directly at its mouth, bearing NE. $\frac{1}{4}$ E. 5 miles distant. At 3 p. m. a third test of the ground was made off Narrow Strait, 3.8 miles from South Point, Spruce Island, which bore W. $\frac{1}{4}$ S. The combined catch at these stations was 52 cod, 4 halibut, 1 rockfish, and 13 sculpins. The average weight of the halibut was $18\frac{1}{2}$ pounds, average length $25\frac{1}{2}$ inches. One weighed 45 pounds and was 43 inches in length. The cod were fairly large and of good quality.

The ground covered on this day does not indicate that a large body of halibut might be expected at this season, although it is reported by local fishermen that at times they are to be found in paying quantities, more especially in the vicinity of Marmot Bay. It is quite evident that cod at most seasons are quite plentiful.

At 5 a. m., July 20, in latitude $58^{\circ} 06' 30''$ N., longitude $151^{\circ} 00' 00''$ W., a trial was begun in 65 fathoms of water, on coarse sandy bottom, lasting 45 minutes; 1 halibut and 11 cod taken. The result was not as satisfactory as expected, although the character of the bottom was such as should attract halibut.

At 11.55 a. m., about 14 miles from the position of the last station, in latitude $58^{\circ} 03' 00''$ N., longitude $150^{\circ} 32' 00''$ W., 8 halibut, 13 cod, 2 rockfish, and an octopus were caught; depth, 50 fathoms; rocky bottom. The halibut averaged $13\frac{3}{4}$ pounds and 33 inches. There was very little food in their stomachs. The eggs of one had the appearance of being well developed. The ground bore evidence of being rich in marine growth, several clusters of crinoids being taken on the hooks of the trawl. In this locality the indications are

that the ground is prolific and a large catch of halibut could be obtained in a short time.

At 4.18 p. m., in latitude $58^{\circ} 16' 00''$ N., longitude $150^{\circ} 20' 00''$ W., a set was made in 48 fathoms; bottom, pebbles and rocks. At 4.30 put over the second dory $1\frac{1}{2}$ miles NW. by W. from the first position and made a set in 52 fathoms; character of the bottom, broken shells. The first trawl remained down 1 hour and 5 minutes, and the second 1 hour and 20 minutes. The catch of the first consisted of 6 halibut, 14 cod, and 2 skates; and the second 7 halibut, 16 cod, and 2 skates. The halibut at the first station averaged 22 pounds in weight and 32 inches in length; the largest weighed 40 pounds, having a length of 42 inches. Those caught at the second station averaged 18 pounds and 33 inches. This ground is situated 10 miles S. by E. $\frac{1}{2}$ E. from the "spot" where the first trial was made on the afternoon of June 5. In this region there is every evidence of a fishing ground of considerable importance.

On July 21 the *Albatross* anchored off the town of Seward, Resurrection Bay, a distance of 112 miles north of the position of the last trial.

Blying Sound.—The next trial was made on the morning of July 24 at the mouth of Blying Sound and just north of Aialik Bay, in 50 fathoms, near the south end of Cheval Island, on rocky bottom. The trawl remained set 1 hour and 20 minutes, in which time 3 halibut, 7 cod, and 2 turbot were captured. The result of this trial did not indicate the presence of a large body of halibut. It is possible that the glacial water discharged from Resurrection and Aialik Bays may prevent halibut from approaching this part of the coast; although in Icy Strait, southeast Alaska, where there is a large quantity of glacial water coming from Muir and Brady Glaciers, halibut are very plentiful at different periods.

In a trial lasting one hour, in 57 fathoms, rocky bottom, off the south side of Seal Rocks, which lie 8 miles off the west side of Aialik Bay, 1 halibut weighing 7 pounds, and 1 skate were caught. As there seemed to be nothing of importance in this locality the ship was headed for Point Gore, 49 miles south and west of Seal Rocks. The following morning, July 25, on account of stormy weather, an anchorage was made in Sunday Harbor, where we remained until the morning of July 27.

Sunday Harbor.—This harbor affords good anchorage for large vessels. There is very little obstruction at its entrance. The northern arm of the bay is also free from obstruction after passing a dry rock at the mouth. From this point to the head of the harbor the passage is open. Vessels will find good anchorage in depths ranging from 7 to 16 fathoms. At the entrance head of the harbor there is an

abundance of wood and several small streams carrying a supply of water for steamers or sailing vessels. From the ship, with hand lines, 1 halibut, weighing 85 pounds, and 15 cod were caught; also 1 halibut, weighing 85 pounds, on a trawl set at the mouth of the bay, in 15 fathoms; rocky bottom.

July 27, the storm having abated, the *Albatross* steamed out of the bay and headed offshore, and at 3.15 p. m. made a set in 49 fathoms, rocky bottom, 7 miles from East Chugach Island, which bore W. $\frac{3}{4}$ S., in which position 15 halibut, averaging 12 $\frac{3}{4}$ pounds and 30 $\frac{1}{4}$ inches, and 9 cod were taken, a convincing indication that the ground here is prolific. It is also safe to say that along the coast from Port Dick to the westward beyond the Chugach Islands, also offshore in depths ranging from 40 to 50 fathoms, halibut are to be found in paying quantities.

At 7 p. m. a position was occupied in 66 fathoms of water, rocky bottom, Pearl Island bearing NW., distance 6 miles, or latitude 59° 00' 00'' N., longitude 151° 34' 00'' W. Owing to the strong tide which was running, which did not show its full strength until the anchor of the trawl reached bottom, the ground line parted, causing the loss of a large portion of the trawl. On the few remaining hooks 2 halibut were taken, weighing 10 and 16 pounds, respectively.

It may be suggested that in order to make successful sets on this ground, where the tide enters and flows out of Cook Inlet with considerable force, two dories should be used, one at each end of the trawl. By this method there would be less danger of losing the gear should it part, which is likely to be the case on rocky bottom, particularly when a strong tide runs, such as found here at most times, as the second dory would, in the majority of cases, secure the remaining portion of the trawl. Undoubtedly there is a large quantity of halibut in this region, and probably adjacent grounds are equally good. The chief objection to this ground is the probability of losing a large amount of gear. Means of overcoming the danger of such loss would no doubt be found, however, once it became known to fishermen that halibut were plentiful.

A fleet of vessels carrying 10 or 12 dories each, and each dory operating 8 to 10 skates of gear, would in a very short time locate the most prolific spots, as was done by fishermen on the various grounds in southeast Alaska, Queen Charlotte ground, and off Cape Scott, Vancouver Island.

Portlock Bank.—On July 28 three trials were made on Portlock Bank, the position and depths as follows: Latitude 58° 36' 00'' N., longitude 150° 56' 30'' W., 43 fathoms; latitude 58° 28' 00'' N., longitude 150° 25' 00'' W., 36 fathoms and latitude 58° 18' 00'' N., longitude 149° 46' 00'' W., 42 fathoms. The trials were 17 and 22

miles apart in an easterly direction from the position of the first dory. The character of the bottom at each station was rocky.

In the first position only 4 halibut and 5 cod were taken. Attached to the hooks were many sea anemones and a hermit crab. On the ground line and snoods was a considerable quantity of what is called by fishermen "slime," and is claimed by them to be wherever found an indication of good halibut ground. The practical fishermen on board, and also Capt. H. B. Joyce, feel certain that large quantities of halibut are to be found on this ground at some season of the year, basing their opinion upon comparisons with grounds in southeast Alaska, where similar conditions exist and where halibut are abundant at certain periods and very scarce at others.

At the second station occupied the catch consisted of 8 cod. On account of the sharp rocks, of which the bottom was chiefly composed, the ground line chafed off, causing the loss of one-half the trawl and an anchor. The character of the bottom here is such as to attract halibut, the portion of the trawl saved bringing up large numbers of holothurians, ascidians, sea pens, and live shells. The result of the last trial was 6 halibut, 17 cod, and 2 red rockfish. The average weight of the halibut was $16\frac{1}{2}$ pounds and of the rockfish $15\frac{1}{2}$ pounds.

A test of the ground was made the following morning, July 29, in 69 fathoms of water, on sharp rocky bottom, latitude $58^{\circ} 32' 00''$ N., longitude $148^{\circ} 59' 00''$ W. A strong southeast wind was blowing, accompanied by a choppy sea and foggy at intervals. At the expiration of one hour the work of hauling the trawl began. As soon as the anchor was broken out and a strain brought to bear on the ground line, it parted, two hooks from the end. By the time the dory reached the ship the wind had increased considerably. A course was then shaped for Montague Island, situated at the mouth of Prince William Sound, off which we arrived the same evening, a distance of 80 miles from the last station occupied. The weather being very thick, the ship lay to during the night.

Mouth of Prince William Sound.—July 30 the *Albatross* came to anchor in 28 fathoms, and at 7.30 a. m. a set was made close to the ship, Cape Clear bearing N. $\frac{1}{4}$ W., distance 3 miles; bottom rocky. The trawl was set on the last of the ebb tide and hauled at the beginning of the slack tide, but before finishing the tide began to run a strong flood, making it very difficult to get the gear. The catch was 5 halibut and 7 rockfish. One halibut weighing 36 pounds was taken on a hand line from the ship; two others were brought to the water's edge but escaped. The rockfish averaged 16 pounds and the halibut 37 pounds, 45 inches long, and they were of excellent quality. In this locality success depends largely upon choosing the condition of the tide, which sweeps in and out of Prince William Sound with

considerable velocity. Later in the day very satisfactory results were obtained $3\frac{1}{4}$ miles off Danger Island; which bore N. $\frac{1}{4}$ W., depth 41 fathoms; character of the bottom, blue clay. The halibut were not saved, as the ship was well supplied with fish. Their average weight was estimated to be 10 pounds. This ground showed possibilities of supplying a large demand for halibut, 13 being taken on a single trawl which was set 1 hour and 20 minutes.

MacLeod Harbor.—In the evening the ship anchored in MacLeod Harbor, Montague Island. Shortly after coming to anchor a trawl was baited and set at the mouth of the harbor in 20 fathoms, increasing to 24 fathoms at the outer end. The bottom was found rocky in most places. A set of 12 hours resulted in 10 halibut, averaging 30 pounds, the largest weighing 85 pounds; 6 skates, 1 large ground shark, and 4 dogfish. That sharks had eaten some of the fish was indicated by the head of one halibut hanging to the hook, and this is frequently the case on ground where sharks are more or less abundant. On the grounds of southeast Alaska, and also on Flattery Bank, some 15 years ago, before extensive fishing for halibut had been carried on, it was not uncommon for fully one-third of the catch to be mutilated by ground sharks.

Should commercial fishing be extensively carried on in this locality, which is likely to be the case, vessels may find shelter in MacLeod Harbor and also Hanning Bay, $5\frac{1}{2}$ miles farther north. At MacLeod Harbor there are also good sites for buildings and wharves, and headquarters could easily be established for carrying on a fishery. A good water supply is close by, a stream emptying into the head of the harbor, and there is a cascade about one-half mile to the eastward not far from the beach. The beach extends nearly around the harbor. A dory load of salmon was taken from the stream with two hauls of a small seine, a portion being used by the ship's company and the rest for bait.

On the morning of August 1 the ship got under way at an early hour and proceeded to sea, but finding thick weather outside the sound it was considered advisable to make investigations farther north in parts of Prince William Sound, as to which favorable reports had been received of the presence of halibut.

The ship steamed through Montague Strait a distance of some 40 miles, and at noon set one trawl in 48 fathoms of water off the south side of Little Smith Island, which bore NW. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles distant, the east end of Smith Island bearing NE. by N. $\frac{1}{4}$ N. $3\frac{1}{4}$ miles. Reports had been circulated that a considerable quantity of halibut had been captured in this particular locality, but the result of our investigation was negative, two turbot being caught on a trawl baited with fresh salmon. The character of the bottom was found to be muddy.

In the early part of the evening an anchorage was made in Zaikof Bay, situated on the northern end of Montague Sound. A test of the ground was made on the south side of the bay in 39 fathoms of water, rocky bottom. The trawl was baited with fresh salmon and remained set 16 hours, at the end of which time 5 halibut averaging 40 pounds, 9 skates, 3 sharks, and 1 cod were captured. One individual weighed 140 pounds, which is considerably greater than the average size of halibut on this coast. Attached to one hook was the head of a halibut, and here, as at MacLeod Harbor, it is very probable that a number of halibut had been eaten by sharks. The bottom in this bay, or at least that portion of it covered by the trawl, was composed of small rocks, pebbles, and gravel; the marine growth brought up on some of the hooks consisted of ascidians and specimens of pennatula, either one of which forms of life, wherever found on fishing grounds, implies that bottom fish, such as cod and halibut, may be expected in more or less abundance.

This trial demonstrated excellent possibilities and that a large body of halibut inhabit this section of the island. It is quite evident that a small fleet of halibut fishermen in a short time would locate the best grounds in this vicinity and soon learn to take advantage of the local conditions in these waters.

Zaikof Harbor is well sheltered from northwest and east winds, but somewhat exposed to north and northeast winds. Port Etches on the mainland, 12 miles distant, is said to be a good harbor and well protected from easterly gales.

It is very probable that herring, in their season, may be obtained for bait purposes in various parts of Prince William Sound. Salmon fishermen at Orca have stated that while in search of salmon they have frequently encountered large bodies of herring off Smith Island, Peak Island, and in Herring Bay, Knight Island. Bait being a very important factor in the halibut fishery, it is necessary to have the base of supply as near the fishing ground as possible.

Cape Hinchinbrook.—From Zaikof Harbor a course was shaped which took us across Hinchinbrook Entrance, thence eastward $8\frac{1}{2}$ miles, where a trial was made in 33 fathoms on muddy bottom, Cape Hinchinbrook bearing SW. by W., and Hook Point N. $\frac{1}{4}$ E., 6 miles. The species captured were such as might be expected on soft muddy bottom. This trial was made while waiting for the fog to clear before going offshore. Several whales were present; also a few gulls.

It may be stated that from the western end of Hinchinbrook Island to Kayak Island and a distance of 10 miles from the coast the bottom is a deposit of soft mud discharged from the Copper River. On this ground there is an absence of commercial fishes or sessile marine growth.

Between Cape Hinchinbrook and Wessels Reef.—The *Albatross* steamed offshore 19 miles from the position of the last station and anchored in 38 fathoms; bottom, mud, pebbles, and small rocks; latitude $59^{\circ} 56' 20''$ N., longitude $146^{\circ} 28' 30''$ W.

At 6 p. m. a trawl baited with fresh salmon was set close to the ship and remained down 1 hour and 25 minutes, capturing one small halibut. Attached to the hook were many live shells, ascidians, and small stones, an indication of a good fishing ground which no doubt attracts halibut at some portion of the year.

On August 3 trial was made in 49 fathoms, a short distance from the position of the previous set. The ground seemed to be barren, nothing being caught. A considerable quantity of soft mud was attached to the anchors, and in many places the ground line, buoy line, and snoods of the trawl were covered with it. As this kind of bottom covers a considerable area no economic species could be expected at any season on this ground.

Middleton Island.—Another trial was made at 2.30 p. m. in 25 fathoms of water 6 miles from the south end of Middleton Island, which bore E. by S. $\frac{1}{2}$ S.; bottom composed of broken shells. In this position, as at the last station, there was an absence of fish of commercial species.

At the time the trawl was being set a strong southwest breeze was blowing, accompanied by a rough sea, and in consequence it was hauled after being down 45 minutes. A number of whales were seen. During the afternoon and night the ship steamed to the westward a distance of 49 miles, and at 9.40 a. m., August 4, in latitude $59^{\circ} 18' 00''$ N., longitude $148^{\circ} 03' 00''$ W., a trawl was set in 70 fathoms on rocky bottom. A strong southwest wind caused a sharp choppy sea. The result of this trial of 1 hour and 15 minutes was 14 cod. During the trial a salmon was observed jumping close to the ship. Our position at the time was $29\frac{1}{2}$ miles from the nearest land, which was the southern end of Montague Island, situated at the mouth of Prince William Sound, into which a large body of salmon enters each season.

From this position a run of 19 miles was made to the westward, and the ground for halibut tested in latitude $59^{\circ} 13' 20''$ N., longitude $148^{\circ} 38' 30''$ W.; depth, 67 fathoms; character of bottom, a mixture of pebbles and mud, which is the general character of the ground within a radius of 15 miles. Judging from the bottom and the taking of two halibut in a short time, it is thought that halibut may be found here in commercial quantities before and after the salmon run in Prince William Sound is over, this opinion being based on the fact that in the waters of southeast Alaska and British Columbia halibut follow salmon to the mouth of rivers and into bays. At such times it is not unusual for halibut to leave shore grounds and follow the salmon or herring.

During the night the *Albatross* ran $68\frac{1}{2}$ miles to the eastward and on August 5, early in the morning, slowly approached the southern end of Middleton Island; weather foggy. At 8.30, the fog having cleared sufficiently to take bearings, a halibut trawl was set in 50 fathoms, the southwest end of the island bearing N. by W., $4\frac{1}{2}$ miles distant; bottom composed of rocks and shells. The trial occupied one hour, in which time four halibut were captured, their weights being 8, 23, 24, and 33 pounds. Their stomachs were comparatively empty, which was the case with a large number of stomachs previously opened. Several whales were on the ground, and on the east side of the island orcas were playing about in large numbers, sometimes as many as 40 and 50 in a school, and acting as if pursuing surface fish.

At 1.40 p. m. another trial was made on the east side of the island, the north end bearing W. $\frac{3}{4}$ S., 8 miles distant; depth, 84 fathoms.

The bottom here proved to be muddy. In a trial lasting one hour one black cod was caught. The bait on the rest of the hooks was unmolested.

On the eastern side of Middleton Island and, for that matter, all around it, the bottom which would attract halibut, cod, or other fish of the commercial species, lies near the shore.

Sunken shoals and rocks fringe the entire length of Middleton Island on the west side and extend 2 miles from the south end and some 6 miles off the north end, making navigation extremely dangerous, especially as there is no light or harbor on the island and no buoys to mark the shoals. Wesslers Reef, which lies 16 miles north, should also be given a wide berth.

There seems to be very little in this locality to warrant either cod or halibut vessels in taking the risks of prosecuting their fishery in the vicinity of the rocks and shoals around Middleton Island.

Middleton Island and Cape St. Elias, Kayak Island.—The ship ran 25 miles on a N. by E. $\frac{1}{4}$ E. course and at 6.30 (Aug. 5) a trawl was set in 65 fathoms, latitude $59^{\circ} 44' 00''$ N., longitude $145^{\circ} 24' 00''$ W. The specimen of bottom brought up on the lead was black mud, but on the chance of there being rocky or sandy patches near, a set was made. Here, as at the previous station, near Middleton Island, the catch consisted of one black cod. In the immediate vicinity of this position several places marked on the chart indicate bottom where cod and halibut might at times be found, one 3 miles north and another 9 miles to the westward; but for the most part the ground lying between Cape Hinchinbrook, Kayak, and Middleton Islands offers little or no inducement to fishermen, being inhabited chiefly by sharks and other bottom scavengers.

Cape St. Elias.—This cape is situated on the southern end of Kayak Island. The island is 17 miles long by $1\frac{1}{2}$ miles wide and

extends in a northerly direction, the north end being separated from the mainland by a channel 1 mile wide, the water on the north side of the channel washing Okalee Spit, which marks the southern and eastern boundary of Controller Bay.

At 6 p. m., on August 6, a position was occupied in 60 fathoms of water, muddy bottom, Cape St. Elias bearing WSW., 25 miles distant, and Cape Suckling NW. by W. $\frac{1}{4}$ W., 14 miles. At this station very satisfactory results were obtained, 5 halibut being caught in a trawl lasting 1 hour and 30 minutes. The halibut were the largest yet taken during the investigation, averaging 100 pounds in weight and 53 inches in length.

Inasmuch as scattering halibut were found in this vicinity and the trial was made on muddy bottom, the result points to prolific ground close by, a probability confirmed by the quality and size of the fish.

The next trial in this vicinity was made 3 miles from Cape Suckling, which bore NW.; depth, 24 fathoms; character of the bottom, glacial mud. Two halibut and one skate were captured in this berth, the halibut weighing 8 pounds each.

Only scattering halibut might be expected on ground of this kind, but they are very good indication that there is a body of fish in the near vicinity. South of Cape Suckling some 20 miles the depth of water ranges from 180 to 225 fathoms, the bottom being composed of gray ooze; the bottom inside of the 100-fathom curve is made up largely of mud and silt, except in a few places 12 to 15 miles eastward of Cape St. Elias.

Icy Bay.—A distance of 28 miles in an E. $\frac{1}{4}$ N. direction from our last position a sounding was taken in 90 fathoms. Finding soft, muddy bottom we continued 2 miles farther on the same course and got 100 fathoms of water. All the soundings on the chart in this particular locality being marked mud and ooze, and it being considered therefore useless to make further investigation, the *Albatross* steamed 32 miles inshore and in the evening came to anchor in 29 fathoms of water, the western entrance of Icy Bay bearing NE. $\frac{1}{4}$ E., 10 miles distant, and 6 miles directly offshore. At 8.40 p. m. a trawl was set close to the ship and remained down over night, catching 2 cod and 1 skate. No great catch of desirable fish was expected in the immediate vicinity of the ship, but it was thought that a portion of the trawl might fall on patches of hard bottom.

Icy Bay to Point Manby.—The following day, August 7, the ship got under way at an early hour, and during the day gradually worked to the eastward along the coast over soft, muddy bottom, soundings being taken frequently. In the evening, at anchor off Point Manby, trawls were set in 21 fathoms of water, on hard sand and gravelly bottom, the only suitable place found during the day. A set lasting 1

hour and 45 minutes resulted in the capture of 5 halibut averaging 30 pounds, excellent in quality and uniform in size. One halibut was caught on a hand-line from the ship. The stomach of one contained the head of a partly-digested turbot; the other stomachs were empty.

Among fishermen the uniform size of halibut taken is regarded as favorable indication that a large body of fish is near. The fishermen on board were of this opinion, and the ground in this locality affords a good opportunity to put their theory to a test.

Early in the morning of August 8 the *Albatross* steamed offshore 2 miles, making frequent soundings and getting hard bottom. At 8.20 a. m. the anchor was dropped in 10 fathoms of water on the southern edge of a shoal spot $5\frac{1}{4}$ miles SE. by E. $\frac{1}{2}$ E. from Point Manby. The shoal is $3\frac{1}{4}$ miles long by $\frac{1}{2}$ mile wide, extending east and west. Situated between this shoal and Ocean Cape, which marks the southern entrance to Yakutat Bay, are several other shoals on which the water is less than 8 fathoms deep, the general character of the bottom being small rocks and pebbles.

A short trial on this spot of ground, near where the ship was anchored, resulted in 3 halibut, which averaged 67 pounds, and 4 dogfish. The largest halibut weighed 100 pounds. In the wake of the dory setting the trawl, salmon were jumping. Presumably, had the trawl remained set several hours on this ground, a much greater number of halibut would have been taken. When fishermen first began to search for halibut banks off Cape Scott, in Hecate Strait, Dixon Entrance, and other localities, it frequently happened that only a few halibut were captured in the first few trials on ground which subsequently proved to be very prolific.

Malaspina Glacier.—From this anchorage the ship steamed $8\frac{1}{2}$ miles in an easterly direction along the front of Malaspina Glacier, and at 11.03 a. m., on account of a dense fog, anchored $1\frac{1}{4}$ miles from the shore in 14 fathoms of water, just outside of the 10-fathom curve, sandy bottom. While waiting for the fog to clear a halibut trawl was baited and set near the ship, capturing 1 dogfish and 1 sculpin. The fog clearing revealed that we were anchored close to a glacial stream flowing through the moraine carrying a considerable quantity of mud, which discolored the water and was no doubt the cause of the scarcity of fish in this locality. There being no place of prominence along the front of the glacier by which to locate our position, bearings were taken on Ocean Cape, which bore E. $\frac{1}{2}$ N., 10 miles distant. In the afternoon the *Albatross* anchored off Yakutat village.

Disenchantment Bay.—The following morning, August 9, we steamed into Disenchantment Bay at slow speed. At the time there was considerable floating ice, which, combined with fog, made it

necessary to feel our way. Entering the bay as far as the ice would permit, the ship lay to and a halibut trawl was set close to Point Latouche parallel to the shore, one end of the trawl being in 30 fathoms and the other in 60 fathoms of water, bottom hard sand. Less than one-half mile from the shore the depth was 163 fathoms. The trawl remained down 1 hour and 30 minutes and captured 2 halibut and 7 dogfish. The halibut weighed 42 and 55 pounds, respectively, and were 42 and 47 inches in length.

Several Indians, engaged in hunting hair seals, came alongside, and they informed us that they caught halibut in all parts of the bay where the water was not too deep. The water varies greatly in depth, as was indicated by the sounding taken from the ship and also by the trawl line, the ends of which were about the same distance from the shore, but in depths with a difference of 30 fathoms. Fishing in this bay would have to be confined chiefly to localities near the shore. At times, moreover, it would be difficult to fish with trawls in this part of the bay on account of the large masses of floating ice, which break off from the face of Hubbard Glacier and are scattered by wind and current over the fishing ground. In the lower part of the bay and in all parts of Yakutat Bay it is said to be possible to fish at all seasons, weather permitting. In the evening the *Albatross* anchored off Yakutat village.

Yakutat.—The Indians of Yakutat have always done more or less fishing for halibut in Disenchantment and Yakutat Bays, where suitable depths and the right character of bottom are found; also on "spots" near Ocean Cape.

It is said that there are many "spots" of good halibut ground in this vicinity, which Indians locate by landmarks. Regular halibut fishermen would meet with little difficulty in locating the best ground, as a single dory would cover a much larger area than the entire number of canoes usually engaged in fishing. Indians ordinarily fish with a single wooden hook on well-known grounds which have always supplied their wants, and in consequence they have never considered it necessary to extend their knowledge regarding the abundance or scarcity of halibut beyond local "spots." A small fleet of halibut fishermen would soon discover the grounds known to the Indians and locate the best grounds lying between Ocean Cape and Icy Bay.

At the time of the salmon run halibut are frequently caught in Yakutat Harbor. This season it was reported that several, weighing 200 pounds each, were caught by cannery men from the cannery wharf, attracted by the offal from the salmon cannery. The taking of halibut in a harbor is no criterion that they are to be found in quantities on grounds near by; those captured in the manner described are generally stragglers.

Halibut are frequently caught around the islands near Sitka, yet fishermen who have investigated outlying grounds in that locality have always met with poor success.

Prior to 1904 a considerable body of herring annually visited Yakutat, their principal ground being in a lagoon just back of the village. Since that time few herring have appeared, and the fishery has become a total failure. The disappearance of the fish is attributed to the pollution of the ground in the lagoon where most of them were caught and dressed, no care being taken to keep the water free from offal.

Vessels fishing on grounds in this region would usually find it necessary to take with them a large amount of bait. In the spring, however, when herring strike along the coast from the Strait of Juan de Fuca to Yakutat, halibut fishermen could at times obtain herring for bait purposes at other places adjacent to Yakutat.

Ocean Cape and Icy Bay.—It is thought that the grounds within the above-mentioned limits have a sufficient commercial value to warrant one or two halibut steamers making extensive trials at a time when halibut are scarce in the vicinity of Cape Spencer, the most northern region in Pacific waters where the halibut fishery has been conducted. It frequently happens during the summer months that considerable cruising is done by the steamers in search of fish, and should a small portion of the fleet repair to this ground it is not unreasonable to suppose that fairly good results would attend the trials made. This area seems as much worthy of consideration as a number of small banks farther south, where extensive fishing has been carried on during the last 10 or 12 years and where, though at first few halibut were found, the grounds subsequently proved to be valuable.

South of Yakutat Bay.—On the morning of August 10 we left Yakutat and steamed down the coast from Ocean Cape 28 miles on a SE. by S. $\frac{1}{4}$ S. course and sounded, expecting to find rocky bottom, as indicated on the chart. Finding muddy bottom, six soundings were taken at intervals of 2 miles. At the last sounding, latitude $58^{\circ} 53' 00''$ N., longitude $139^{\circ} 47' 00''$ W., depth 85 fathoms, finding bottom less muddy than at the previous soundings and mixed with sand, a test of the ground was made. The trial lasted one hour, resulting in a catch of one dogfish. This position was 39 miles from Dry Bay.

For a distance of 90 miles south of Ocean Cape the character of the bottom, or at least that portion of it sounded over by the *Albatross*, is such as to preclude the possibility of its being a halibut ground. This is confirmed by the chart. There may be scattering patches of bottom where halibut exist, but it is doubtful whether in large quan-

tities. After this set the ship steamed at slow speed all night on a S. $\frac{3}{4}$ E. course, covering $49\frac{1}{2}$ miles.

On the following day, August 11, at 4.45 a. m., investigated the ground in 70 fathoms, rocky and sandy bottom, Lituya Bay 38 miles distant and bearing N. by E. $\frac{1}{2}$ E. An hour was given to the trial; and 7 halibut, 1 rockfish, and 1 cod constituted the catch. Only one of the halibut was brought on board. It weighed 115 pounds, and the others were estimated to range from 20 to 50 pounds in weight. The stomach of the individual brought on board contained a rockfish. On one of the trawl hooks was a piece of sponge and an ascidian.

A station was occupied $8\frac{1}{2}$ miles NE. $\frac{1}{2}$ E. from where the last set was made, in 53 fathoms, Lituya Bay bearing NE. $\frac{1}{2}$ N., 32 miles, the bottom composed of sand and pebbles. The catch was 2 halibut and 4 rockfish. The halibut were small, estimated 10 and 15 pounds. It is quite evident that halibut were quite numerous in this particular locality, as each of the individuals captured was "jigged," and the fish evidently did not care for salt bait, which was the only kind the *Albatross* carried.

Another indication that this is a good ground for halibut was the richness of the bottom, the hooks bringing up large quantities of pennatulids and sea anemones.

A few salmon were jumping near the ship and several whales were on the ground. The banks lie from 15 to 25 miles offshore from the Fairweather Range, have suitable depths of water, and cover a large area; and it is thought that should halibut fishermen carefully investigate the ground in this latitude they would be well rewarded.

Our next trial was $2\frac{3}{4}$ miles from Harbor Point, Lituya Bay, situated on the south side of the bay, bearing NE. $\frac{1}{2}$ N. In a depth of 40 fathoms, on bottom composed of sand and gravel, a trial of one hour resulted in 6 halibut, 4 skates, and 2 dogfish. The halibut were estimated to weigh about 10 pounds each. It is evident that at this season there are few fish on the inshore grounds. The bottom is also less attractive than it is offshore, very little marine growth being taken on the trawl.

The last trial in this region was made on the morning of August 12 in 77 fathoms of water $8\frac{1}{2}$ miles S. $\frac{3}{4}$ W. from Cape Cross, Yacobi Island. The bottom being rocky, it was difficult to haul the trawl, and 2 halibut, their combined weight 54 pounds, 10 rockfish, and 8 dogfish was the catch. At the proper season halibut are likely to be found in more paying quantities. As this ground no doubt has frequently been visited by vessels fishing in the vicinity of Cross Sound, it is probable that the banks and "spots" within a radius of 25 miles or more are well known to fishermen.

In the evening of August 12 the *Albatross* arrived at Sitka and preparations were made for coaling ship. Scattering halibut are caught near Sitka at all seasons, but no banks of commercial importance have been reported or found in the near vicinity. Indians usually catch all that they require for home consumption among the islands of Sitka Bay, but the amount is not large.

In the evening of August 20 we left Sitka and the following morning began a line of soundings off Coronation Island, toward Forester Island, for the purpose of ascertaining the depth of water and character of the bottom, where it had been reported that the water was comparatively shallow, and also to mark the outer margin of fishing banks in this region.

The first sounding was in latitude $55^{\circ} 57' 30''$ N., longitude $135^{\circ} 27' 00''$ W. In this position no bottom was found at 250 fathoms, and the vessel steamed 5 miles in an E. by S. $\frac{3}{4}$ S. direction and sounded in 134 fathoms. Four other soundings were taken on this line 3 miles apart, the depths varying from 103 to 110 fathoms. After this soundings were taken 6, 10, 14, and 11 miles apart, covering a distance of 41 miles, and in depths of 116, 138, 110, and 116 fathoms. The general character of the bottom was hard sand. From 4 to 6 miles farther offshore it drops off into profound depths, 400 and 600 fathoms. We were on the western edge of the bank. Between this ridge and Baranof Island and the outlying islands is assumed to be good halibut ground. The depths range from 50 to 85 fathoms.

No attempt was made to make a practical test of ground covered by the line of soundings, the depths of water and general character of the bottom being considered sufficient knowledge concerning this region, lying as it does in close proximity to the banks, where fishing is extensively carried on. Fishermen in possession of the above information will have no difficulty in determining for themselves the value of the ground.

Coronation Island ground.—One of the first localities investigated between Dixon Entrance and Sitka Bay was around Coronation Island, where in several places known to fishermen large catches have been taken in the last two years. A considerable body of fish has also been located about 40 miles south of Cape Ommaney, situated on the southern end of Baranof Island at the entrance of Christian Sound. Fishermen have made little or no attempt to locate fishing grounds offshore from Coronation Island. A location is generally exhausted, or at least greatly depleted of fish, before the possibility of new banks in the same region is seriously considered.

It is only when fish are scarce on the inshore grounds that attempts have been made to find new places, and it was in this way that the

grounds mentioned were discovered, Forester Island being one where a portion of the fleet has met with success in the last two years.

Soundings off the west coast of Queen Charlotte Islands.—On the morning of August 22 we sounded in 1,368 fathoms of water, 60 miles from the previous sounding taken, 38 miles SSW. $\frac{1}{4}$ W. from the Kerourat Islands, latitude $51^{\circ} 29' 00''$ N., longitude $131^{\circ} 48' 00''$ W. The Kerourat Islands extend offshore from Cape St. James, the southern end of the Queen Charlotte Islands.

In the position of this sounding fishermen had reported shoal water. The chart soundings in this locality ranged from 800 to 1,500 fathoms and, with the sounding taken by the *Albatross*, preclude the possibility of there being shoal water in this region.

Shoal water is confined near the west coast of the Queen Charlotte Islands, and halibut have been found there, but in no great quantities any considerable distance from the shore. It is reported that the west side of the island offers little inducement to halibut fishermen. Many vessels have made an investigation of the inshore grounds, but with little or no success.

From the foregoing it is to be assumed that no fishing banks of importance exist off the coast of the Queen Charlotte Islands south from Dixon Entrance to the latitude of the Cape Scott ground, a distance of over 200 miles. From Dixon Entrance northward, however, farther offshore than has been found necessary to fish, vessels will find suitable ground. It was not possible for the *Albatross* to make an extensive survey of these grounds in one season. By noting the positions given and referring to the accompanying charts it will be found that enough information is available to render it comparatively easy for fishermen to develop the banks.

Cape Scott ground.—On the morning of August 24 several trials were made in the vicinity of Cape Scott, the first in 52 fathoms on rocky bottom, the south end of Cox Island bearing NW. $\frac{3}{4}$ N., $3\frac{3}{4}$ miles distant. At the expiration of one hour the trawl was hauled and 3 halibut were taken, their average weight 82 pounds. The largest taken weighed 150 pounds. One small ratfish was also caught.

Very little fishing for halibut has been done off the south side of Cox, Triangle, and Haycock Islands, it being stated that halibut have never been found in such numbers as to warrant a second trial. It also has been said that halibut have never been taken directly south of these islands and Scott Channel. Such, however, seems not to be the case, as scattering individuals have been taken on this ground by the fishermen on board in the last two years.

A trial off the north end of Scott Channel in 28 fathoms of water, the east end of Cox Island bearing SW. by W. $\frac{1}{8}$ W., $5\frac{1}{2}$ miles, resulted in 2 average-sized halibut. This is a favorite "spot" for

halibut, and in the spring and early summer a considerable fleet of vessels resort to it, catching large fares. No fishing vessels of any description were on the bank at the time, and neither had we observed any off the coast of Baranof and Prince of Wales Islands. It was subsequently learned that many vessels of the fleet had suspended operations for a time, owing to the scarcity of bait.

The bank has an area of about 850 square miles and extends from Cape Scott, Vancouver Island, westward along the northern side of Cox, Lanz, Haycock, and Triangle Islands, in places from 5 to 12 miles offshore in a northerly direction and some 15 miles in a north-westerly direction beyond Triangle Island, the most western island of the group. Fishermen assert that in proportion to its size this bank has furnished as many if not more fish than any other bank off the Pacific coast. In recent years, however, owing to the extensive fishing which had been carried on, there has been an appreciable decrease in the supply. This, like all halibut grounds which have been overfished, requires "rest," and it is very probable that in a few years, should a portion of the fleet seek more northern and western waters, which is likely to be the case, the bank will be restocked by natural process. Several banks of the Atlantic which had become nearly depleted of halibut through excessive fishing and abandoned for a number of years, were found on return to them to be quite as prolific as formerly, though they in course of time relapsed into their previous condition.

In the early history of the halibut fishery on the Pacific coast, the grounds lying off Cape Scott, on the northern end of Vancouver Island, were among the first resorted to, the fishermen having been told of these grounds by the Indians living at Fort Rupert, a small village situated on the east side of the island and not far from Cape Scott. At that time few vessels were engaged in the industry, and they confined their operations to inshore grounds, not finding it necessary to investigate small patches farther out. In consequence, the fishermen possessed no positive knowledge of the extent of the bank and when the spots of ground known to them became exhausted it was naturally supposed that no others existed on that part of the coast. This was in 1895. As the fishery increased in importance larger vessels were employed and several steamers were introduced, doing more or less cruising and making practical tests on grounds not previously fished, with the result of doubling the previous size of the Cape Scott ground and for a number of years yielding exceptionally large fares.

This condition also prevailed in the vicinity of Dixon Entrance and farther north on the west coast of Prince of Wales Island, where it was thought that a small fleet, by constant fishing, would soon tem-

porarily exhaust the ground. It is true that in the region mentioned no large bank has been discovered between Cape Muzon and Christian Sound, but since the introduction of steamers and larger sailing vessels a much greater area has been developed, which has furnished the market with several million pounds of halibut. In the last few years, however, these prolific grounds have shown signs of temporary depletion which has caused a more diligent search farther offshore.

Icy Strait.—This strait, which comes in the same category, was first visited for halibut about 15 years ago. The fishery was started on a small scale with a cannery steamer after the salmon season had closed, and the catch was shipped to market by the regular line of steamers plying between southeast Alaska and Puget Sound ports. Several shipments were made during the winter, and as the work proved remunerative the captain of the steamer continued in the fishery the following winter. Soon several other steamers were added to the winter fleet, and also a number of small sailing vessels. As the demand for halibut increased and it became known that large numbers of the fish inhabited this and adjacent regions the fishery, instead of being conducted only in the winter months, was extended to cover all seasons when the fish were obtainable.

Fishing was wholly confined to Icy Strait and small bays and inlets among the islands bordering the strait. It is only in recent years that vessels have sought waters any considerable distance west from the mouth of the strait in the vicinity of Cape Spencer.

As stated elsewhere, this ground lies comparatively near the southern part of what might be termed the Fairweather Bank, which extends northward about 60 miles in the latitude of Dry Bay.

Sydney Inlet, Vancouver Island.—On the morning of August 25 a sounding was taken 25 miles S. $\frac{1}{2}$ E. from Esteban Point, getting no bottom at 250 fathoms and demonstrating that in the immediate vicinity of this position the water is too deep for commercial fishing. Another sounding was then taken 22 miles from the light, which bore N. $\frac{3}{4}$ W. While the depth of water found was not too deep for operating halibut trawls, the character of the bottom did not indicate ground such as halibut frequent.

At 8 a. m., having got 80 fathoms and finding the bottom composed of mud and sand mixed, a skate of trawl was set, Esteban Point bearing NW. by N. $\frac{3}{4}$ N. 18 miles. A trial lasting one hour afforded 3 black cod and 1 red rockfish. Fishermen in this locality are largely guided to the best fishing grounds by landmarks. A distance of one-half mile and sometimes a less distance off the proper mark will often put them on barren ground.

The soundings taken and the trial made in this locality were for the purpose of ascertaining the character of the bottom and depth of water on the edge of the bank offshore from the positions where fish are usually caught. Judging from the depth and character of bottom found, it would seem that fishermen have thoroughly covered the ground and already possess the necessary knowledge of this part of the coast for all practical purposes connected with the fishery.

A considerable fleet of small craft, which harbor in Sydney Inlet during stormy weather, fish on this ground and Flattery Bank in spring and continue until the scarcity of halibut makes it no longer profitable, after which they repair to more northern localities.

Flattery Bank.—Continuing southward along the coast a short set was made with 2 skates on muddy and sandy bottom in 76 fathoms 30 miles from Amphitrite Light, which bore NE. by E. $\frac{3}{4}$ E., where 1 red rockfish and 4 dogfish were caught. Notwithstanding the short time the trawls remained down, it was sufficiently long to demonstrate what sort of a catch might be expected. Earlier in the season this ground affords good fishing.

From this position the ship proceeded 2 miles on a S. by E. $\frac{1}{4}$ E. course and found 86 fathoms, muddy bottom. Ran 2 miles farther on the same course and got 92 fathoms. Close to this sounding the chart shows a depth of 225 fathoms, and a distance of 2 miles on the same line brought us into a depth of 150 fathoms, all of which indicated that we were on the outer edge of the bank.

A distance of 8 miles in an ENE. direction brought us into a depth of 60 fathoms, $32\frac{1}{2}$ miles from Cape Beal, on the southwest end of Vancouver Island, which bore NE. Here a trawl was set which remained down one hour, taking 4 black cod, 3 rockfish, and 2 skates. As at the previous station, the bottom consisted of hard mud and sand.

Steaming back on the course 2 miles, a trawl was set in 63 fathoms, bottom hard and rocky. From this position Cape Beal bore NE., $34\frac{1}{2}$ miles distant. In a trial which lasted one hour, 5 rockfish, 1 black cod, and 1 ground shark were caught. The trawl was found to be "hung up" on the rocks, causing the loss of an anchor and about half of the ground line. To many of the remaining hooks were attached basket starfish, an indication of good ground.

In the previous trials farther north earlier in the day there was an absence of the bottom life such as is known to attract halibut.

Flattery Bank has been resorted to for halibut since 1888, during which time it is very probable that each year a large portion of the ground within the 100-fathom curve has been fished on, and the best grounds contained within that area located by landmarks.

A bank lying so near the coast, and with several harbors within comparatively easy reach, seems to require no special investigation more than what can easily be performed by fishing vessels. Vessels setting trawls at random and making "flying sets" on various parts of the bank to test the ground in some particular locality will naturally at some time discover any "spot" of good ground not already known.

The chance of finding prolific fishing grounds beyond a depth of 100 fathoms or more is not great, although it is reported by some and supposed by others that small isolated banks exist outside of the plateau which forms Flattery Bank and adjoining ground on the north. This theory no doubt is based on reports circulated by fishermen and others who have noticed patches of discolored water, it being taken for granted that here were banks because the water had the appearance of being shallow. To prove or disprove the truthfulness of these reports would require considerable time, especially as no definite positions are given.

No further trials were made, and in the evening of August 25 we left the bank and steamed up the Straits of Juan de Fuca and proceeded to Comox, British Columbia, where the *Albatross* remained three days taking in coal.

On the morning of the 29th Capt. Joyce and the four fishermen were landed at Seattle. On the morning of September 2 the ship anchored off Sausalito, San Francisco Bay.

HALIBUT INVESTIGATIONS, FISHERIES STEAMER "ALBATROSS," SUMMER OF 1911.

Position.	Date (1911).	Depth.	Character of bottom.	Temperature.		Number of trawls.	Time.		Bait.	Halibut taken.	Average size.	Average weight.	Remarks.
				Air.	Surf.		Set.	Hauled.					
SOUTHEAST ALASKA.													
Vicinity of Killisnoo: Table Island, N. 84° E.; left tangent Killisnoo Island N. by E.	June 2	75	Rocky.....	46	44	2	7.30 p. m.	5.00 a. m. (June 3).	Salt herring...				34 black cod, 8 rockfish, 7 turbot, 10 ground sharks.
PORTLOCK BANK.													
Eastern edge: 58° 20' 00" N., 150° 30' 00" W.	June 5	38	Hard sand, fine gravel.	44	42	2	1.53 p. m.	3.13 p. m.	Salt herring...	28	29½	16	40 cod. During the trial 54 cod were taken from the ship with 4 handlines. Size 18 to 36 inches.
KODIAK ISLAND.													
Halibut Bay.....	June 6	15											50 cod caught in 1 hour from the ship with 4 handlines.
CHIGNIK BAY.													
Anchorage Bay, Chignik Harbor..	June 9	26											25 cod and 1 small turbot caught during trial of 2 hours with 4 handlines.
Do.....	do.....	26		43	42	1	3.30 p. m.	4.30 p. m.	Salt herring...				11 cod, 1 turbot, 1 sculpin.
Off mouth of Chignik Harbor.....	June 10	26	Sand, mud.							3			23 small cod, 3 small halibut, 1 turbot; 2 handlines.
Do.....	June 11	28											74 cod, 1 turbot, 6 sculpins; 2 handlines.
Do.....	June 12	28								1	27½	8	59 cod; 2 handlines.
Do.....	June 18	25	Sand, rocky.							17	31	17	84 cod; 2 handlines; 5 hours.
Do.....	do.....	25	do.....	59	46	1	9.00 a. m.	2.00 p. m.	Salt herring...	2	26½	11½	45 cod; 2 handlines.
Do.....	do.....	25	do.....										

VICINITY OF AKUTAN PASS.													
Off mouth of Akun Bay, Akun Island.	June 28	41-74	Finegraysand	43	40	4	9.35 a. m..	10.55 a. m.	Salt herring...	5	28	10	115 cod.
Lost Harbor, Akun Island.....	do.....	20	Rocky.....	45	41	1	3.00 p. m..	4.00 p. m..	do.....	2	25	6	10 cod.
Akutan Harbor, Akutan Island.....	do.....	27	do.....	45	43	1	5.15 p. m..	6.45 p. m..	do.....	1	21	4	12 cod.
Off North Head, Akutan Island...	June 29	26	do.....	45	43	1	7.00 a. m..	8.00 a. m..	do.....	1	23	5	38 cod, 3 skates, 2 sculpins.
				47	41	1	8.18 a. m..	9.18 a. m..	do.....				
SLIME BANK, BERING SEA.													
Cape Lapin, SE., distance 16 miles.	July 6	43	Black gravel..	44	44	2	7.00 a. m..	7.40 a. m..	Salt herring...				54 cod, 1 turbot, 1 skate, 1 crab.
Cape Sarichef, distance 22 miles, 54° 53' 00" N., 165° 20' 00" W.	do.....	54	Sand, gravel..	44	42	1	4.00 p. m..	4.45 p. m..	do.....				6 cod.
DAVIDSON BANK.													
Southeast end of Tigalda Island, bearing N., distance 3 miles, 53° 45' 00" N., 164° 30' 00" W.	July 7	42	Gray sand....	42	42	1	7.00 a. m..	7.40 a. m..	Salt herring...				11 cod, 1 flounder, 1 sculpin.
	do.....	62	Finegraysand	44	44	1	12.45 p. m.	1.45 p. m..	do.....				12 cod.
SANNAK BANK.													
Seal Rock, bearing W. by N. ½ N., 54° 13' 00" N., 162° 10' 00" W.	July 8	50	Pebbles, rock.	43	43	1	8.00 a. m..	9.00 a. m..	Salt herring...	3	30	10	28 cod, 1 red rock-fish, 1 octopus.
	do.....	43	do.....	43	43	1	8.10 a. m..	8.40 a. m..	do.....				63 cod, 2 octopi.
Lookout Point, Canton Island, bearing NW. ¼ N., distance 16 miles, 54° 08' 00" N., 162° 11' 20" W.	do.....	64	Rocky.....	44	44	1	11.50 a. m.	12.50 p. m.	do.....	2	26	8	
	do.....	45	Very rocky....	44	44	1	12.10 p. m.	1.10 p. m..	Salt herring, fresh octopus.				In trying to get up anchor buoy line chafed off on a rock.
Pinnacle Rock, bearing NW. ¼ W., distance 17 miles, 54° 31' 00" N., 161° 33' 00" W.	do.....	47	Rocky.....	46	42	1	6.04 p. m..	7.34 p. m..	Salt herring...	2	26½	7½	8 cod, 9 sculpins.
SHUMAGIN BANK.													
Mountain Cape, Nagai Island, bearing ENE., distance 16 miles, 54° 53' 00" N., 160° 38' 30" W.	July 9	40	Sand, pebbles.	50	44	1	1.00 p. m..	2.00 p. m..	Salt herring...	1	20½	3	3 cod, 2 sculpins.
	do.....	80	Sand, gravel...	49	44	1	6.05 p. m..	7.05 p. m..	do.....	3	29	10	16 cod, 1 turbot.
Simonof Island, bearing WSW., distance 21 miles, 54° 55' 00" N., 158° 34' 00" W.	July 10	90	Mud, sand.....	48	46	1	7.00 a. m..	8.20 a. m..	do.....				4 cod, 1 skate.

HALIBUT INVESTIGATIONS, FISHERIES STEAMER "ALBATROSS," SUMMER OF 1911—Continued.

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HALIBUT FISHING GROUNDS OF THE PACIFIC COAST.

Position.	Date (1911).	Depth.	Character of bottom.	Temperature.		Number of trawls.	Time.		Bait.	Halibut taken.	Average size.	Average weight.	Remarks.
				Air.	Surf.		Set.	Hauled.			Inches.	Pounds.	
SHUMAGEN BANK—continued.		<i>Fath.</i>		<i>° F.</i>	<i>° F.</i>						<i>Inches.</i>	<i>Pounds.</i>	
Simeonof Island, bearing WSW., distance 40 miles, 54° 53' 00" N., 157° 48' 00" W.	July 10..	48	Rocky.....	54	44	1	12.30 p. m.	2.00 p. m..	Salt herring...	8	34½	18	39 cod.
2 miles SSE. from position of 1st dory.	...do.....	48	.....do.....	54	44	1	12.45 p. m.	1.05 p. m..	.....do.....	3	25	7	27 cod.
2 miles SSE. from position of 2d dory.	...do.....	52	Gray sand.....	54	44	1	12.58 p. m.	2.28 p. m..	.....do.....				17 cod.
3 miles SSE. from position of 3d dory 54° 59' 30" N., 157° 43' 00" W.	...do.....	70	Fine sand.....	54	44	1	1.22 p. m..	3.02 p. m..	.....do.....				14 cod.
	...do.....	42	Gravel, rocks..	56	46	1	4.57 p. m..	6.30 p. m..	Salt herring, fresh halibut.	8	33	20½	31 cod, 7 sculpins, 1 starfish.
55° 01' 30" N., 157° 43' 00" W.	...do.....	42	.....do.....	49	46	1	5.20 p. m..	6.45 p. m..	Salt herring...	6	30	11	15 cod.
OFF SEMIDI ISLANDS.													
Lighthouse Rock, bearing WNW. ¼ W., distance 7 miles.	July 11	48	Rocky.....	47	44	1	6.15 a. m.	7.15 a. m.	.....do.....	1	25	6	4 cod.
Lighthouse Rock, bearing W. ¼ S., distance 10 miles.	...do....	48	Small rocks, sand.	48	44	1	8.05 a. m.	8.35 a. m.	.....do.....	4	23	5	21 cod.
2 miles from 1st dory, NE. ¼ N.	...do....	49	Rocky.....	48	46	1	8.20 a. m.	10.00 a. m.	.....do.....	5	26½	9	10 cod.
2 miles from 2d dory, NE. ¼ N.	...do....	50	Small pebbles, sand.	48	46	1	8.45 a. m.	10.30 a. m.	.....do.....	7	28	9½	12 cod.
3 miles from 3d dory, NE. ¼ N.	...do....	53	Small rocks...	48	45	1	9.20 a. m.	11.10 a. m.	.....do.....	7	20	10	9 cod.
Chowiet Island, bearing NW. ¼ W., distance 6½ miles.	...do....	100	Sand.....	48	44	1	1.15 p. m.	2.40 p. m.	Salt herring, fresh cod.				26 cod, 2 skates, 1 basket starfish.
CHIRIKOF ISLAND.													
North end Chirikof Island, bearing E., distance 11 miles.	July 11	40	Dead shells...	46	45	1	6.50 p. m.	8.10 p. m.	Salt herring, fresh cod.	2	28	10½	8 cod, 1 skate.
WESTERN ENTRANCE SHELKOF STRAIT.													
Cape Ikulik, bearing N. by W., distance 6 miles.	July 12	58	Shells, rocks, black mud.	47	45	1	7.00 a. m.	8.40 a. m.	Salt herring, fresh cod	7	26	8	16 cod, 16 skates, 2 turbot.
Low Cape, bearing E. by N., distance 8 miles.	...do....	34	Rocky.....	52	48	1	12.35 p. m.	1.35 p. m.	.....do.....	13	20½	11½	9 cod, 1 skate, 4 sculpins, 1 octopus.

1 mile from 1st dory, S. by E. $\frac{1}{2}$ E.	do.	52	48	1	12.50 p. m.	1.50 p. m.	do.	8	29	14	13 cod, 1 sculpin.
Cape Alitak, bearing N.E. by N., distance 10 miles.	do.	27	49	1	4.55 p. m.	6.10 p. m.	do.	4	26 $\frac{1}{2}$	8 $\frac{1}{2}$	11 cod, 1 turbot, 2 skates.
2d dory, $\frac{1}{2}$ mile E. by N. $\frac{1}{2}$ N.	do.	40	49	1	5.02 p. m.	6.32 p. m.	Salt herring...	3	28	10 $\frac{1}{2}$	3 skates, 1 turbot.
ALBATROSS BANK.											
56° 21' 00" N., 153° 15' 00" W.	July 13	18	46	1	4.50 a. m.	5.50 a. m.	Salt herring, fresh octopus.				6 cod; lost all ground line except a short piece.
56° 36' 00" N., 152° 56' 00" W.	do.	44	48	1	10.15 a. m.	11.35 a. m.	Salt herring...	4	23 $\frac{1}{2}$	5 $\frac{1}{2}$	28 cod, 1 skate, 1 sculpin.
57° 00' 00" N., 152° 21' 00" W.	do.	45	48	1	6.40 p. m.	8.10 p. m.	do.	2	30	15	17 cod, 2 skates.
PORTLOCK BANK.											
57° 31' 00" N., 151° 11' 00" W.	July 14	42	47	1	5.00 a. m.	6.00 a. m.	Salt herring...	2	26 $\frac{1}{2}$	8	19 cod, 1 sculpin.
57° 46' 00" N., 151° 27' 00" W.	do.	34	44	1	10.10 a. m.	11.30 a. m.	do.	3	25 $\frac{1}{2}$	6 $\frac{1}{2}$	13 cod, 1 sculpin, 1 skate.
Cape Chiniak, bearing SW. $\frac{1}{4}$ W., distance 12 miles.	July 17	54	48	1	12.45 p. m.	2.15 p. m.	do.	9	28 $\frac{1}{2}$	9 $\frac{1}{2}$	11 cod, 5 turbot.
Ugak Island, bearing SW. $\frac{1}{2}$ S., distance 10 miles.	do.	40	48	1	6.05 p. m.	7.20 p. m.	do.	7	24	5 $\frac{1}{2}$	7 cod, 7 sculpin, 1 skate.
1 mile SW. by W. from 1st dory.	do.	38	48	1	6.30 p. m.	8.10 p. m.	do.	3	27	8 $\frac{1}{2}$	8 cod, 2 sculpin, 1 skate, 1 octopus.
57° 12' 30" N., 151° 12' 00" W.	July 18	72	49	1	4.50 a. m.	6.00 a. m.	do.				9 cod, 1 black cod, 1 Attu mackerel.
57° 27' 00" N., 150° 40' 00" W.	do.	62	51	1	1.45 p. m.	3.25 p. m.	Salt herring, fresh cod.	3	38 $\frac{1}{2}$	9 $\frac{1}{2}$	33 cod, 1 skate.
57° 42' 00" N., 150° 42' 00" W.	do.	55	50	1	5.50 p. m.	6.35 p. m.	do.	5	30	13	32 cod.
Marmot Cape, bearing W., distance 5 miles.	July 19	55	48	1	6.27 a. m.	7.47 a. m.	Fresh cod.				2 cod, 2 skates.
Izhut Bay, Afognak Island; Pillar Cape, bearing N.E. $\frac{1}{2}$ E., distance 5 miles.	do.	30	51	1	11.10 a. m.	12.40 p. m.	Fresh cod, salt herring.	3	33	21	41 cod, 1 rockfish, 5 sculpins.
Off Narrow Strait, Afognak Island; South Point Spruce Island, bearing W. $\frac{1}{2}$ S., distance 3.8 miles.	do.	20	51	1	3.00 p. m.	4.20 p. m.	Salt herring...	1	28	9	11 cod, 8 sculpins.
WESTERN EDGE PORTLOCK BANK.											
58° 06' 30" N., 151° 00' 00" W.	July 20	65	48	1	5.00 a. m.	5.45 a. m.	Salt herring...	1	33	15	11 cod.
58° 03' 00" N., 150° 32' 00" W.	do.	50	49	1	11.55 a. m.	12.55 p. m.	do.	8	33	13 $\frac{1}{2}$	13 cod, 2 rockfish, 1 octopus.
58° 16' 00" N., 150° 20' 00" W.	do.	48	51	1	4.18 p. m.	5.23 p. m.	do.	6	32	22	14 cod, 2 skates.
1 $\frac{1}{2}$ miles N. by W. from 1st dory.	do.	52	51	1	4.30 p. m.	5.50 p. m.	do.	7	33	18	16 cod, 2 skates.
South end of Cheval Island, near beach.	July 24	50	57	1	9.45 a. m.	11.05 a. m.	do.	3	21	4	7 cod, 2 turbot.
South side of Seal Rocks; Aialik.	do.	57	58	1	2.35 p. m.	3.35 p. m.	do.	1	27	9	1 skate.
Mouth of Dick Bay.	July 27	15	50	1	9.30 a. m.	10.30 a. m.	do.	1	56	85	2 starfish, 15 cod caught with hand lines from ship.

HALIBUT INVESTIGATIONS, FISHERIES STEAMER "ALBATROSS," SUMMER OF 1911—Continued.

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Position.	Date (1911).	Depth.	Character of bottom.	Tempera- ture.		Number of trawls.	Time.		Bait.	Halibut taken.	Aver- age size.	Average weight.	Remarks.
				Air.	Surf.		Set.	Hauled.					
WESTERN EDGE PORTLOCK BANK continued.													
East Chugach Island, bearing W. ¼ S., distance 7 miles.	July 27	<i>Fath.</i> 49	Rocky	° F. 51	° F. 50	1	3.15 p. m.	4.35 p. m.	Salt herring...	15	<i>Inches.</i> 30½	<i>Pounds.</i> 12½	9 cod.
Pearl Island, bearing NW., dis- tance 6 miles.	...do....	66	...do.....	50	50	1	7.00 p. m.	8.00 p. m.	...do.....	2	30½	13	Lost 6 lines of trawl.
PORTLOCK BANK.													
58° 36' 00" N., 150° 58' 30" W.....	July 28	43	Rocky	49	50	1	6.12 a. m.	6.47 a. m.	Fresh halibut.	4	33½	13½	5 cod, 1 hermit crab, 1 large and many small anemones.
58° 28' 00" N., 150° 29' 00" W.....	...do....	36	...do.....	49	48	1	11.00 a. m.	12.30 a. m.	Salt herring...				8 cod; lost buoy lines, half skate, and anchor.
58° 18' 00" N., 149° 46' 00" W.....	...do....	42	...do.....	49	46	1	4.20 p. m.	5.20 p. m.	...do.....	6	31½	16½	17 cod, 2 rockfish.
58° 32' 00" N., 148° 59' 00" W.....	July 29	69	Rocky, shells.	52	55	1	7.20 p. m.	8.20 p. m.	...do.....				Lost all but two hooks.
MOUTH OF PRINCE WILLIAM SOUND.													
Cap's Clear, bearing N. ¼ W., dis- tance 3 miles.	July 30	28	Rocky.....	54	55	1	7.30 a. m.	8.45 a. m.	Salt herring...	5	43	37	7 rockfish, average 16 pounds, 2 es- caped; 1 halibut, 36 pounds, 41 inches. Caught from ship with hand lines.
Danger Island, bearing N. ¼ W., distance 3½ miles.	...do....	41	Blue clay.....	55	55	1	1.10 p. m.	2.30 p. m.	...do.....	13		≈ 10	Not brought in.
Mouth MacLeod Harbor, Mon- tague Island.	...do....	20-24	Rocky.....	58	53	1	4.30 p. m.	5.30 a. m. (July 31)	...do.....	10		30	2 largest 85.59 pounds, 6 skates, 1 dogfish, 1 ground shark; 1 halibut eaten up all but head.

HALIBUT FISHING GROUNDS OF THE PACIFIC COAST.

Little Smith Island, bearing NW. $\frac{1}{2}$ W., distance $1\frac{1}{2}$ miles, and east end Smith Island, bearing NE. by N. $\frac{1}{2}$ N., distance $3\frac{1}{2}$ miles.	Aug. 1	48	Mud.....	62	58	1	12.00 m...	1.20 p. m.	do.....								2 turbot.	
Mouth Zalkof Bay.....	do.....	39	Rocky.....	63	56	1	4.15 p. m.	8.15 a. m. (Aug. 2.)	Fresh salmon	5		a 40					1 halibut 140 pounds, 9 skates, 3 sharks, 1 cod, 1 ground shark, 1 turbot, 1 dogfish. Small.	
Cape Hinchinbrook, bearing SW. by W., distance $8\frac{1}{2}$ miles.	Aug. 2	33	Mud.....	55	59	1	1.00 p. m.	2.20 p. m.	do.....								1 turbot, 1 dogfish.	
$59^{\circ} 56' 20''$ N., $146^{\circ} 28' 30''$ W.....	do.....	38	Rocky.....	60	56	1	6.00 p. m.	7.25 p. m.	do.....	1							Nothing.	
$59^{\circ} 56' 00''$ N., $146^{\circ} 28' 45''$ W.....	Aug. 3	49	Rocky, mud...	57	56	1	10.00 a. m.	11.00 a. m.	Salt herring...									
MIDDLETON ISLAND.																		
South end of Middleton Island, bearing E. by S. $\frac{1}{2}$ S., distance 6 miles.	Aug. 3	25	Broken shells..	55	55	1	2.30 p. m.	3.15 p. m.	Salt herring..									Nothing.
$59^{\circ} 18' 00''$ N., $148^{\circ} 03' 00''$ W.....	Aug. 4	70	Rocky.....	53	54	1	9.40 a. m.	11.05 a. m.	do.....									14 cod.
$59^{\circ} 13' 20''$ N., $148^{\circ} 38' 30''$ W.....	do.....	67	Rocky, mud...	55	55	1	5.13 p. m.	6.38 p. m.	do.....	2	34	11						
Southwest end of Middleton Island, bearing N. by W., distance $4\frac{1}{2}$ miles.	Aug. 5	50	Rocks, shells..	53	54	1	8.30 a. m.	9.30 a. m.	do.....	4	36	19 $\frac{1}{2}$						
North end of Middleton Island, bearing W. $\frac{1}{2}$ S., distance 8 miles.	do.....	84	Blue mud....	54	56	1	1.40 p. m.	2.40 p. m.	do.....									1 small cod.
$59^{\circ} 44' 00''$ N., $145^{\circ} 24' 00''$ W.....	do.....	65	Black mud....	55	55	1	6.30 p. m.	7.50 p. m.	do.....									1 black cod.
CAPE ST. ELIAS.																		
Cape St. Elias, bearing WSW., distance 25 miles, and Cape Suckling, bearing NW. by W. $\frac{1}{2}$ W., distance 14 miles.	Aug. 6	60	Blue mud....	55	56	1	6.00 a. m.	7.30 a. m.	Salt herring...	5	53	100						
Cape Suckling, bearing NW., distance 3 miles.	do.....	24	Glacial mud...	56	56	1	9.12 a. m.	9.57 a. m.	do.....	2		8						1 skate.
Icy Bay, bearing NE. $\frac{1}{2}$ E., distance 10 miles.	do.....	29	Mud.....	57	57	1	8.40 p. m.	6.10 a. m. (Aug. 7.)	do.....									2 cod, 1 skate, 1 shark.
Point Manby, bearing N. by W. $\frac{1}{2}$ W., distance $3\frac{1}{2}$ miles.	Aug. 7	21	Hard sand, gravel.	52	48	1	6.50 p. m.	8.35 p. m.	do.....	5	39	30						1 halibut caught from deck.
Point Manby, bearing NW. by W. $\frac{1}{2}$ W., distance $5\frac{1}{2}$ miles.	Aug. 8	10	Rocks, pebbles.	47	47	1	8.20 a. m.	9.05 a. m.	do.....	3	49	67						4 dogfish.
Ocean Cape, bearing E. $\frac{1}{2}$ N., distance 10 $\frac{1}{2}$ miles.	do.....	14	Sand.....	54	46	1	12.00 m...	1.00 p. m.	do.....									1 dogfish, 1 sculpin.
Disenchantment Bay, Point Latouche, bearing S. by E., distance $1\frac{1}{2}$ miles.	Aug. 9	30-60	Hard sand....	57	56	1	12.00 m...	1.30 p. m.	do.....	2	44 $\frac{1}{2}$	48 $\frac{1}{2}$						

a Approximate.

HALIBUT INVESTIGATIONS, FISHERIES STEAMER "ALBATROSS," SUMMER OF 1911—Continued.

Position.	Date (1911).	Depth.	Character of bottom.	Temperature.		Number of trawls.	Time.		Bait.	Halibut taken.	Average size.	Average weight.	Remarks.
				Air.	Surf.		Set.	Hauled.					
SOUTH OF YAKUTAT BAY.													
		<i>Fath.</i>		° F.	° F.						<i>Inches.</i>	<i>Pounds.</i>	
58° 53' 00" N., 139° 47' 00" W.....	Aug. 10	85	Sand, mud....	56	58	1	4.00 p. m..	5.00 p. m..	Salt herring...				1 small dogfish.
Lituya Bay, bearing N. by E. $\frac{1}{2}$ E., distance 38 miles.	Aug. 11	70	Rocks, sand...	56	58	1	4.45 a. m..	5.45 a. m..	do.....	7		20-50	Largest halibut 115 pounds, 1 rockfish, 1 cod, 4 red rockfish.
Lituya Bay, bearing NE. $\frac{1}{4}$ N., distance 32 miles.	...do....	53	Pebbles, sand..	58	58	1	8.15 a. m..	9.15 a. m..	do.....	2		10-15	4 skates, 2 dogfish.
Harbor Point, Lituya Bay, bearing NE. $\frac{1}{4}$ N., distance 2 $\frac{1}{2}$ miles.	...do....	40	Sand, gravel...	62	58	1	2.05 p. m..	3.05 p. m..	do.....	6		10	4 skates, 2 dogfish.
Cape Cross, Yacobi Island, bearing N. $\frac{1}{2}$ E., distance 8 $\frac{1}{2}$ miles.	Aug. 12	77	Rocky.....	56	56	1	5.00 a. m..	6.00 a. m..	do.....	2		20-34	10 redfish, 8 dogfish.
CAPE SCOTT.													
South end of Cox Island, bearing NW. $\frac{1}{2}$ N., distance 3 $\frac{1}{2}$ miles.	Aug. 24	52	Rocky.....	53	54	1	9.25 a. m..	10.25 a. m..	Salt herring...	3	50	82	Largest halibut 150 pounds, 1 glammers (ratfish).
Off Sydney Inlet, Vancouver Island, Esteban Point, bearing NW. by N. $\frac{1}{2}$ N., distance 18 miles.	Aug. 25	80	Mud, sand....	58	56	1	8.10 a. m..	9.10 a. m..	do.....				3 black cod, 1 rockfish.
FLATTERY BANK.													
Amphitrite Light, bearing NE. by E. $\frac{1}{2}$ E., distance 30 miles.	Aug. 25	76	Mud, sand....	58	56	2	11.55 a. m..	1.25 p. m..	Salt herring...				4 dogfish, 1 rockfish.
Cape Beal, bearing NE., distance 3 $\frac{1}{4}$ miles.	...do....	60	do.....	58	56	1	4.55 p. m..	5.55 p. m..	do.....				4 black cod, 2 skates, 3 rockfish.
Cape Beal, NE., distance 34 $\frac{1}{2}$ miles.	...do....	63	Rocky.....	58	56	1	5.15 p. m..	6.15 p. m..	do.....				5 rockfish, 1 black cod, 1 shark. Lost half skate gear and 1 anchor.

* Estimated.

SUMMARY.

To cover the fishing banks of Alaska thoroughly and indicate accurately the areas where halibut exist in commercial quantities would require several seasons of active work. An entire season should be devoted to systematic operations in each particular region, all parts of the banks being tested several times at suitable intervals and at different seasons to show their actual resources. In the short time which the *Albatross* had to carry on the work it was found impossible to enter upon such a plan, and the results accomplished are of value chiefly as indicating the lines which further investigations may profitably pursue.

No large catches of halibut were made in any one locality, but many of the trials led to the belief that thorough fishing would be profitable. The grounds which seemed to offer the greatest inducement to fishermen are included in the area extending from the western part of Albatross Bank to the Fairweather Ground. The eastern part of Albatross Bank and the western part of Portlock Bank warrant further investigations, and the inshore grounds are also worthy of attention, especially in the vicinity of the northern end of Kodiak Island, in and off the mouth of Prince William Sound, and between Marmot Island and the eastern entrance of Shelikof Strait. The plateau between Cape Spencer and Yakutat Bay would probably be quite as well worth exploitation as the southeast Alaska banks, where in many cases the fishermen have obtained only meager results for several years.

It is known that halibut exist in more or less abundance on banks extending north of Cross Sound and westward to Unimak Pass, but more knowledge is needed in regard to both numbers and migrations of the fish on these grounds before a fishery can prudently be undertaken so far from a home port.

The average weight of halibut caught by the *Albatross* was about 20 pounds, but individuals weighing from 100 to 150 pounds were also taken. It is not uncommon to find small halibut on all banks, and some of the banks which now yield the greatest number of large halibut formerly gave indications of having few fish of marketable size.

The question of bait supply will require further investigation. Should bait prove to be scarce in the fishing region, means will have to be devised to ship the supply to convenient places along the coast, long passages from the banks in search of it being neither feasible nor profitable.

Only vessels of the largest size now employed in the halibut fishery could operate with any degree of success or profit on banks situated from 500 to 800 miles or more from the nearest market. Small ves-

sels will be obliged to continue fishing on inshore grounds and banks adjacent to the coast, unless shipping facilities should be established at points in central Alaska, Kodiak Island, and other places farther west.

Vessels fishing the Fairweather Ground and Portlock and Albatross Banks will be at some disadvantage as to harbors, but on the western part of Portlock Bank and the northern and eastern part of Albatross Bank shelter can be found along the coast of Kodiak and other islands at no great distance from the fishing grounds. There are several harbors near the grounds lying southwest of Kodiak Island, and in the vicinity of the Shumagin Islands, but the heavy tide makes them dangerous in foggy weather. In the vicinity of Sannak Island and Unimak Pass, also, currents and tides of unknown direction frequently interfere with navigation.

At many of the stations occupied by the *Albatross* it was evident that vessels fitted for cod trawling would have little difficulty in securing their trips. Cod were particularly abundant on the eastern edge of Portlock Bank, Sannak Bank, and in the vicinity of Akun, Akutan, and Simeonof Islands. But while cod caught off shore are in better condition than those taken nearer in, and while their abundance on these grounds is known to the fishermen, little fishing has been done in these localities by the large vessels, and boats connected with the shore stations do not venture so far out. It is thought these offshore grounds could be worked with profit.

The investigation as a whole points to opportunity for development of the Pacific halibut fishery much beyond its present limits. The phenomenal catches landed in the last few years suggest no stringency of supply on grounds now fished, and this fact will doubtless delay the expansion of the fishery, but with the now large demand of the markets it is expected that some of the large steamers will at once proceed to develop the possibilities that have been revealed.